



Contract Documents and Specifications for

City of San Juan Bautista

**Sanitary Sewer Force Main to Hollister
Project**

**Volume 1A
Bid Set**

Date: December 2022



CITY OF SAN JUAN BAUTISTA

SANITARY SEWER FORCE MAIN TO HOLLISTER PROJECT

LICENSEE RESPONSIBLE FOR TECHNICAL SPECIFICATIONS

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12/30/2022

CITY OF SAN JUAN BAUTISTA

SANITARY SEWER FORCE MAIN TO HOLLISTER PROJECT

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SECTION 00100

INVITATION TO BID

CITY OF SAN JUAN BAUTISTA SANITARY SEWER FORCE MAIN TO HOLLISTER PROJECT

ADVERTISEMENT FOR BIDS

The City of San Juan Bautista is requesting Bids for the construction of the following Project:

City of San Juan Bautista Sanitary Sewer Force Main to Hollister Project

Bids for the construction of the Project will be received at the office of the City Hall, located at 311 Second Street, PO Box 1420, San Juan Bautista, CA 95045 until May 26, 2023 at 2:00 pm local time. At that time the Bids received will be publicly opened and read.

The Project includes the following Work:

- Construction of a 10-inch HDPE sanitary sewer force main extending from the City of San Juan Bautista Wastewater Treatment Plant to the City of Hollister Domestic Wastewater Treatment Plant
- Construction of a Primary Pump Station to convey the wastewater to Hollister
- Construction of a Storage Pump Station for peak flow shaving to the Emergency Storage Basins (ESBs) when influent flows exceed the capacity of the Primary Pump Station as well as the necessary improvements to drain the ESBs
- Construction of Chemical Feed System

Bids will be received for a single prime Contract. Bids shall be on a lump sum and unit price basis, as indicated in the Bid Form.

The engineer's opinion of probable cost (cost estimate) for this project is \$14,400,000.

Obtaining the Bidding Documents

Bidding Documents are available at the City website at www.san-juan-bautista.ca.us for download, examination, and printing. Hard copies will not be provided. Direct all bid period questions to the City Engineer, Paul Greenway, at 831-400-8964 or Paul@G7ei.com.

Pre-bid Conference

A mandatory pre-bid conference for the Project will be held on May 11, 2023 at 10:00 am at City Hall, located at 311 Second Street, San Juan Bautista, CA 95045 (a site visit will follow). At this meeting, representatives of the City and Design Engineer will discuss the bid documents, site constraints, order of work, and other items specific to the project. A sign-in sheet will be available up until 11:00 am only. Bids received from Bidders who do not sign the sign-in sheet and attend the meeting will be returned to the Bidder unopened. Attendance by subcontractors is not mandatory, but all interested prospective subcontractors are encouraged to attend. The City will transmit to attendees such Addenda as the City considers necessary in response to questions raised at the pre-bid meeting and walk-through. Oral

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statements not confirmed by Addenda may not be relied upon and are not binding or legally effective. Except for walk-through after the mandatory pre-bid meeting, no other access to the project site will be granted without the City's approval. During the entirety of all site visits, the Bidder must be accompanied full time by an authorized representative of the City. There are no exceptions to this requirement.

Instructions to Bidders.

Bid security shall be furnished in accordance with Section 00200 – Instruction to Bidders.

In accordance with the provisions of California Labor Code Sections 1770, 1773, 1773.1, 1773.6, and 1773.7 as amended, the Director of the Department of Industrial Relations has determined the general prevailing rate of per diem wages in accordance with the standards set forth in Section 1773 for the locality in which the work is to be performed. It shall be mandatory upon the Contractor to whom the work is awarded and upon any subcontractor under the Contractor to pay not less than said specified prevailing rates, to all workmen employed by them in the execution of the Contract.

Pursuant to Labor Code sections 1725.5 and 1771.1, all contractors and subcontractors that wish to bid on, be listed in a bid proposal, or enter into a contract to perform public work must be registered with the Department of Industrial Relations. No Bid will be accepted nor any contract entered into without proof of the contractor's and subcontractors' current registration with the Department of Industrial Relations to perform public work. If awarded a contract, the Bidder and its subcontractors, of any tier, shall maintain active registration with the Department of Industrial Relations for the duration of the Project. Further, Contractor and all Subcontractors shall comply with the requirements of Labor Code sections 1777.5 and 1777.6 in the employment of apprentices.

Each Bidder shall be licensed at the time of bidding under the provisions of Chapter 9, Division 3 of the Business and Professions Code of the State of California to do the type of work contemplated for this project. The license classification shall be Class A – General Engineering.

At time of bid award, the Contractor and all sub-contractors shall have valid City business licenses, which may be obtained from City Hall at 311 Second Street, PO Box 1420, San Juan Bautista, CA 95045.

The Contractor is responsible for obtaining, adhering to the requirements of, or supporting the City in adherence to requirements thereof, permits as described in the Instructions to bidders (City of San Juan Bautista, City of Hollister, San Benito County, Caltrans, Regional Water Resources Control Board, State Water Resources Control Board, Air Resources Board, North Central Coast Air Basin, Occupational Safety and Health Administration, Mitigation Monitoring and Reporting Plan, Biological Opinion, Water Quality Certification, Section 2081 Incidental Take Permit and Streambed Alteration Permit).

Bidders are advised that this project is funded, in part, by a loan or grant from the U.S. Department of Agriculture Rural Development (USDA). Bidders are required to comply with all of the provisions for this funding program in accordance with these specifications related to wage requirements (Specification 00300), and American Iron and Steel (AIS) procurement (Specification 00200 and 00481). Also, to allow for final funding commitments based on accepted bids, there may be a delay of up to 60 days between bid opening and Award.

For all further requirements regarding bid submittal, qualifications, procedures, and contract award, refer to the Instructions to Bidders that are included in the Bidding Documents.

This Advertisement is issued by:

Owner: City of San Juan Bautista

By: Doug Pike

Title: City Engineer

Date: April 21, 2023

END OF ADVERTISEMENT FOR BIDS

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SECTION 00200

INSTRUCTIONS TO BIDDERS

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ARTICLE 1—DEFINED TERMS

- 1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:
- A. *Issuing Office*—The office from which the Bidding Documents are to be issued, and which registers plan holders.
 - B. *Owner* – City of San Juan Bautista
 - C. *Bidder* – The individual or entity who submits a Bid directly to the Owner
 - D. *Successful Bidder* – The lowest responsible Bidder submitting a responsive Bid whom Owner makes an award.

ARTICLE 2—BIDDING DOCUMENTS

- 2.01 Bidder shall obtain a complete set of Bidding Requirements and proposed Contract Documents (together, the Bidding Documents) by contacting City Hall at 311 Second Street, PO Box 1420, San Juan Bautista, CA 95045, or electronically at www.san-juan-bautista.ca.us. See the Agreement for a list of the Contract Documents. It is Bidder’s responsibility to determine that it is using a complete set of documents in the preparation of a Bid. Bidder assumes sole responsibility for errors or misinterpretations resulting from the use of incomplete documents, by Bidder itself or by its prospective Subcontractors and Suppliers.
- 2.02 Bidding Documents are made available for the sole purpose of obtaining Bids for completion of the Project and permission to download or distribution of the Bidding Documents does not confer a license or grant permission or authorization for any other use. Authorization to download documents, or other distribution, includes the right for plan holders to print documents solely for their use, and the use of their prospective Subcontractors and Suppliers, provided the plan holder pays all costs associated with printing or reproduction. Printed documents may not be re-sold under any circumstances.
- 2.03 Owner has established a Bidding Documents Website as indicated in the Advertisement or invitation to bid. Owner recommends that Bidder register as a plan holder with the Issuing Office at such website, and obtain a complete set of the Bidding Documents from such website. Bidders may rely that sets of Bidding Documents obtained from the Bidding Documents Website are complete, unless an omission is blatant. Registered plan holders will receive Addenda issued by Owner.
- 2.04 Plan rooms (including construction information subscription services, and electronic and virtual plan rooms) may distribute the Bidding Documents or make them available for examination. Those prospective bidders that obtain an electronic (digital) copy of the Bidding Documents from a plan room are encouraged to register as plan holders from the Bidding Documents Website or

Issuing Office. Owner is not responsible for omissions in Bidding Documents or other documents obtained from plan rooms, or for a Bidder's failure to obtain Addenda from a plan room.

2.05 *Electronic Documents*

- A. When the Bidding Requirements indicate that electronic (digital) copies of the Bidding Documents are available, such documents will be made available to the Bidders as Electronic Documents in the manner specified.
 - 1. Bidding Documents will be provided in Adobe PDF (Portable Document Format) (.pdf) that is readable by Adobe Acrobat Reader. It is the intent of the Engineer and Owner that such Electronic Documents are to be exactly representative of the paper copies of the documents. However, because the Owner and Engineer cannot totally control the transmission and receipt of Electronic Documents nor the Contractor's means of reproduction of such documents, the Owner and Engineer cannot and do not guarantee that Electronic Documents and reproductions prepared from those versions are identical in every manner to the paper copies.
- B. Unless otherwise stated in the Bidding Documents, the Bidder may use and rely upon complete sets of Electronic Documents of the Bidding Documents, described in Paragraph 2.06.A above. However, Bidder assumes all risks associated with differences arising from transmission/receipt of Electronic Documents versions of Bidding Documents and reproductions prepared from those versions and, further, assumes all risks, costs, and responsibility associated with use of the Electronic Documents versions to derive information that is not explicitly contained in printed paper versions of the documents, and for Bidder's reliance upon such derived information.
- C. After the Contract is awarded, the Owner will provide or direct the Engineer to provide for the use of the Contractor documents that were developed by Engineer as part of the Project design process, as Electronic Documents in native file formats.
 - 1. Electronic Documents that are available in native file format include:
 - a. AutoCAD
 - b. MS Word
 - 2. Release of such documents will be solely for the convenience of the Contractor. No such document is a Contract Document.
 - 3. Unless the Contract Documents explicitly identify that such information will be available to the Successful Bidder (Contractor), nothing herein will create an obligation on the part of the Owner or Engineer to provide or create such information, and the Contractor is not entitled to rely on the availability of such information in the preparation of its Bid or pricing of the Work. In all cases, the Contractor shall take appropriate measures to verify that any electronic/digital information provided in Electronic Documents is appropriate and adequate for the Contractor's specific purposes.
 - 4. In no case will the Contractor be entitled to additional compensation or time for completion due to any differences between the actual Contract Documents and any related document in native file format.

ARTICLE 3—QUALIFICATIONS OF BIDDERS

- 3.01 Bidder is to submit the following information with its Bid to demonstrate Bidder's qualifications to perform the Work:
- A. Written evidence establishing its qualifications such as financial data, previous experience, and present commitments.
 - B. A written statement that Bidder is authorized to do business in the state where the Project is located, or a written certification that Bidder will obtain such authority prior to the Effective Date of the Contract.
 - C. Bidder's state or other contractor license number, if applicable.
 - D. Subcontractor and Supplier qualification information.
 - E. Other required information regarding qualifications.
- 3.02 A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.
- 3.03 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.

ARTICLE 4—PRE-BID CONFERENCE

- 4.01 A mandatory pre-bid conference will be held at the time and location indicated in the Advertisement or invitation to bid. Representatives of Owner and Engineer will be present to discuss the Project. Proposals will not be accepted from Bidders who do not attend the conference. It is each Bidder's responsibility to sign in at the pre-bid conference to verify its participation. Bidders must sign in using the name of the organization that will be submitting a Bid. A list of qualified Bidders that attended the pre-bid conference and are eligible to submit a Bid for this Project will be issued in an Addendum.
- 4.02 Information presented at the pre-Bid conference does not alter the Contract Documents. Owner will issue Addenda to make any changes to the Contract Documents that result from discussions at the pre-Bid conference. Information presented, and statements made at the pre-bid conference will not be binding or legally effective unless incorporated in an Addendum.

ARTICLE 5—SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

- 5.01 *Site and Other Areas*
- A. The Site is identified in the Bidding Documents. By definition, the Site includes areas within rights-of-way, excluding drainage ditches, easements, with environmental restrictions as identified in Appendix B through Appendix F, and other lands furnished by Owner for the use of the Contractor. Land not identified in the contract documents as project area or staging areas may not be used for temporary construction facilities, construction equipment, or storage of materials and equipment unless cleared environmentally and approved by the City.

5.02 Existing Site Conditions

A. Subsurface and Physical Conditions; Hazardous Environmental Conditions

1. The Supplementary Conditions identify the following regarding existing conditions at or adjacent to the Site:
 - a. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data.
 - b. Technical Data contained in such reports and drawings.
2. Owner will make copies of reports and drawings referenced above available to any Bidder on request. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the General Conditions, has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.
3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.

B. *Underground Facilities:* Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05 of the General Conditions, and not in the drawings referred to in Paragraph 5.02.A of these Instructions to Bidders. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

5.03 Site Visit and Testing by Bidders

- A. Bidder is required to visit the Site and conduct a thorough visual examination of the Site and adjacent areas. During the visit the Bidder must not disturb any ongoing operations at the Site.
- B. A Site visit is scheduled following the pre-bid conference. Maps to the Site will be available at the pre-Bid conference.
- C. Bidders visiting the Site are required to arrange their own transportation to the Site.
- D. All access to the Site other than during a regularly scheduled Site visit must be coordinated through the following Owner or Engineer contact for visiting the Site, as specified in Section 00100. Bidder must conduct the required Site visit during normal working hours.
- E. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions prior to bidding.
- F. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder general access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on Owner's authority regarding the Site. Bidder is responsible for establishing access needed to reach specific selected test sites.

- G. Bidder must comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all relevant permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.
- H. Bidder must fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

5.04 *Owner's Safety Program*

- A. Site visits and work at the Site may be governed by an Owner safety program. If an Owner safety program exists, it will be noted in the Supplementary Conditions.

5.05 *Other Work at the Site*

- A. Reference is made to Article 8 of the Supplementary Conditions for the identification of the general nature of other work of which Owner is aware (if any) that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) and relates to the Work contemplated by these Bidding Documents. If Owner is party to a written contract for such other work, then on request, Owner will provide to each Bidder access to examine such contracts (other than portions thereof related to price and other confidential matters), if any.

ARTICLE 6—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 *Express Representations and Certifications in Bid Form, Agreement*

- A. The Bid Form that each Bidder will submit contains express representations regarding the Bidder's examination of Project documentation, Site visit, and preparation of the Bid, and certifications regarding lack of collusion or fraud in connection with the Bid. Bidder should review these representations and certifications, and assure that Bidder can make the representations and certifications in good faith, before executing and submitting its Bid.
- B. If Bidder is awarded the Contract, Bidder (as Contractor) will make similar express representations and certifications when it executes the Agreement.

ARTICLE 7—INTERPRETATIONS AND ADDENDA

- 7.01 Owner on its own initiative may issue Addenda to clarify, correct, supplement, or change the Bidding Documents.
- 7.02 *Bidder shall submit all questions about the meaning or intent of the Bidding Documents to Engineer in writing. Contact information and submittal procedures for such questions are as specified in Section 00100.*
- 7.03 Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all registered plan holders. Questions received less than seven days prior to the date for opening of Bids may not be answered.
- 7.04 Only responses set forth in an Addendum will be binding. Oral and other interpretations or clarifications will be without legal effect. Responses to questions are not part of the Contract

Documents unless set forth in an Addendum that expressly modifies or supplements the Contract Documents.

ARTICLE 8—BID SECURITY

- 8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of ten (10) percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a Bid bond issued by a surety meeting the requirements of Paragraph 6.01 of the General Conditions. Such Bid bond will be issued in the form included in the Bidding Documents.
- 8.02 The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract, furnished the required Contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Contract and furnish the required Contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited, in whole in the case of a penal sum bid bond, and to the extent of Owner's damages in the case of a damages-form bond. Such forfeiture will be Owner's exclusive remedy if Bidder defaults.
- 8.03 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of 7 days after the Effective Date of the Contract or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.
- 8.04 Bid security of other Bidders that Owner believes do not have a reasonable chance of receiving the award will be released within 7 days after the Bid opening.
- 8.05 Copies of all documentation and supporting information in support of the bid preparation shall be secured in an escrow account for independent review and certification

ARTICLE 9—CONTRACT TIMES

- 9.01 The number of days within which, or the dates by which, the Work is to be (a) substantially completed and (b) ready for final payment, and (c) Milestones (if any) are to be achieved, are set forth in the Agreement.
- 9.02 Provisions for liquidated damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

ARTICLE 10—SUBSTITUTE AND "OR EQUAL" ITEMS

- 10.01 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration during the bidding and Contract award process of possible substitute or "or-equal" items. In cases in which the Contract allows the Contractor to request that Engineer authorize the use of a substitute or "or-equal" item of

material or equipment, application for such acceptance may not be made to and will not be considered by Engineer until after the Effective Date of the Contract.

- 10.02 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, and those “or-equal” or substitute or materials and equipment subsequently approved by Engineer prior to the submittal of Bids and identified by Addendum. No item of material or equipment will be considered by Engineer as an “or-equal” or substitute unless written request for approval has been submitted by Bidder and has been received by Engineer within 10 days of the issuance of the Advertisement for Bids or invitation to Bidders. Each such request must comply with the requirements of Paragraphs 7.05 and 7.06 of the General Conditions, and the review of the request will be governed by the principles in those paragraphs. The burden of proof of the merit of the proposed item is upon Bidder. Engineer’s decision of approval or disapproval of a proposed item will be final. If Engineer approves any such proposed item, such approval will be set forth in an Addendum issued to all registered Bidders. Bidders cannot rely upon approvals made in any other manner.
- 10.03 All prices that Bidder sets forth in its Bid will be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of “or-equal” or substitution requests are made at Bidder’s sole risk.
- 10.04 Bidders are advised that, in accordance with Public Contract Code Section 3400, the Owner has made a finding that particular materials, products, things and services are designated by specific brand or trade name in order to match other materials, products, things or services in use or to obtain necessary items available only from one source. By listing a sole-source vendor, Owner has only identified a particular product the supply of which will conform to the Contract. Owner does not warrant in any respect the performance of any designated sole-source vendor. Owner shall not be responsible for, and Contractor shall not be excused for, any failure of a sole-source vendor to supply a conforming product in a timely fashion. Bidders shall refer to individual specification sections for specific requirements.
- 10.05 Contractors, manufacturers or suppliers or materials and equipment may offer an alternative product and request the alternatives to specified products be considered equal unless the Owner has sole-sourced a product in accordance with Public Contract 3400. Inclusion of such alternatives in the bid is the sole responsibility of the Contractor. Inclusion of the proposed alternative should only be considered if it is the Contractor’s sole belief the offered alternative is equal in quality and performance to the specified product. After award of the Contract, such offers of alternative products will be reviewed and processed as described in Section 00436 – List of Equipment Manufacturers. If the material, equipment, process or article offered by the Contractor is not, in the Owner’s sole opinion, substantially equal or better in respect to that specified, then the Contractor shall furnish that material, process or article specified or one that in the Owner’s opinion is substantially equal or better in every respect.

ARTICLE 11—SUBCONTRACTORS, SUPPLIERS, AND OTHERS

- 11.01 A Bidder must be prepared to retain specific Subcontractors and Suppliers for the performance of the Work if required to do so by the Bidding Documents or in the Specifications. If a prospective

Bidder objects to retaining any such Subcontractor or Supplier and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.

- 11.02 The apparent Successful Bidder, and any other Bidder so requested, must submit to Owner a list of the Subcontractors (Specification Section 00434) or Suppliers (Specification Section 00436) proposed for the Work with Bid. At a minimum, the list of Subcontractors shall include the Geotechnical Engineer who will be preparing the Geotechnical Report for the City WWTP site and the electrical subcontractor.
- 11.03 If requested by Owner, such lists must be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor or Supplier. This information, if requested, would be in addition to the already required information of the Electrical Subcontractor and Electrical System Integrator found in Sections 00452 and 00453, respectively, which must be furnished to Owner within three (3) business days of the Bid.

If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor or Supplier, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder will submit a substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.

- 11.04 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors and Suppliers. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor or Supplier, so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.07 of the General Conditions.

ARTICLE 12—PREPARATION OF BID

- 12.01 The Bid Form is included with the Bidding Documents.
- A. All blanks on the Bid Form must be completed in ink and the Bid Form signed in ink. Erasures or alterations must be initialed in ink by the person signing the Bid Form. A Bid price must be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.
 - B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words "No Bid" or "Not Applicable."
- 12.02 If Bidder has obtained the Bidding Documents as Electronic Documents, then Bidder shall prepare its Bid on a paper copy of the Bid Form printed from the Electronic Documents version of the Bidding Documents. The printed copy of the Bid Form must be clearly legible, printed on 8½ inch by 11-inch paper and as closely identical in appearance to the Electronic Document version of the Bid Form as may be practical. The Owner reserves the right to accept Bid Forms which nominally vary in appearance from the original paper version of the Bid Form, providing that all required information and submittals are included with the Bid.

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- 12.03 A Bid by a corporation must be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation must be shown.
- 12.04 A Bid by a partnership must be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership must be shown.
- 12.05 A Bid by a limited liability company must be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown.
- 12.06 A Bid by an individual must show the Bidder's name and official address.
- 12.07 A Bid by a joint venture must be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The joint venture must have been formally established prior to submittal of a Bid, and the official address of the joint venture must be shown.
- 12.08 All names must be printed in ink below the signatures.
- 12.09 The Bid must contain an acknowledgment of receipt of all Addenda, the numbers of which must be filled in on the Bid Form.
- 12.10 Postal and e-mail addresses and telephone number for communications regarding the Bid must be shown.
- 12.11 The Bid must contain evidence of Bidder's authority to do business in the state where the Project is located, or Bidder must certify in writing that it will obtain such authority within the time for acceptance of Bids and attach such certification to the Bid.
- 12.12 If Bidder is required to be licensed to submit a Bid or perform the Work in the state where the Project is located, the Bid must contain evidence of Bidder's licensure, or Bidder must certify in writing that it will obtain such licensure within the time for acceptance of Bids and attach such certification to the Bid. Bidder's state contractor license number, if any, must also be shown on the Bid Form.
- 12.13 Crawford & Associates, Inc. prepared a soil investigation report entitled "Geotechnical Report, San Juan Bautista to Hollister Sanitary Force Main Project, San Benito County, California, dated September 2022. This report pertains to the force main and does not include the City's WWTP site where additional improvements, such as the Primary Pump Station, are planned. The geotechnical and final structural design at the City WWTP site shall be a design build component of the Project. The Contractor shall be responsible for the preparation of the Geotechnical Report and the final structural design of the City WWTP site. The Bid amount shall include all costs associated with the development of the Geotechnical Report for the City WWTP site and the final structural design of the City WWTP site (including structural calculations).

ARTICLE 13—BASIS OF BID

13.01 *Base Bids*

- A. Bidders must submit base Bids based on unit prices and lump sum prices for various project configurations in sequence, each deducting the lowest priority project component from the previous project configuration. The Owner will declare their budget prior to opening bids

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and the first project configuration with a qualified bid less than the Owner's budget shall be the basis for bid selection. See the Bid Form.

13.02 Unit Price and Lump Sum

- A. Bidders must submit a Bid on a unit price and lump sum basis for each item of Work listed in the unit price section of the Bid Form, and on a lump sum basis for each item of Work listed as lump sum.
- B. The "Bid Price" (sometimes referred to as the extended price) for each unit price Bid item will be the product of the "Estimated Quantity", which Owner or its representative has set forth in the Bid Form, or as details in the plans and specification for contractor determination, for the item and the corresponding "Bid Unit Price" offered by the Bidder. The total of all unit price Bid items will be the sum of these "Bid Prices"; such total will be used by Owner for Bid comparison purposes. The final quantities and Contract Price will be determined in accordance with Paragraph 13.03 of the General Conditions.
- C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.
- D. The unit prices shall be used to adjust the costs associated with the City WWTP site following completion of the final design of the site per the City WWTP site Geotechnical Report.

ARTICLE 14—SUBMITTAL OF BID

- 14.01 The Bidding Documents include one separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of the Bid Form is to be completed and submitted with the Bid security and the other documents required to be submitted under the terms of Article 2 of the Bid Form.
- 14.02 A Bid must be received no later than the date and time prescribed and at the place indicated in the Advertisement or invitation to bid and must be enclosed in a plainly marked package with the Project title, and, if applicable, the designated portion of the Project for which the Bid is submitted, the name and address of Bidder, and must be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid must be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid must be addressed to the location designated in the Advertisement.
- 14.03 Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Bidder unopened.

ARTICLE 15—MODIFICATION AND WITHDRAWAL OF BID

- 15.01 An unopened Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted

prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.

- 15.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 15.01 and submit a new Bid prior to the date and time for the opening of Bids.
- 15.03 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, the Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, the Bidder will be disqualified from further bidding on the Work.
- 15.04 In accordance with Sections 5101 and 5103, California Public Contract Code, withdrawal of Bids may be permitted for mistakes made in filling out the Bid but will not be permitted for mistakes resulting from errors in judgment or carelessness in inspecting the site of the work or in reading the Contract Documents.
- 15.05 In the event Bidder alleges that a clerical error had been made in the list of subcontractors, the procedures for substitution shall be provided in accordance with Section 4107.5, California Public Contract Code.

ARTICLE 16—OPENING OF BIDS

- 16.01 Bids will be opened at the time and place indicated in the advertisement or invitation to bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.
- 16.02 Opening of Bids:
- A. All Bids, irrespective of any irregularities or informalities, if received on time, will be opened and publicly read aloud at the time and place set forth in specification Section 00100 – Invitation to Bid, provided that, if a mandatory pre-bid walk-through is prescribed in specification Section 00100 – Invitation to Bid , any bid from a Bidder who did not sign the sign-in sheet and attend the meeting and walk-through, will be returned to the Bidder unopened. Bidders, their representatives and other interested persons may be present at the opening and reading of bids.
 - B. Any bids received after the time for receiving and opening bids as forth in specification Section 00100 – Invitation to Bid or as postponed by addenda will not be opened. Any such bids will be returned, unopened, to the Bidder.
 - C. The public reading of each bid will include at least the following:
 - 1. Name and address of Bidder.
 - 2. The total amount of Bid.
- 16.03 The Owner reserves the right to postpone the date and time for receiving and/or opening of bids at any time prior to the date and time established in specification Section 00100 – Invitation to

Bid. Postponement notices may be faxed and will subsequently be mailed to plan holders of record in the form of an addendum.

ARTICLE 17—BIDS TO REMAIN SUBJECT TO ACCEPTANCE

17.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 18—EVALUATION OF BIDS AND AWARD OF CONTRACT

18.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner also reserves the right to waive all minor Bid informalities not involving price, time, or changes in the Work.

18.02 Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible.

18.03 If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, whether in the Bid itself or in a separate communication to Owner or Engineer, then Owner will reject the Bid as nonresponsive.

18.04 If Owner awards the contract for the Work, such award will be to the responsible Bidder submitting the lowest responsive Bid.

18.05 *Evaluation of Bids*

A. In evaluating Bids, Owner will consider whether the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.

B. In the comparison of Bids, alternates will be applied in the same order of priority as listed in the Bid Form. To determine the Bid prices for purposes of comparison, Owner will announce to all bidders a "Base Bid plus alternates" budget after receiving all Bids, but prior to opening them. For comparison purposes alternates will be accepted, following the order of priority established in the Bid Form, until doing so would cause the budget to be exceeded. After determination of the Successful Bidder based on this comparative process and on the responsiveness, responsibility, and other factors set forth in these Instructions, the award may be made to said Successful Bidder on its base Bid and any combination of its additive alternate Bids for which Owner determines funds will be available at the time of award.

C. For the determination of the apparent low Bidder when unit price bids are submitted, Bids will be compared on the basis of the total of the products of the estimated quantity of each item and unit price Bid for that item, together with any lump sum items.

18.06 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for

those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.

- 18.07 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

ARTICLE 19—BONDS AND INSURANCE

- 19.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds, other required bonds (if any), and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it must be accompanied by required bonds and insurance documentation.
- 19.02 Article 8, Bid Security, of these Instructions, addresses any requirements for providing bid bonds as part of the bidding process.

ARTICLE 20—SIGNING OF AGREEMENT

- 20.01 When Owner issues a Notice of Award to the Successful Bidder, it will be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder must execute and deliver the required number of counterparts of the Agreement and any bonds and insurance documentation required to be delivered by the Contract Documents to Owner. Within 10 days thereafter, Owner will deliver one fully executed counterpart of the Agreement to Successful Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

ARTICLE 21—SALES AND USE TAXES

- 21.01 Bid prices shall include all federal state, and local taxes.

ARTICLE 22—RETAINAGE

- 22.01 Substitution of securities is not allowed in this contract.

ARTICLE 23—OWNER SELECTED EQUIPMENT

- 23.01 Sole-Sourced Items and Substitutions during Bidding:
- A. Bidders are advised that, in accordance with Public Contract Code Section 3400, the Owner has made a finding that particular materials, products, things or services are designated by specific brand or trade names in order to match other materials, products, things or services in use or to obtain necessary items available only from one source. By listing a sole-source vendor, Owner has only identified a particular product the supply of which will conform to the Contract. Owner does not warrant in any respect the performance of any designated sole-source vendor. Owner shall not be responsible for, and Contractor shall not be excused for, any failure of a sole-source vendor to supply a conforming product in a timely fashion. Bidders shall refer to individual specification sections for specific requirements.

- B. Contractors, manufacturers or suppliers of materials and equipment may offer an alternative product and request the alternatives to specified products be considered equal unless the Owner has sole-sourced a product in accordance with Public Contract Code 3400. Inclusion of such alternatives in the bid is the sole responsibility of the Contractor. Inclusion of the proposed alternative should only be considered if it is the Contractor's sole belief the offered alternative is equal in quality and performance to the specified product. After award of the Contract, such offers of alternative products will be reviewed and processed as a "or equal" substitution. If the material, equipment, process or article offered by the Contractor is not, in the Owner's sole opinion, substantially equal or better in respect to that specified, then the contractor shall furnish that material, process or article specified or one that in the Owner's opinion is substantially equal or better in every respect.

ARTICLE 24—OWNER PRE-PURCHASED EQUIPMENT

24.01 Owner has not pre-purchased any equipment for this project.

ARTICLE 25—LOCAL BUSINESS LICENSE

25.01 The Contractor shall have a local business license for the work contemplated before the Contract can be executed. If required by Owner, all subcontractors will be required to secure the appropriate local business license before they commence work on the project.

ARTICLE 26—SHEETING, SHORING AND BRACING

26.01 Pursuant to the provisions of the California Labor Code Section 6707, each bid submitted shall contain, in the bid, the amount included for adequate sheeting, shoring, and bracing, or equivalent method, for the protection of life and limb in trenches and open excavation, which shall conform to applicable safety orders. By listing this sum, the Bidder warrants that its action does not convey tort liability to the Owner, the Design Engineer, the Construction Manager, and other employees, agents, and subconsultants.

ARTICLE 27—OFFER OF ASSIGNMENT OF ANTITRUST ACTIONS

27.01 As provided by Section 4552, et. Seq., of the California Government Code, in submitting a bid to the Owner, the Bidder offers and agrees that if the bid is accepted, it will assign to the Owner all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Section 15) or under the Cartwright Act (Chapter 2 (Chapter 2 [commencing with Section 16700] of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, materials, or services by the Bidder for sale to the Owner pursuant to the bid. Such assignment shall be made and become effective at the time the Owner tenders final payment to the Bidder.

ARTICLE 28—ASSIGNMENT OF CONTRACT

28.01 Any attempted assignment by the Contractor of any contract to be entered into hereunder, or any part thereof, or of funds to be received there under by the Contractor, is void unless such

assignment has prior written approval by the Owner, and the Surety has been given due notice of such assignment in writing and has consented thereto in writing.

ARTICLE 29—BID PROTEST PROCEDURE

- 29.01 Any protest relating to the form or content of the bidding or contract documents must be submitted in writing to the Owner at least ten (10) business days before the original date for receiving Bids. Any person who submits a Bid shall be deemed to have waived any protest to the form or content of the bidding or contract documents.
- A. The protest document shall contain a complete statement of the basis for the protest.
 - B. The protest shall identify the specific portion(s) of the bidding or contract documents that form the basis for the protest.
 - C. The protest shall include the name, address and telephone number of the person representing the protesting party.
 - D. The documents shall be transmitted by fax or overnight mail.
 - E. The procedure and time limits set forth in this paragraph are mandatory and are the Bidder's sole and exclusive remedy in the event of protest. Failure to comply with these procedures shall constitute a waiver of any right to further pursue the protest, including filing a Government Code claim or legal proceedings.
- 29.02 Any protest relating to any particular proposal or the award of the contract must be submitted in writing to the Owner. The protest must be received no later than fifteen (15) business days after the Bid opening.
- A. The initial protest document shall contain a complete statement of the basis for the protest.
 - B. The protest shall identify the specific portion(s) of the proposal documents that form the basis for the protest.
 - C. The protest shall include the name, address and telephone number of the person representing the protesting party.
 - D. The party filing the protest shall concurrently transmit a copy of the initial protest document and any attached documentation to all other parties who have a direct financial interest that may be adversely affected by the outcome of the protest. Such parties shall include all other Bidders who appear to have a reasonable prospect of receiving an award depending upon the outcome of the protest. The documents shall be transmitted by fax or overnight mail.
 - E. The procedure and time limits set forth in this paragraph are mandatory and are the Bidder's sole and exclusive remedy in the event of protest. Failure to comply with these procedures shall constitute a waiver of any right to further pursue the protest, including filing a Government Code claim or legal proceedings.

ARTICLE 30—WORKERS’ COMPENSATION REQUIREMENTS

- 30.01 As required by Section 1860 of the California Labor Code and in accordance with the provisions of Section 3700 of the Labor Code, every Contractor will be required to secure the payment of workers’ compensation to its employees.
- 30.02 In accordance with Section 1861 of the California Labor Code, the Contractor shall furnish the Owner with a statement as follows: “I am aware of the provisions of 3700 of the Labor Code which requires every employer to be insured against liability for worker’s compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this contract.”

ARTICLE 31—SUBCONTRACTOR LISTING LAW

- 31.01 In accordance with Section 4104 of the California Public Contract Code, each Bidder, in his or her Bid, shall set forth the name and the location of the place of business of each Subcontractor who will perform Work or labor or render service to the prime Contractor in or about the construction of the Work or improvement, or a Subcontractor licensed by the State of California who, under subcontract to the prime contractor, specially fabricates and installs a portion of the work or improvement according to detailed drawings contained in the plans and specifications, in an amount in excess of one-half of one percent of the prime contractor’s total bid.
- 31.02 In accordance with Section 4107 of the California Public Contract Code, no Contractor whose Bid is accepted shall without consent of the Owner either: (a) substitute a person as a Subcontractor in place of the Subcontractor listed in the original Bid; or (b) permit a subcontract to be voluntarily assigned or transferred or allow it to be performed by anyone other than the original Subcontractor listed in the original Bid; or (c) sublet or subcontract any portion of the Work in excess of one-half of one percent of the prime Contractor’s total Bid as to which his or her original Bid did not designate a Subcontractor.
- 31.03 Penalties for failure to comply with the foregoing sections of the California Public Contract Code are set forth in Sections 4106, 4110, and 4111 of the Public Contract Code. A prime contractor violating this law violates his or her contract and the awarding authority may exercise the option, in its own discretion, of (1) canceling his or her contract or (2) assessing the prime contractor a penalty in an amount of not more than 10 percent of the amount of the subcontract involved, and this penalty shall be deposited in the fund out of which the prime contract is awarded. In any proceedings under this section the prime contractor shall be entitled to a public hearing and to five days’ notice of the time and place thereof.

ARTICLE 32—WAGES

- 32.01 Wages
- A. Notice is hereby given that, pursuant to 1773 of the Labor Code of the State of California, the general prevailing rate of per diem wages and the general prevailing rate for holidays and overtime work for each craft, classification, or type of worker required to execute the contract shall be obtained from the Director of the Department of Industrial Relations.

- B. It shall be mandatory upon the Contractor to whom the work is awarded and upon any subcontractor under the Contractor to pay not less than said specified prevailing rates to all workmen employed by them in the execution of the Contract.
- C. Pursuant to Labor Code Section 1722 and 1771.1, the General Contractor (Bidder) and all listed Subcontractors shall be registered to bid and work on public works projects with the Department of Industrial Relations (DIR), pursuant to Labor Code Section 1725.5 (with limited exceptions from this requirement for bid purposed only under section 1771.1a). No bid will be accepted nor any contract entered into without proof of contractor's and subcontractors' current registration with the Department of Industrial Relations to perform public work. If awarded a contract, the Bidder and its subcontractor(s), of any tier, shall maintain active registration with the Department of Industrial Relations for the duration of the Project. Contractors must furnish certified payroll records to the Labor Commissioner, in accordance with the law. This project is subject to compliance monitoring and enforcement by the DIR.

ARTICLE 33—FUNDING

33.01 Funding

It is anticipated that the project will receive United States Department of Agricultural (USDA). Therefore, the Contractor shall be responsible for complying with Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A - Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference. See Specification 00481.

ARTICLE 34—AMERICAN IRON AND STEEL REQUIREMENTS, CONSOLIDATED APPROPRIATIONS ACT OF 2017

34.01 All USDA requirements will remain in effect unless such requirements are inconsistent with the statutory requirements of the Consolidated Appropriations Act of 2017 or the requirements contained in this specification section.

34.02 The Contractor shall be responsible for complying with Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A - Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference. See Specification 00481. See USDA's website for more information, including possible waivers, at:

<https://www.rd.usda.gov/water-and-waste-disposal-programs-american-iron-and-steel-requirement>

1. Contractor shall include all costs associated with meeting the requirements of the Consolidated Appropriations Act of 2017 into the Bid Form as part of the base bid. The Contractor shall also include, as a deductive bid item, the amount the Owner will save if the Contractor does not meet the requirements of the Consolidated Appropriations Act of 2017.

- a. If a waiver is not granted for this project, the Contractor will be responsible for supplying iron and steel products only produced in the United States.
2. Self- certification letters from equipment and material manufacturers shall be submitted with individual submittal packages, per specification section 01300 and 00481. Note that un-certified manufacturers shall be a basis for rejection of product, unless a waiver has been granted. Contractor shall replace all rejected items (due to noncompliance with Consolidated Appropriations AIS guidelines) with Consolidated Appropriation AIS compliant manufacturers, at no cost to the owner.
3. The Contractor shall certify in writing that all iron and steel products installed for this project by his/her company and by any and all subcontractors and manufacturers his/her company has contracted with for this project comply with Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A - Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference, or are the subject of a waiver approved by the Secretary of Agriculture or designee. The Contractor shall submit to the Engineer the Prime Contractor's Certification (sample provided in Specification 00481).
4. Naming of manufacturers within specifications or other contract documents does not guarantee their compliance with Consolidated Appropriations AIS guidelines. Contractor shall ensure all chosen manufacturers used on this project are self-certified Consolidated Appropriations AIS requirements compliant, as stated in this specification section and related governing Consolidated Appropriations AIS documents.

ARTICLE 35—BUILD AMERICA BUY AMERICA (BABA) PROVISIONS OF THE “INFRASTRUCTURE INVESTMENT AND JOBS ACT” (IIJA; P.L.117-58)

35.01 This Build America Buy America (BABA) provisions of the “Infrastructure Investment and Jobs Act” (IIJA; P.L.117-58) were waived for this Project.

ARTICLE 36—ENVIRONMENTAL REQUIREMENTS

- 36.01 Subject to change, the Contractor will be responsible for helping the monitoring biologists comply with permit measures, including:
1. Participation in training sessions, assign monitors from within the crew that can check the work site and equipment
 2. Agreement to and implementation of protective measures, such as preventing entrapment of wildlife in holes or trenches by covering or adding ramps, regular removal of trash, no firearms, no pets, implementation of accidental spill and erosion control plans, stage equipment away from aquatic areas, limit access routes and staging areas to the extent possible, revegetate affected areas, etc.

36.02 In addition to the two bullets identified above, the Contractor is responsible for adhering to all environmental and procedural requirements, as detailed in the following documents:

1. Appendix B, - San Juan Bautista to Hollister Force Main Mitigation Monitoring and Reporting Program CEQA & NEPA, September 9, 2022 (EMC Planning Group Inc.)
2. Appendix C - Biological Opinion for the San Juan Bautista to Hollister Sewer Force Main Project, San Benito County, California (USFWS 2022)
3. Appendix D - Water Quality Certification, San Juan Bautista to Hollister Sewer Force Main Project (RWQCB 2022)
4. Appendix E - Section 2081 Incidental Take Permit, San Juan Bautista to Hollister Sewer Force Main Project (2081-2022-033-04) (CDFW)
5. Appendix F - Streambed Alteration Agreement, San Juan Bautista to Hollister Sewer Force Main Project (EPIMS Notification No. SBO-29921) (CDFW)

ARTICLE 37 – PROJECT PERMITS

37.01 Contractor is responsible for securing the following local permits:

1. Caltrans Encroachment Permit. The Owner will secure the Encroachment Permit with Caltrans and the Contractor shall be responsible for becoming a Permit Rider on the Caltrans Encroachment Permit for work around Highway 156 (Contractor must submit a Rider Application to amend the Encroachment Permit to become a Permit Rider).
 - a. The City Caltrans Encroachment Permit will be provided via addendum or change order when approved by and received from Caltrans. It is anticipated that the City Caltrans Encroachment Permit will be provided by July 1, 2023, at which time the Contractor shall apply to become a Permit Rider. Work within the Caltrans right-of-way may begin once the Contractor is approved as a Permit Rider.
2. City of San Juan Bautista Encroachment Permit
3. City of Hollister Encroachment Permit
4. City of Hollister Tree Removal Permit (if trees are removed)
5. County of San Benito Encroachment Permit
 - a. County of San Benito Encroachment Permit Application is provided in Appendix G. The Contractor shall be applicant for the County of San Benito Encroachment Permit. In Section 2 of the application, the Contractor shall select Option C wherein the Contractor shall certify that he/she is licensed under the provisions of the Contractor's License Laws and shall provide his/her license Number and Classification.
6. County of San Benito Grading Permit
7. California Air Resources Board Air Permit
8. North Central Coast Air Basin Permit to Construct
9. Occupational Safety and Health Administration (OSHA) Excavation and Overhead Utility Proximity Permits
10. California State Water Resources Control Board (SWRCB) General Construction Activity Storm Water Permit

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11. California Regional Water Quality Control Board (RWQCB) discharge permits for discharging water used for pipe pressure testing, leakage testing, disinfection, and for dewatering as necessary. If not to the San Juan Bautista WWTP or the City of Hollister WWTP.

END OF SECTION

SECTION 00300

WAGE REQUIREMENTS

The prevailing wage rates of the State of California apply to this contract as do any requirements of the State of California associated with the use of these State Prevailing wages.

1. Prevailing Wages: Notice is hereby given that pursuant to 1773 of the Labor Code of the State of California, the general prevailing rate of per diem wages and the general prevailing rate for holidays and overtime work for each craft, classification, or type of worker required to execute the contract shall be obtained from the Director of the Department of Industrial Relations. Said prevailing rate of per diem wages will be made available to any interested party upon request, and a copy thereof shall be posted at each job site by the Contractor.
2. Statutory Penalty For Failure to Pay Minimum Wages: In accordance with 1775 (a) through (c) of the California Labor Code, the contractor shall as a penalty to the State of political subdivision on whose behalf a contract is made or awarded, forfeit the current statutory penalty for each calendar day or portion thereof, for each worker paid less than the prevailing wage rates as determined by the director for the work or craft in which the worker is employed for any public work done under the contract by the contractor or, except as provided in subdivision 1775 (b), by any subcontractor under the contractor.
3. Statutory Penalty for Unauthorized Overtime Work: In accordance with Section 1813 of the California Labor Code, the contractor shall as a penalty to the State or political subdivision on whose behalf the contract is made or awarded, forfeit the current statutory penalty for each worker employed in the execution of the contract by the respective contractor or subcontractor for each calendar day during which said worker is required or permitted to work more than 8 hours in any one calendar day and 40 hours in any one calendar week in violation of Sections 1810-1815 of the California Labor Code.
4. Requirements: Contractor agrees to comply with Sections 1777.5, 1777.6 and 1777.7 of the California Labor Code relating to the employment of apprentices. The responsibility for compliance with these provisions is fixed with the prime contractor for all apprenticeship occupations. Under these sections of the law, contractors and subcontractors must employ apprentices in apprenticeship occupations, where journeymen in the craft are employed on the public work, in a ratio of not less than one apprentice hour for each five journeymen hours (unless an exemption is granted in accordance with 1777.5) and contractors and subcontractors shall not discriminate among otherwise qualified employees as indentured apprentices on any public work solely on the ground of race, religious creed, color, national origin, ancestry, sex, or age, except as provided in 3077 of the Labor Code. Only apprentices, as defined in 3077, which provides that an apprentice must be at least 16 years of age, who are in training under apprenticeship standards and who have signed written apprentice agreements will be employed on public works in apprenticeship occupations.

5. Payroll Records: Contractor shall keep accurate payroll records in format specified by the Division of Labor Standards Enforcement. Said information shall include, but not be limited to, a record of the name, address, social security number, work classification, straight time and overtime hours worked each day and week, and actual per diem wages paid to each journeyman, apprentice, or worker employed by the contractor. Copies of such record shall be made available for inspection at all reasonable hours, and a copy shall be made available to employee or his authorized representative, the Division of Labor Standards Enforcement, and the Division of Apprenticeship Standards in compliance with California Labor Code, Section 1776. Contractor and subcontractors shall furnish and submit electronic certified payrolls directly to the Labor Commissioner, and duplicate copies available to the owner.

END OF SECTION

SECTION 00410

BID FORM FOR CONSTRUCTION CONTRACT

SAN JUAN BAUTISTA SANITARY SEWER FORCE MAIN TO HOLLISTER PROJECT

The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 1—OWNER AND BIDDER

- 1.01 This Bid is submitted to:
- Don Reynolds, City Manager
City of San Juan Bautista
311 Second Street, PO Box 1420
San Juan Bautista CA 95045
- 1.02 Section 00100 – Advertisement to Bid.
- 1.03 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2—ATTACHMENTS TO THIS BID

- 2.01 The following documents are submitted with and made a condition of this Bid:
- A. Section 00420 – Non Collusion Affidavit To Be Executed By Bidder and Submitted With Bid
 - B. Required Bid security, in accordance with Specification Section 00430
 - C. Section 00434 – List of Proposed Subcontractors
 - D. Section 00436 – List of Proposed Suppliers
 - E. Section 00440 – Compliance Statement
 - F. Section 00450 – Certification Regarding Debarment
 - G. Section 00451 – Certification of Bidder Experience and Qualification
 - H. Section 00457 – Contractor's Certificate Regarding Workers' Compensation
 - I. Section 00460 – Certification For Contracts, Grants, and Loans

2.02 The following documents shall be submitted after bid opening:

- A. In evaluating Bidders, Owner may request supplemental information on the qualifications and experience of the subcontractors listed in Section 00434 and equipment manufacturers listed in Section 00436.
- B. The undersigned Bidder understands that a Bidder will be potentially ineligible for an award of Contract unless the Bidder has furnished the required Electrical Subcontractor and System Integrator certifications within three (3) business days after receipt of bids as required in Sections 00452 and 00453, respectively.

ARTICLE 3—BASIS OF BID—LUMP SUM BID AND UNIT PRICES

3.01 *Lump Sum and Unit Prices*

If award is made, the Owner will determine making an award to the lowest responsive, responsible Bidder whose bid complies only with the requirements specified by California Public Contract Code Section 20103.8(a). Accordingly, the Owner will determine the lowest responsive, responsible bid based on the Base Bid Amount.

Additive or deductive bid items will be awarded at the Owner’s discretion and are not part of the Base Bid Amount on which the lowest responsive, responsible Bidder will be determined.

Base Bid Schedule ⁽¹⁾

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
1	Mobilization	LS	1	\$	\$
2	Demobilization	LS	1	\$	\$
3	Survey Control and Construction Staking	LS	1	\$	\$
4	Sheeting, Shoring and Bracing or equivalent method for the protection of life and limb in trenches and open excavations in conformance with all applicable safety standards	LS	1	\$	\$
5	Excavation Dewatering	LS	1	\$	\$
6	SWPPP Compliance	LS	1	\$	\$
7	Tree Removal (felling, trimming, stump removal, disposal) By 10-inch Breast Height Diameter Tree (exact tree work to be determined in the field)	EA	5	\$	\$
8	Hydroseed	LS	1	\$	\$

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Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
9	Traffic Control	LS	1	\$	\$
10	Geotechnical Report and Final City WWTP Design (Design Build)	LS	1	\$	\$
11	Critical Path Method & Schedule	LS	1	\$	\$
12	As-Built Drawings	LS	1	\$	\$
13	10-inch DR11 IPS HDPE Pipe (SJB WWTP, open cut) ⁽²⁾	FT	213	\$	\$
14	10-inch DR11 IPS HDPE Pipe (Rancho Vista Development, 18-inch Casing) ⁽²⁾	FT	2,215	\$	\$
15	10-inch DR11 IPS HDPE Pipe (San Juan Highway, open cut) ⁽²⁾	FT	1,224	\$	\$
16	10-inch DR11 IPS HDPE Pipe (Prescott Road and San Justo Road, open cut) ⁽²⁾	FT	10,470	\$	\$
17	10-inch DR13.5 IPS HDPE Pipe (Prescott Road and San Justo Road, open cut) ⁽²⁾	FT	1,544	\$	\$
18	10-inch DR13.5 IPS HDPE Pipe (Lucy Brown Lane, Duncan Avenue, Bixby Road, Freitas Road, and Mitchell Road [to end of existing paved section near End of County Road sign], open cut) ⁽²⁾	FT	19,206	\$	\$
9	10-inch DR13.5 IPS HDPE Pipe (shoulder, open cut) ⁽²⁾	FT	4,026	\$	\$
20	10-inch DR13.5 IPS HDPE Pipe (through existing 42-inch casing) ⁽²⁾	FT	227	\$	\$
21	SJB WWTP AC Paving	TON	87	\$	\$
22	San Juan Highway/First Street AC Pavement (Grind and pave one lane [force main lane]; AC curb shall be included in respective HDPE pipe bid item)	TON	363	\$	\$
23	Prescott / San Justo Road AC Pavement (Grind and pave one lane [force main lane])	TON	2,592	\$	\$
24	Lucy Brown Lane, Duncan Avenue, Bixby Road, Freitas Road, Mitchell Road AC Pavement (Grind and pave one lane [force main lane])	TON	3,788	\$	\$
25	Prescott Road Canal Pipe Crossing, Station 56+79.85 to 57+86.48 (casing, footings, carrier pipe, appurtenances, etc.) ⁽²⁾	LS	1	\$	\$

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Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
26	San Juan Highway Canal Pipe Crossing and Seismic Flexibility, station 25+00.72 to station 25+99.34 (casing, footings, carrier pipe, fittings, appurtenances, etc.) ⁽²⁾	LS	1	\$	\$
27	Manhole Removal & Restoration, including pavement repair (on 18-inch SS - SJB WWTP through intersection of Third St and Lavagnino Dr)	EA	6	\$	\$
28	Manhole Removal & Restoration, including pavement repair (on 18-inch SS - Intersection of Third St and Lavagnino Dr to intersection of Rancho Way and Caetano Place)	EA	3	\$	\$
29	Manhole Removal & Restoration, including pavement repair (on 18-inch SS - Caetano Place)	EA	1	\$	\$
30	Hollister Manhole Restoration and Tie-in	LS	1	\$	\$
31	SJB WWTP Pig Launch Station ⁽²⁾	LS	1	\$	\$
32	San Justo Road / Lucy Brown Road Pig Receiving & Launch Station ⁽²⁾	LS	1	\$	\$
33	Freitas Road Pig Receiving & Launch Station ⁽²⁾	LS	1	\$	\$
34	Hollister WWTP Pig Receiving Station ⁽²⁾	LS	1	\$	\$
35	Striping	LS	1	\$	\$
36	Primary Pump Station (pumps, discharge piping, FRP basin, valves, davit crane)	LS	1	\$	\$
37	Storage Pump Wet Well Improvements (coating)	LS	1	\$	\$
38	Storage Pump Station (pumps, discharge piping, valves)	LS	1	\$	\$
39	ESB 1 Sump Pump (pump, manhole, piping, valve)	LS	1	\$	\$
40	Screen	LS	1	\$	\$
41	Chemical Feed System	LS	1	\$	\$
42	Throttling Valve and Appurtenances (flow control from storage)	LS	1	\$	\$
43	Temporary Bypass Piping	LS	1	\$	\$
44	SJB WWTP Yard Piping & Fittings	LS	1	\$	\$

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Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
45	SJB WWTP EQ Tank Piping	LS	1	\$	\$
46	SJB WWTP Site Work (grading and paving, etc.)	LS	1	\$	\$
47	Clearing & Grubbing	LS	1	\$	\$
48	Foundation	LS	1	\$	\$
49	Sludge Removal from SJB Ponds	DRY TON	660	\$	\$
50	SJB WWTP Demolition Work	LS	1	\$	\$
51	Standby Generator	LS	1	\$	\$
52	Main Switchboard	LS	1	\$	\$
53	Electrical and Instrumentation for Primary Pumps (includes flow meters, actuators, VFDs, MCC, MSB, transformer, conduit, etc.)	LS	1	\$	\$
54	Electrical and Instrumentation for Storage Pumps and Screen (includes flow meters, actuators, VFDs, MCC, MSB, transformer, conduit, etc.)	LS	1	\$	\$
55	Electrical and Instrumentation for Sump Pump (includes flow meters, actuators, MCC, MSB, transformer, conduit, etc.)	LS	1	\$	\$
56	PLC and Telemetry	LS	1	\$	\$
57	Startup and Testing Including Initial Pigging by Contractor	LS	1	\$	\$
Base Bid Amount (Sum of All Unit Price and Lump Sum Bid Items)					\$
Base Bid in Words					

- (1) Enter all non-specified items from the drawing set and specifications (Volumes 1 and 2) in the most related bid item, such as backfill, aggregate base, paving (unless included in a separate bid item), off-haul and disposal of unwanted materials, specific instrumentation, seismic parameters, etc. The Sum of all Unit Prices and Lump Sum Bid Items shall constitute the entire project, i.e. no non-specified item in the bid form shall be
- (2) Bid item includes all related appurtenances including valves and fittings for a complete installed cost.

Additive Bid Item A

Additive Bid Item	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
A	Add AC overlay and fog line striping over one lane (lane without the force main)	TON	6,779	\$	\$
A	Remove 3-inch grind from force main lane paving in Base Bid Amount. (With added AC overlay with Additive Bid Item A, the full road can be overlaid, and the grind omitted.)	SF	372,000	\$	- \$
Total of Additive Bid Item A					\$

Deductive Bid Item B

Deductive Bid Item	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
B	Remove AC overlay and striping from force main lane	TON	6,706	\$	- \$
B	Remove 3-inch grind from force main lane paving in Base Bid Amount.	SF	372,000	\$	- \$
B	Add T-Trench pavement repair and associated pavement removal to edge of road	TON	5,438	\$	\$
Total of Deductive Bid Item B					- \$

Deductive Bid Item C

Deductive Bid Item	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
C	Remove all work related to the existing wet well (leave equipment as is: no new storage pumps; no new screen; no associated electrical work; no wet well improvements)	LS	1	\$	- \$

Deductive Bid Item D

Deductive Bid Item	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
D	Remove all SJB WWTP demolition related work (except the filters and UV disinfection equipment, which must be removed from site to complete new improvements)	LS	1	\$	- \$

Deductive Bid Item E

E	Remove all work related to the sump pump manhole (piping, electrical, site; pump to be provided to operations staff)	LS	1	\$	- \$
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Additive Bid Item F

F	Conduit & pull boxes along with T-Trench pavement repair	LF	34,182	\$	- \$
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A. Bidder acknowledges that:

1. each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and
2. estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Work will be based on actual quantities, determined as provided in the Contract Documents.

ARTICLE 4—TIME OF COMPLETION

4.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

4.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 5—BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

5.01 *Bid Acceptance Period*

- A. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

5.02 *Instructions to Bidders*

- A. Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security.

5.03 *Receipt of Addenda*

- A. Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Addendum Date

ARTICLE 6—BIDDER’S REPRESENTATIONS AND CERTIFICATIONS

6.01 *Bidder’s Representations*

- A. In submitting this Bid, Bidder represents the following:
 - 1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.
 - 2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 - 3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
 - 4. Bidder has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
 - 5. Bidder has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
 - 6. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder’s (Contractor’s) safety precautions and programs.
 - 7. Based on the information and observations referred to in the preceding paragraph, Bidder agrees that no further examinations, investigations, explorations, tests, studies, or data

are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.

8. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
9. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
10. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
11. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

6.02 *Bidder's Certifications*

A. The Bidder certifies the following:

1. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation.
2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.
3. Bidder has not solicited or induced any individual or entity to refrain from bidding.
4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 8.02.A:
 - a. Corrupt practice means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.
 - b. Fraudulent practice means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.
 - c. Collusive practice means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.
 - d. Coercive practice means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

BIDDER hereby submits this Bid as set forth above:

Bidder:

(typed or printed name of organization)

By: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Date: _____
(typed or printed)

If Bidder is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.

Attest: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Date: _____
(typed or printed)

Address for giving notices:

Bidder's Contact:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Phone: _____

Email: _____

Address: _____

Bidder's Contractor License No.: (if applicable) _____

**NON COLLUSION AFFIDAVIT TO BE EXECUTED BY BIDDER AND
SUBMITTED WITH BID**

(Public Contract Code Section 7106)

State of California

County of _____

_____, being first duly sworn, deposes and says that he or she is _____ of _____, the party making the foregoing bid, that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and further that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

By _____

Subscribed and sworn to before me on _____
(date)

(Notary Public)

(SEAL)

SECTION 00430

BID BOND

<p>Bidder</p> <p>Name: _____</p> <p>Address (<i>principal place of business</i>): _____</p>	<p>Surety</p> <p>Name: _____</p> <p>Address (<i>principal place of business</i>): _____</p>
<p>Owner</p> <p>Name: City of San Juan Bautista</p> <p>Address (<i>principal place of business</i>): 311 2nd Street, PO Box 1420 San Juan Bautista, CA 95045</p>	<p>Bid</p> <p>Project (<i>name and location</i>): City of San Juan Bautista Sanitary Sewer Force Main to Hollister Project</p> <p>Bid Due Date: May 8, 2023</p>
<p>Bond</p> <p>Penal Sum: _____</p> <p>Date of Bond: _____</p>	
<p>Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.</p>	
<p>Bidder</p> <p>_____</p> <p style="text-align: center;"><i>(Full formal name of Bidder)</i></p>	<p>Surety</p> <p>_____</p> <p style="text-align: center;"><i>(Full formal name of Surety) (corporate seal)</i></p>
<p>By: _____</p> <p style="text-align: center;"><i>(Signature)</i></p>	<p>By: _____</p> <p style="text-align: center;"><i>(Signature) (Attach Power of Attorney)</i></p>
<p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p>	<p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p>
<p>Title: _____</p>	<p>Title: _____</p>
<p>Attest: _____</p> <p style="text-align: center;"><i>(Signature)</i></p>	<p>Attest: _____</p> <p style="text-align: center;"><i>(Signature)</i></p>
<p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p>	<p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p>
<p>Title: _____</p>	<p>Title: _____</p>
<p><i>Notes: (1) Note: Addresses are to be used for giving any required notice. (2) Provide execution by any additional parties, such as joint venturers, if necessary.</i></p>	

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond will be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder occurs upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation will be null and void if:
 - 3.1. Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
 - 3.2. All Bids are rejected by Owner, or
 - 3.3. Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions does not in the aggregate exceed 60 days from the Bid due date without Surety's written consent.
6. No suit or action will be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety, and in no case later than one year after the Bid due date.
7. Any suit or action under this Bond will be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder must be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Postal Service registered or certified mail, return receipt requested, postage pre-paid, and will be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond will be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute governs and the remainder of this Bond that is not in conflict therewith continues in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

SECTION 00434

LIST OF SUBCONTRACTORS

In accordance with Chapter 2 (commencing with Section 4100), Division 5, Title 1 of the Government Code of the State of California (Subletting and Subcontracting Fair Practices Act), list on the form provided: (a) the name and location of the place of business of each subcontractor who will perform work or labor, or render service to the general contractor in or about the construction of the work or improvement, or a subcontractor licensed by the State of California, who, under subcontract to the general contractor specially fabricates and installs a portion of the work of improvement according to detailed drawings contained in the plans and specifications, in an amount in excess of one-half of one percent (0.5%) of the general contractor’s total bid; and (b) that portion of the work which will be done by each such subcontractor for each such portion as defined by the Contractor in his bid. Additionally, include information of the qualified system supplier and integrator, as defined by Section 00453.

If a Contractor fails to specify a Subcontractor for any portion of the work to be performed under this contract in excess of one-half of one percent (0.5%) of the total bid, he agrees to perform that portion himself.

The Bidder’s attention is directed to the provisions found in Section 00200 – Instructions to Bidders, which stipulates the percent of the Work to be performed by the Contractor.

Work to be Performed	Contractor License Number	Percent of Total Contract	Subcontractor's Name and Address
1.			
2.			
3.			
4.			
5.			
6.			

Name of Bidder: _____

Work to be Performed	Contractor License Number	Percent of Total Contract	Subcontractor's Name and Address
7.			
8.			
9.			
10.			
11.			
12.			

Add additional sheets, if necessary.

BIDDER

(Signature)

(Date)

END OF SECTION

SECTION 00436

LIST OF EQUIPMENT MANUFACTURERS

Bidder shall list the manufacturer or supplier that will furnish the respective item of equipment. Bidder shall list only one manufacturer or supplier for each piece of equipment listed. Failure by Bidder to list names of manufacturers or suppliers for every item of equipment listed may be cause for rejection of the Bid. The manufacturers or suppliers listed by the Bidder shall not be changed after submitting list unless approved in writing by the Owner.

1.1 LUMP SUM BASE BID

- A. The Bidder shall base the Lump Sum Base Bid upon the specified and named Alternate A, B, C, or D major equipment items as listed in the following Major Product or System Schedule.
- B. Award of the contract will be made as described in the specification Section 00200 – Instructions to Bidders.

1.2 MAJOR PRODUCT OR SYSTEMS SCHEDULE

- A. This section includes a schedule listing alternate equipment acceptable to Owner. The Bidder shall indicate (circle proposed manufacturer) which named alternate equipment it intends to provide. Bidders may also propose “or-equal” equipment for those items where a blank space is provided by writing in the manufacturer’s name.
- B. If an “or equal” manufacturer is proposed by the Bidder, the cost of any required engineering redesign, and the cost of any electrical, mechanical or structural modifications to adjacent and interfacing equipment necessary to make the several parts fit together, licensing fees and additional construction and other costs resulting from the proposed “or equal” equipment shall be included in the Bid. If there is a deviation from the drawings, submittal of new contract drawings requires approval prior to installation; all drawings must be stamped by a California certified professional engineer. These deviations shall be at no cost to the owner. If the proposed “or-equal” manufacturer is not accepted by the Owner after the Award of Contract, the Bidder shall furnish and install the named equipment at no additional cost to the Owner.
- C. When an “or-equal” manufacturer is offered by Bidder, the Bidder shall list only such equipment that will comply with the requirements of the Specifications. Equipment will generally be deemed “or equal” provided that the equipment is the same or better than the named equipment in function, performance, reliability, quality, and general configuration.

Name of Bidder: _____

- D. In order that Owner may determine if the proposed “or equal” equipment is a satisfactory alternative to the named equipment, Bidder shall submit full descriptive material and a detailed list of the equipment proposed as outlined in the Instructions to Bidder. No evaluation of submittals will be made prior to the Bid opening. It is the responsibility of Contractor to furnish materials and equipment meeting the requirements of the Specifications, and acceptance of the Bid does not constitute or imply approval of equipment proposed. Owner reserves the right to deny approval of any equipment or materials that do not comply with the Specifications, even though listed herein.

MAJOR PRODUCT OR SYSTEMS SCHEDULE

Item No.	Spec. Section	Description	Manufacturer/Supplier
1.	11302	Submersible Pumps	A. <u>Flygt</u> B. _____ C. _____
2.	13614	FRP Package Wet Well	A. <u>Topp Industries</u> B. <u>Barski Industries</u> C. _____
3.	11303	Sump Pump	A. <u>Flygt</u> B. _____ C. _____
4.	11337	Basket Screen and Washer Compactor	A. <u>WesTech</u> B. <u>JWC</u> C. _____
5.	13322	Calcium Nitrate Chemical Feed System	A. <u>Evoqua</u> B. _____ C. _____
6.	15072	Polyethylene Pressure Pipe	A. <u>ISCO</u> B. _____ C. _____
7.	11391	Automatic Samplers	A. <u>ISCO</u> B. <u>HACH</u> C. _____
8.	14313	Davit Crane	A. <u>Thern</u> B. <u>Yale</u> C. _____
9.	16620	Diesel Generator	A. <u>Caterpillar</u> B. <u>Onan-Cumins</u> C. _____

Name of Bidder: _____

Item No.	Spec. Section	Description	Manufacturer/Supplier
10.	16400	Low Voltage Switchboard	A. <u>Eaton</u> B. <u>Square D By Schneider Electric</u> C. <u>GE by ABB</u> D. <u>Siemens Corporation</u>
11.	16155	Motor Control Center	A. <u>TESCO</u> B. <u>Telstar Instruments</u> C. <u>Krug-Bixby-Long Associates</u>
12.	16157	Variable Frequency Drive	A. <u>Eaton</u> B. <u>Schneider Electric</u> C. <u>Rockwell</u>
13.	17300	PLC	A. <u>AB Compact Logix</u> B. _____ C. _____
14.	16460	Transformer	A. <u>Square D</u> B. <u>General Electric</u> C. <u>Cutler-Hammer</u>
15.	17110	Panel Enclosures	A. <u>Hoffman</u> B. <u>Tesco</u> C. _____

Notes:

- Not all major products and systems are included in the table above; only those items related to mechanical equipment. Other products, such as concrete, steel and piping are not included.
- Items in this table must be circled or completed for the bid.

BIDDER

(Signature)

(Date)

END OF SECTION

SECTION 00440

COMPLIANCE STATEMENT

SDA
Form RD 400-6
(Rev. 2-98)

This statement relates to a proposed contract
with _____

(Name of borrower or grantee)

who expects to finance the contract with assistance from either the Rural Housing Service (RHS), Rural Business-Cooperative Service (RBS), or the Rural Utilities Service (RUS) or their successor agencies, United States Department of Agriculture (whether by a loan, grant, loan insurance, guarantee, or other form of financial assistance). I am the undersigned bidder or prospective contractor. I represent that:

1. I have, have not, participated in a previous contract or subcontract subject to Executive Order 11246 (regarding equal employment opportunity) or a preceding similar Executive Order.
2. If I have participated in such a contract or subcontract, I have, have not, filed all compliance reports that I have been required to file in connection with the contract or subcontract.

If the proposed contract is for \$50,000 or more and I have 50 or more employees, I also represent that:

3. I have, have not, previously had contracts subject to the written affirmative action program requirements of the Secretary of Labor.
4. If I have participated in such a contract or subcontract, I have, have not, developed and placed on file at each establishment affirmative action programs as required by the rules and regulations of the Secretary of Labor.

I understand that if I have failed to file any compliance reports that have been required of me, I am not eligible and will not be eligible to have my bid considered or to enter into the proposed contract unless and until I make an arrangement regarding such reports that is satisfactory to either the RHS, RBS, or RUS, or to the office where the reports are required to be filed.

I also certify that I do not maintain or provide for my employees any segregated facilities at any of my establishments, and that I do not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I certify further that I will not maintain or provide for my employees any segregated facilities at any of my establishments, and that I will not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I agree that a breach of this certification is a violation of the Equal Opportunity clause in my contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other

storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. I further agree that (except where I have obtained identical certifications from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity clause; that I will retain such certifications in my files; and that I will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods): (See Reverse).

RD 400-6 (Rev. 2-98)

**NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENTS
FOR
CERTIFICATIONS OF NON-SEGREGATED FACILITIES**

A certification of Nonsegregated Facilities, as required by the May 9, 1967, order (32F.R. 7439, May 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding \$10,000 which is not exempt from the provisions of the Equal Opportunity Clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

Date: _____
_____ *Signature of Bidder or Prospective Contractor*

Address (including Zip Code)

END OF SECTION

SECTION 00450

CERTIFICATION REGARDING DEBARMENT

U.S. DEPARTMENT OF AGRICULTURE

**Certification Regarding Debarment, Suspension, Ineligibility
and Voluntary Exclusion – Lower Tier Covered Transactions.**

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 7 CFR Part 3017.510, Participants' responsibilities. The regulations were published as Part IV of the January 30, 1989, Federal Register (pages 4722-4733). Copies of the regulations may be obtained by contacting the Department of Agriculture agency with which this transaction originated.

(BEFORE COMPLETING CERTIFICATION, READ INSTRUCTIONS ON REVERSE)

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.
2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

Organization Name

PR/Award Number or Project Name

Name(s) and Title(s) of Authorized Representative(s)

Signature(s)

Date

Form AD-1048 (1/92)

Instructions for Certification

1. By signing and submitting this form, the prospective lower tier participant is providing the certification set out on the reverse side in accordance with these instructions.
2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
3. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
4. The terms “covered transaction,” “debarred,” “suspended,” “ineligible,” “lower tier covered transaction,” “participant,” “person,” “primary covered transaction,” “principal,” “proposal,” and “voluntarily excluded,” as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.
5. The prospective lower tier participant agrees by submitting this form that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
6. The prospective lower tier participant further agrees by submitting this form that it will include this clause titled “Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – Lower Tier Covered Transactions,” without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principles. Each participant may, but is not required to, check the Nonprocurement List.
8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

9. Except for transactions authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly entered into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

Form AD-1048 (1/92)

END OF SECTION

SECTION 00451

QUALIFICATIONS STATEMENT

ARTICLE 1—GENERAL INFORMATION

1.01 Provide contact information for the Business:

Legal Name of Business:			
Corporate Office			
Name:		Phone number:	
Title:		Email address:	
Business address of corporate office:			
Local Office			
Name:		Phone number:	
Title:		Email address:	
Business address of local office:			

1.02 Provide information on the Business’s organizational structure:

Form of Business:	<input type="checkbox"/> Sole Proprietorship <input type="checkbox"/> Partnership <input type="checkbox"/> Corporation		
<input type="checkbox"/> Limited Liability Company <input type="checkbox"/> Joint Venture comprised of the following companies:			
	1.		
	2.		
	3.		
Provide a separate Qualification Statement for each Joint Venturer.			
Date Business was formed:		State in which Business was formed:	
Is this Business authorized to operate in the Project location?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Pending	

1.03 Identify all businesses that own Business in whole or in part (25% or greater), or that are wholly or partly (25% or greater) owned by Business:

Name of business:		Affiliation:	
-------------------	--	--------------	--

Address:			
Name of business:		Affiliation:	
Address:			
Name of business:		Affiliation:	
Address:			

1.04 Provide information regarding the Business’s officers, partners, and limits of authority.

Name:		Title:	
Authorized to sign contracts:	<input type="checkbox"/> Yes <input type="checkbox"/> No	Limit of Authority:	\$
Name:		Title:	
Authorized to sign contracts:	<input type="checkbox"/> Yes <input type="checkbox"/> No	Limit of Authority:	\$
Name:		Title:	
Authorized to sign contracts:	<input type="checkbox"/> Yes <input type="checkbox"/> No	Limit of Authority:	\$
Name:		Title:	

ARTICLE 2—LICENSING

2.01 Provide information regarding licensure for Business:

Name of License:			
Licensing Agency:			
License No:		Expiration Date:	
Name of License:			
Licensing Agency:			
License No:		Expiration Date:	

ARTICLE 3—DIVERSE BUSINESS CERTIFICATIONS

3.01 Provide information regarding Business’s Diverse Business Certification, if any. Provide evidence of current certification.

Certification	Certifying Agency	Certification Date
<input type="checkbox"/> Disadvantaged Business Enterprise		
<input type="checkbox"/> Minority Business Enterprise		
<input type="checkbox"/> Woman-Owned Business Enterprise		
<input type="checkbox"/> Small Business Enterprise		
<input type="checkbox"/> Disabled Business Enterprise		

<input type="checkbox"/> Veteran-Owned Business Enterprise		
<input type="checkbox"/> Service-Disabled Veteran-Owned Business		
<input type="checkbox"/> HUBZone Business (Historically Underutilized) Business		
<input type="checkbox"/> Other		
<input type="checkbox"/> None		

ARTICLE 4—SAFETY

4.01 Provide information regarding Business’s safety organization and safety performance.

Name of Business’s Safety Officer:		
Safety Certifications		
Certification Name	Issuing Agency	Expiration

4.02 Provide Worker’s Compensation Insurance Experience Modification Rate (EMR), Total Recordable Frequency Rate (TRFR) for incidents, and Total Number of Recorded Manhours (MH) for the last 3 years and the EMR, TRFR, and MH history for the last 3 years of any proposed Subcontractor(s) that will provide Work valued at 10% or more of the Contract Price. Provide documentation of the EMR history for Business and Subcontractor(s).

Year									
Company	EMR	TRFR	MH	EMR	TRFR	MH	EMR	TRFR	MH

ARTICLE 5—FINANCIAL

5.01 Provide information regarding the Business’s financial stability. Provide the most recent audited financial statement, and if such audited financial statement is not current, also provide the most current financial statement.

Financial Institution:		
Business address:		
Date of Business’s most recent financial statement:		<input type="checkbox"/> Attached
Date of Business’s most recent audited financial statement:		<input type="checkbox"/> Attached
Financial indicators from the most recent financial statement		

Contractor's Current Ratio (Current Assets ÷ Current Liabilities)	
Contractor's Quick Ratio ((Cash and Cash Equivalents + Accounts Receivable + Short Term Investments) ÷ Current Liabilities)	

ARTICLE 6—SURETY INFORMATION

6.01 Provide information regarding the surety company that will issue required bonds on behalf of the Business, including but not limited to performance and payment bonds.

Surety Name:			
Surety is a corporation organized and existing under the laws of the state of:			
Is surety authorized to provide surety bonds in the Project location?	<input type="checkbox"/> Yes <input type="checkbox"/> No		
Is surety listed in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" published in Department Circular 570 (as amended) by the Bureau of the Fiscal Service, U.S. Department of the Treasury? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Mailing Address (principal place of business):			
Physical Address (principal place of business):			
Phone (main):		Phone (claims):	

ARTICLE 7—INSURANCE

7.01 Provide information regarding Business's insurance company(s), including but not limited to its Commercial General Liability carrier. Provide information for each provider.

Name of insurance provider, and type of policy (CLE, auto, etc.):			
Insurance Provider		Type of Policy (Coverage Provided)	
Are providers licensed or authorized to issue policies in the Project location?			<input type="checkbox"/> Yes <input type="checkbox"/> No
Does provider have an A.M. Best Rating of A-VII or better?			<input type="checkbox"/> Yes <input type="checkbox"/> No
Mailing Address (principal place of business):			
Physical Address			

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(principal place of business):			
Phone (main):		Phone (claims):	

ARTICLE 8—CONSTRUCTION EXPERIENCE

8.01 Provide information that will identify the overall size and capacity of the Business.

Average number of current full-time employees:	
Estimate of revenue for the current year:	
Estimate of revenue for the previous year:	

8.02 Provide information regarding the Business’s previous contracting experience.

Years of experience with projects like the proposed project:			
As a general contractor:		As a joint venturer:	
Has Business, or a predecessor in interest, or an affiliate identified in Paragraph 1.03:			
Been disqualified as a bidder by any local, state, or federal agency within the last 5 years? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Been barred from contracting by any local, state, or federal agency within the last 5 years? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Been released from a bid in the past 5 years? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Defaulted on a project or failed to complete any contract awarded to it? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Refused to construct or refused to provide materials defined in the contract documents or in a change order? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Been a party to any currently pending litigation or arbitration? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Provide full details in a separate attachment if the response to any of these questions is Yes.			

8.03 List all projects currently under contract in Schedule A and provide indicated information.

8.04 List a minimum of three and a maximum of six projects completed in the last 5 years in Schedule B and provide indicated information to demonstrate the Business’s experience with projects similar in type and cost of construction.

8.05 In Schedule C, provide information on key individuals whom Business intends to assign to the Project. Provide resumes for those individuals included in Schedule C. Key individuals include the Project Manager, Project Superintendent, Quality Manager, and Safety Manager. Resumes may be provided for Business’s key leaders as well.

ARTICLE 9—REQUIRED ATTACHMENTS

- 9.01 Provide the following information with the Statement of Qualifications:
- A. If Business is a Joint Venture, separate Qualifications Statements for each Joint Venturer, as required in Paragraph 1.02.
 - B. Diverse Business Certifications if required by Paragraph 3.01.
 - C. Certification of Business's safety performance if required by Paragraph 4.02.
 - D. Financial statements as required by Paragraph 5.01.
 - E. Attachments providing additional information as required by Paragraph 8.02.
 - F. Schedule A (Current Projects) as required by Paragraph 8.03.
 - G. Schedule B (Previous Experience with Similar Projects) as required by Paragraph 8.04.
 - H. Schedule C (Key Individuals) and resumes for the key individuals listed, as required by Paragraph 8.05.
 - I. Additional items as pertinent.

This Statement of Qualifications is offered by:

Business: _____
(typed or printed name of organization)

By: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Date: _____
(date signed)

(If Business is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address for giving notices:

Designated Representative:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address: _____

Phone: _____

Email: _____

Schedule A—Current Projects

Name of Organization					
Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					
Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					
Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

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Schedule B—Previous Experience with Similar Projects

Name of Organization					
Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

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Schedule B—Previous Experience with Similar Projects

Name of Organization					
Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

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Schedule C—Key Individuals

Project Manager			
Name of individual			
Years of experience as project manager			
Years of experience with this organization			
Number of similar projects as project manager			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	
Project Superintendent			
Name of individual			
Years of experience as project superintendent			
Years of experience with this organization			
Number of similar projects as project superintendent			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	

Safety Manager			
Name of individual			
Years of experience as project manager			
Years of experience with this organization			
Number of similar projects as project manager			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	
Quality Control Manager			
Name of individual			
Years of experience as project superintendent			
Years of experience with this organization			
Number of similar projects as project superintendent			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	

SECTION 00452

CERTIFICATION OF ELECTRICAL SUBCONTRACTOR'S EXPERIENCE AND QUALIFICATIONS

This certification and the responses herein shall assist the Owner in determining the lowest responsive responsible bidder. To be eligible for an award of Contract, the Bidder must submit this signed certification from the Electrical Subcontractor listed on Section 00434 – List of Subcontractors within the timeframe identified in the Bid Form, Specification Section 00410. If the Bidder does not list an Electrical Subcontractor for the electrical work, then Bidder must submit to the Owner with bidding documents this signed Certification of Bidder's experience and qualifications to self-perform the electrical work with the understanding that all references to Electrical Subcontractor in this certification shall mean Contractor.

The electrical subcontractor represents that it is competent, knowledgeable, and has special skills on the nature, extent, and inherent conditions of the work to be performed. The electrical subcontractor further acknowledges that there are certain peculiar and inherent conditions existent in the construction of the particular facilities which may create, during the construction program, unusual or peculiar unsafe conditions hazardous to persons and property. The electrical subcontractor expressly acknowledges that it is aware of such peculiar risks and that it has the skill and experience to foresee and to adopt protective measures to adequately and safely perform the construction work with respect to such hazards.

None of the requirements herein are to determine pre-qualification to bid on the Project, but are part of the Owner's evaluation of bids received.

A. ESSENTIAL REQUIREMENTS FOR QUALIFICATION

If the answer to any of questions 1 through 4 is "no", or if the answer to any of questions 5 through 8 is "yes", the Bidder shall provide an explanation of its answer, including the reasons why its answer shall not result in it being disqualified from being awarded the Contract. However, an exemption explanation letter does not guarantee acceptance of Bid. In accordance with all applicable public contract laws, the Owner shall retain the right to reject unqualified Bidders, which shall render the Bid non-responsive.

1. Subcontractor will comply with and provide Commercial General Liability and Automobile insurance as defined in Section 00700 Standard General Conditions and Section 00800-Supplementary Conditions, except the amount of coverage per occurrence or accident shall not be less than \$1,000,000 with an annual general aggregate limit of \$2,000,000.

Yes No

2. Subcontractor has current Workers' Compensation insurance policy as required by the Labor Code or is legally self-insured pursuant to Labor Code section 3700 et. seq.
 Yes No

3. Does your firm meet the requirements of California Code of Regulations, Title 8, Section §290.1. All journeymen shall hold a California general electrician certification?
 Yes No

4. Subcontractor's three year average Workers' Compensation Insurance Experience Modification Rate (EMR) is less than or equal to 1.10 (110%) or is the RIR and LTIR less than 2.2 and 1.2 respectively. See Safety Qualification Criteria below for EMR, RIR, and LTIR rate calculation.
 Yes No

5. Has your contractor's license been revoked at any time in the last five (5) years?
 Yes No

6. Has a surety firm completed a contract on your behalf, or paid for completion because your firm was default terminated by the project owner within the last five (5) years?
 Yes No

7. At the time of submitting this qualification form, is your firm ineligible to bid on or be awarded a public works contract, or perform as a subcontractor on a public works contract, pursuant to either Labor Code section 1777.1 or Labor Code section 1777.7?
 Yes No

8. At any time during the last five (5) years, has your firm, or any of its owners or officers been convicted of a crime involving the awarding of a contract of a government construction project, or the bidding or performance of a government contract?
 Yes No

B. PROJECT EXPERIENCE - To be to the Owner within the timeframe identified in the Bid Form, Specification Section 00410.

The electrical subcontractor shall have performed at least three (3) wastewater or water treatment plant projects with electrical systems of similar or greater complexity in the last five (5) years of similar size that demonstrate the electrical subcontractor's experience and qualification to construct this project; of which, the electrical subcontractor must demonstrate the successful completion of at least two (2) wastewater projects each with a dollar value of at least 65% of the value bid for this project or two (2) wastewater projects each with 65% of the equivalent cost per construction year [of this project] within the past five years.

If the Electrical Subcontractor fails to have the required experience as set forth above, the Bidder shall provide an explanation as to why its Bid should not be rejected. However, an

exemption explanation letter does not guarantee acceptance of Bid. In accordance with all applicable public contract laws, the Owner shall retain the right to reject unqualified Bidders, which shall render the Bid non-responsive.

Bidders are to complete this certification form and not attach their own form to this document with similar information.

1. Project Name: _____
Owner: _____
Electrical Subcontract Cost: _____
Construction Time: _____ Calendar Days
Owner's Representative: _____
Owner's Telephone No.: _____
Date of Substantial Completion _____

2. Project Name: _____
Owner: _____
Electrical Subcontract Cost: _____
Construction Time: _____ Calendar Days
Owner's Representative: _____
Owner's Telephone No.: _____
Date of Substantial Completion _____

3. Project Name: _____
Owner: _____
Electrical Subcontract Cost: _____
Construction Time: _____ Calendar Days
Owner's Representative: _____
Owner's Telephone No.: _____
Date of Substantial Completion _____

4. Project Name: _____
 Owner: _____
 Electrical Subcontract Cost: _____
 Construction Time: _____ Calendar Days
 Owner's Representative: _____
 Owner's Telephone No.: _____
 Date of Substantial Completion _____

5. Project Name: _____
 Owner: _____
 Electrical Subcontract Cost: _____
 Construction Time: _____ Calendar Days
 Owner's Representative: _____
 Owner's Telephone No.: _____
 Date of Substantial Completion _____

C. SAFETY QUALIFICATION CRITERIA

The following information will be used to determine if the electrical subcontractor meets the minimum safety requirements for this project. To qualify to bid and be awarded the project, the contractor shall have a safety record that meets or exceeds the one of the three following safety criteria:

SAFETY CRITERIA REQUIREMENTS FOR QUALIFICATION

1. If the Contractors three-year average Workers' Compensation Experience Modification (EMR) is equal to or less than 110%, the contractor meets the minimum safety requirements for this project;
2. If the Contractor's three-year average EMR is greater than 110%, the Contractor's three-year average Recordable Incident Rate (RIR) must not be greater than 2.2 and three-year average Lost Time Incident Rate (LTIR) must not be greater than 1.2 to meet the minimum safety requirements for this project;

3. If the Contractor only meets either the three-year average RIR or LTIR value, the Contractor shall be required to hire, at no additional cost to the Owner, a mutually acceptable safety consultant who will prepare a project specific safety plan, conduct random weekly inspections of the Contractor's activities to ensure conformance with the safety plan and prepare and submit a weekly report to the Owner summarizing the results of each inspection. The contractor's shall adhere to the safety plan. The contractor's activities shall be adjusted immediately to address any issues resulting from the weekly safety inspection.

Contractors that cannot meet any of the three safety criteria above are not eligible to work for the Owner.

The electrical subcontractor shall list its Experience Modification Rate, Lost time incident Rate, and Recordable Incident Rate for the last three complete years (available from your insurance carrier).

Year	EMR	RIR	LTIR
Three Year Average			

To verify the above information, the Owner will contact the electrical subcontractor's Workers' Compensation Insurance carrier. The electrical subcontractor shall authorize its carrier to release this information. Failure to release this information will result in the bid being non-responsive and result in automatic disqualification of the bid.

Workers' Compensation Insurance Company:

Contact Person for Insurance Company:

Telephone Number:

The Owner may check project references listed to verify information provided along with skills and capacity represented by Subcontractor. It is very important that the Bidder is responsible to verify that all contact information is current for each name listed above and that the Subcontractor has the qualifications and experience required by this certification prior to submission of the certification. The undersigned hereby states that all above representations are correct and true.

Signed this _____ day of _____, 20____

Electrical Subcontractor's Name

Authorized Signature

Title of Signator

Valid CA Contractors License No.

License Classification

Expiration Date

END OF SECTION

SECTION 00453

CERTIFICATION OF SYSTEM INTEGRATOR EXPERIENCE AND QUALIFICATIONS

This certification and the responses herein shall assist the Owner in determining the lowest responsive responsible bidder. To be eligible for an award of Contract, the Bidder must submit to the Owner this signed Certification from the General Contractor's or Electrical Subcontractor's System Integrator of all switchboards, panels, ATs, MCCs, panelboards, panelboard transformers, and PLC hardware; submit certification within the timeframe identified in the Bid Form, Specification Section 00410.

The System Integrator represents that it is competent, knowledgeable, and has special skills on the nature, extent, and inherent conditions of the work to be performed. The System Integrator further acknowledges that he has regularly engaged in similar electrical and instrumentation systems for the municipal water and wastewater industry.

None of the requirements herein are to determine pre-qualification to bid on the Project, but are part of the Owner's evaluation of bids received.

A. ESSENTIAL REQUIREMENTS FOR QUALIFICATION

If the answer to any of questions 1 through 3 is "no", or if the answer to questions 4 is "yes", the Bidder shall provide an explanation of its answer, including the reasons why its answer shall not result in it being disqualified from being awarded the Contract. However, an exemption explanation letter does not guarantee acceptance of Bid. In accordance with all applicable public contract laws, the Owner shall retain the right to reject unqualified Bidders, which shall render the Bid non-responsive.

1. The System Integrator employs personnel on this project who have successfully completed ISA or equal training courses on general-purpose instrumentation.
 Yes No
2. The System Integrator has a permanent, fully staffed, and equipped service facility in operation at least six (6) months prior to bid date within 200 miles of project site. Service facility shall be under same company name as System Integrator and same company shall be staffed with personnel and equipment required to maintain, repair and calibrate the instrumentation system. Subletting repair and warranty work to a third party is not acceptable.
 Yes No
3. System Integrator has current Workers' Compensation insurance policy as required by the Labor Code or is legally self-insured pursuant to Labor Code section 3700 et. seq.

Yes No

4. Has a surety firm completed a contract on your behalf, or paid for completion because your firm was default terminated by the project owner within the last five (5) years?

Yes No

B. PROJECT EXPERIENCE - To be submitted within the timeframe identified in the Bid Form, Specification Section 00410.

The system integrator shall have performed at least three (3) wastewater pump station and force main projects with electrical, instrumentation and automation systems of similar or greater complexity in the last five (5) years of similar size that demonstrate the system integrator's experience and qualification to construct this project; of which, the system integrator must demonstrate the successful completion of at least two (2) wastewater projects with a dollar value of at least 65% of the value bid for this project or two (2) wastewater projects have 65% of the equivalent cost per construction year of this project within the past five years.

If the System Integrator fails to have the required experience as set forth above, the Bidder shall provide an explanation as to why its Bid should not be rejected. However, an exemption explanation letter does not guarantee acceptance of Bid. In accordance with all applicable public contract laws, the Owner shall retain the right to reject unqualified Bidders, which shall render the Bid non-responsive.

Bidders are to complete this certification form and not attach their own form to this document with similar information.

1. Project Name: _____
Owner: _____
System Supply Contract Bid Price: _____
Construction Time: _____ Calendar Days
Owner's Representative: _____
Owner's Telephone No.: _____
Electrical Subcontractor's Name: _____
Date of Substantial Completion _____

2. Project Name: _____
Owner: _____
System Supply Contract Bid Price: _____
Construction Time: _____ Calendar Days

Owner's Representative: _____
Owner's Telephone No.: _____
Electrical Subcontractor's Name: _____
Date of Substantial Completion _____

3. Project Name: _____
Owner: _____
System Supply Contract Bid Price: _____
Construction Time: _____ Calendar Days
Owner's Representative: _____
Owner's Telephone No.: _____
Electrical Subcontractor's Name: _____
Date of Substantial Completion: _____

The Owner may check project references listed to verify information provided along with skills and capacity represented by System Integrator. It is very important that the Bidder is responsible to verify that all contact information is current for each name listed above and that the System Integrator has the qualifications and experience required by this certification prior to submission of the certification.

The undersigned hereby states that all above representations are correct and true.

Signed this _____ day of _____, 20____

System Integrator's Name

Authorized Signature

Title of Signator

END OF SECTION

SECTION 00457

CONTRACTOR'S CERTIFICATE REGARDING WORKERS' COMPENSATION

I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this Contract.

Name of Bidder _____

Signature _____

Name _____

Title _____

Dated _____

END OF SECTION

SECTION 00460

CERTIFICATION FOR CONTRACTS, GRANTS, AND LOANS

RD Instruction 1940-Q
Exhibit A-1

The undersigned certifies, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant or Federal loan, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant or loan.
2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant or loan, the undersigned shall complete and submit Standard Form – LLL, “Disclosure of Lobbying Activities,” in accordance with its instructions.
3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including contracts, subcontracts, and subgrants under grants and loans) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

(Name)

(Date)

(Title)

(08-21-91) PN 171

END OF SECTION

SECTION 00481

AMERICAN IRON AND STEEL REQUIREMENTS

USDA Rural Development

All iron and steel products used in this project must be produced in the United States in compliance with Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A - Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference. This section outlines the basic compliance steps. Please refer to the AIS definitions contained at the end of this section and the AIS references contained throughout the Contract Documents for additional guidance.

PRODUCTS SUBJECT TO AIS

Note: Products to be considered subject to the AIS requirements must be (1) made of greater than 50% iron or steel, measured by cost (based on the material cost) and; (2) permanently incorporated into the project. The list of products subject to the AIS requirement are:

- Lined or unlined pipes or fittings;
- Manhole Covers and other municipal castings;
- Hydrants;
- Tanks;
- Flanges;
- Pipe clamps and restraints;
- Valves;

- **Structural steel**
 - Structural steel is rolled flanged shapes, having at least one dimension of their cross-section three inches or greater, which are used in the construction of bridges, buildings, ships, railroad rolling stock, and for numerous other constructional purposes. Such shapes are designated as wide-flange shapes, standard I-beams, channels, angles, tees and zees. Other shapes include H-piles, sheet piling, tie plates, cross ties, and those for other special purposes.

- **Reinforced precast concrete**
 - While reinforced precast concrete may not be at comprised of 50% iron or steel, in this particular case, the reinforcing bar and wire must be produced in the US and meet the same standards as for any other iron or steel product. Additionally, the casting of the concrete product must take place in the US. The cement and other raw materials used in concrete production are not required to be of domestic origin. If the reinforced concrete is cast at the construction site, the reinforcing bar and wire are considered to be a construction material and must be produced in the US.

- **Construction materials**
 - Construction materials are those articles, materials, or supplies made primarily of iron and steel, that are permanently incorporated into the project, not including mechanical

and/or electrical components, equipment and systems. Some of these products may overlap with what is also considered “structural steel”. This includes, but is not limited to, the following products: wire rod, bar, angles, concrete reinforcing bar, wire, wire cloth, wire rope and cables, tubing, framing, joists, trusses, fasteners (i.e., nuts and bolts), welding rods, decking, grating, railings, stairs, access ramps, fire escapes, ladders, wall panels, dome structures, roofing, ductwork, surface drains, cable hanging systems, manhole steps, fencing and fence tubing, guardrails, doors, and stationary screens.

- NOTE: Mechanical and electrical components, equipment and systems are not considered construction materials. Mechanical equipment is typically that which has motorized parts and/or is powered by a motor. Electrical equipment is typically any machine powered by electricity and includes components that are part of the electrical distribution system. Electrical tubing is therefore not subject to AIS requirements.
- **Municipal castings** are cast iron or steel infrastructure products that are melted and cast. They typically provide access, protection, or housing for components incorporated into utility owned drinking water, storm water, wastewater, and surface infrastructure. They are typically made of grey or ductile iron, or steel. Examples of municipal castings are:
 - Access Hatches;
 - Ballast Screen;
 - Benches (Iron or Steel);
 - Bollards;
 - Cast Bases;
 - Cast Iron Hinged Hatches, Square and Rectangular;
 - Cast Iron Riser Rings;
 - Catch Basin Inlet;
 - Cleanout/Monument Boxes;
 - Construction Covers and Frames;
 - Curb and Corner Guards;
 - Curb Openings;
 - Detectable Warning Plates;
 - Downspout Shoes (Boot, Inlet);
 - Drainage Grates, Frames and Curb
 - Inlets;
 - Junction Boxes;
 - Lampposts;
 - Manhole Covers, Rings and Frames, Risers;
 - Meter Boxes;
 - Service Boxes;
 - Steel Hinged Hatches, Square and Rectangular;
 - Steel Riser Rings;
 - Trash receptacles;
 - Tree Grates;
 - Tree Guards;
 - Trench Grates; and Valve Boxes, Covers and Risers

COMPLIANCE STEPS

1. Identify all products that will be required to be AIS compliant.
2. Manufacturer's Certification Letters are the means to be used to verify compliance with AIS requirements for all products determined to be made primarily of iron and steel (refer to the following Sample Manufacturer's Certification Letter). The manufacturer's certifications shall be submitted to the project Engineer along with the material submittals. Certifications must contain the following elements:
 - a.) Reference to the specific project
 - b.) Identify the items delivered to the project site
 - c.) Reference the AIS requirements
 - d.) Location of the manufacturer- City, State
 - e.) Signature of an authorized company representative
3. A listing of all iron and steel components used in the project and their manufacturers name and location must be maintained and all certification letters need to be kept on-site in a project file.
4. The De Minimis Waiver that allows the use of a minor amount of non-domestic incidental iron and steel components applies to this project. Costs for such de minimis incidental components cumulatively may comprise no more than a total of 5 percent of the total cost of the materials used in and incorporated into a project; the cost of an individual item may not exceed 1 percent of the total cost of the materials used in and incorporated into a project.
 - a) The total cost of the materials can be estimated as 50% of the project cost if the total cost of the materials is not known.
 - b.) If this waiver is used, the Prime Contractor shall maintain a list of all non-domestically produced products used and their costs to demonstrate that they comply with the required percentages.
- 5.) Prime Contractor shall submit a completed Prime Contractor's Certification Letter to the Engineer upon construction Substantial Completion to certify that all Work and Materials has complied with American Iron and Steel requirements (refer to the following Prime Contractor's Certification Letter.)
- 6.) Upon Project Completion, the Engineer shall provide copies of the following items to both the Owner and USDA Rural Development:
 - a.) Engineer's Listing of Iron and Steel components and their Manufacturers
 - b.) Manufacturers' Certification Letters
 - c.) Prime Contractor's Certification Letter of Compliance with AIS
 - d.) Documentation of Compliance with the De Minimis Waiver (if applicable)

AMERICAN IRON STEEL DEFINITIONS

American Iron and Steel (AIS)- Requirements mandated by Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A- Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference for “iron and steel products,” meaning the following products, if made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials. AIS requirements apply in each of the several states, the District of Columbia, and each federally recognized Tribe, but not U.S. Territories.

Coating- A covering that is applied to the surface of an object. If a coating is applied to the external surface of a domestic iron or steel component, and the application takes place outside of the United States, said product would be considered a compliant product under the AIS requirements. Any coating processes that are applied to the external surface of iron and steel components that would otherwise be AIS compliant would not disqualify the product from meeting the AIS requirements regardless of where the coating processes occur, provided that final assembly of the product occurs in the United States. This exemption only applies to coatings on the *external surface* of iron and steel components. It does not apply to coatings or linings on internal surfaces of iron and steel products, such as the lining of lined pipes. All manufacturing processes for lined pipes, including the application of pipe lining, must occur in the United States for the product to be compliant with AIS requirements.

Construction Materials- Those articles, materials, or supplies made primarily of iron and steel, that are permanently incorporated into the project, not including mechanical and/or electrical components, equipment and systems. Some of these products may overlap with what is considered “structural steel”. Note: Mechanical and electrical components, equipment and systems are not considered construction materials. See definition of mechanical and electrical equipment.

Contractor’s Certification- Documentation submitted by the Contractor upon Substantial Completion of the Contract that all iron and steel products installed were produced in the United States.

DeMinimis Components- Various miscellaneous, incidental low-cost components that are essential for, but incidental to, the construction and are incorporated into the physical structure of the project. Examples of *de minimis* components could include small washers, screws, fasteners (such as “off the shelf” nuts and bolts), miscellaneous wire, corner bead, ancillary tube, signage, trash bins, door hardware, etc. Costs for such *de minimis* incidental components cumulatively may comprise no more than a total of five percent of the total cost of the materials used in and incorporated into a project; the cost of an individual item may not exceed one percent of the total cost of the materials used in and incorporated into a project.

Electrical Equipment- Typically any machine powered by electricity and includes components that are part of the electrical distribution system. AIS does not apply to electrical equipment.

Engineer's Certification- Documentation submitted by the Engineer that Drawings, Specifications, and Bidding Documents comply with AIS.

Iron and Steel Products- The following products made primarily of iron and steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials. Only items on the above list made primarily of iron or steel, permanently incorporated into the project must be produced in the United States. For example, trench boxes, scaffolding or equipment, which are removed from the project site upon completion of the project, are not required to be of U.S. iron or steel.

Manufacturer- a supplier, manufacturer, distributor, materialman, or vendor is an entity with which the Owner, Contractor or with any subcontractor has contracted to furnish materials or equipment to be incorporated in the project by the Owner, Contractor or a subcontractor.

Manufacturer's Certification- Documentation provided by the Manufacturer stating that the iron and steel products to be used in the project are produced in the United States in accordance with American Iron and Steel (AIS) Requirements. If items are purchased via a supplier, distributor, vendor, etc. from the Manufacturer directly, then the supplier, distributor, vendor, etc. will be responsible for obtaining and providing these certification letters to the parties purchasing the products.

Manufacturing Processes- Processes such as melting, refining, forming, rolling, drawing, finishing, and fabricating. Further, if a domestic iron and steel product is taken out of the United States for any part of the manufacturing process, it becomes foreign source material. However, raw materials such as iron ore, limestone, and iron and steel scrap are not covered by the AIS requirement, and the materials(s), if any, being applied as a coating are similarly not covered. Non-iron or steel components of an iron and steel product may come from non-U.S. sources. For example, for products such as valves and hydrants, the individual non-iron and steel components do not have to be of domestic origin. Raw materials, such as iron ore, limestone, scrap iron, and scrap steel, can come from non U.S. sources.

Mechanical Equipment- Typically equipment which has motorized parts and/or is powered by a motor. AIS does not apply to mechanical equipment.

Minor Components- Components *within* an iron and/or steel product otherwise compliant with the American Iron and Steel requirements. This is different from the *de minimis* definition in that *de minimis* pertains to the entire project and the minor component definition pertains to a single product. This waiver allows use of non-domestically produced miscellaneous minor components comprising up to five percent of the total material cost of an otherwise domestically produced iron and steel product. However, unless a separate waiver for a product has been approved, all other iron and steel components in said product must still meet the AIS requirements. This waiver does not exempt the whole product from the AIS requirements only minor components within said product and the iron and steel components of the product must be produced domestically. Valves and hydrants are also subject to the cost ceiling requirements described here. Examples of minor components could include items such as pins and springs in valves/hydrants, bands/straps in couplings, and other low-cost items such as small fasteners, etc.

Municipal Castings- Cast iron or steel infrastructure products that are melted and cast. They typically provide access, protection, or housing for components incorporated into utility owned drinking water, storm water, wastewater and solid waste infrastructure.

Primarily Iron or Steel- A product is made of greater than 50 percent iron or steel on a materials cost basis. An exception to this definition is reinforced precast concrete (see Definitions). All technical specifications and applicable industry standards (e.g. NIST, NSF, AWWA) must be met. If a product is determined to be less than 50 percent iron and steel, the AIS requirements do not apply. For example, the cost of a fire hydrant includes:

- The cost of materials used for the iron portion of fire hydrant (e.g. bonnet, body and shoe); and
- The cost to pour and cast to create those components (e.g. labor and energy).

Not included in the cost are:

- The additional material costs for the non-iron and steel internal workings of the hydrant (e.g. stem, coupling, valve, seals, etc.); and
- The cost to assemble the internal workings into the hydrant body.

Produced in the United States- The production in the United States of the iron or steel products used in the project requires that all manufacturing processes must take place in the United States, with the exception of metallurgical processes involving refinement of steel additives.

Reinforced Precast Concrete- Reinforced precast concrete structures must comply with AIS, regardless of whether or not it consists of at least 50 percent iron or steel. The reinforcing bar and wire must be produced in the United States and meet the same standards as for any other iron or steel product. Additionally, the casting of the concrete product must take place in the United States. The cement and other raw materials used in concrete production are not required to be of domestic origin. If the reinforced concrete is cast at the construction site, the reinforcing bar and wire are considered construction materials and must be produced in the United States.

Steel- An alloy that includes at least 50 percent iron, between 0.02 and 2 percent carbon, and may include other elements. Metallic elements such as chromium, nickel, molybdenum, manganese, and silicon may be added during the melting of steel for the purpose of enhancing properties such as corrosion resistance, hardness, or strength. The definition of steel covers carbon steel, alloy steel, stainless steel, tool steel, and other specialty steels.

Structural Steel- Rolled flanged shapes, having at least one dimension of their cross-section three inches or greater, which are used in the construction of bridges, buildings, ships, railroad rolling stock, and for numerous other constructional purposes. Such shapes are designated as wide-flange shapes, standard I-beams, channels, angles, tees, and zees. Other shapes include but are not limited to, H-piles, sheet piling, tie plates, cross ties, and those for other special purposes.

SAMPLE MANUFACTURER'S CERTIFICATION

Date:

Company Name:

Company Address:

Subject: American Iron and Steel Certification
 [Owner's Name]
 [Project Name]

(1). I, [*company representative*], certify that the [*melting, bending, galvanizing, cutting, etc.*] processes took place at the following location:

(City, State)

(2) For [*manufacturing or fabricating*] the following products and/or material: 1.
2.

(3) That were delivered to the following project location:

(City, State)

in full compliance with the USDA Rural Development American Iron and Steel requirements as mandated by Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A - Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference.

Authorized Manufacturer's Representative Signature

(Note: The Authorized Signature shall not be the material distributor or supplier)

PRIME CONTRACTOR'S CERTIFICATION

American Iron and Steel Requirements
USDA Rural Development

Date:

RE: [Owner's Name]
[Project Name]

I hereby certify that to the best of my knowledge and belief, all iron and steel products installed for this project by my company and by any and all subcontractors and manufacturers my company has contracted with for this project comply with Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A - Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference, or are the subject of a waiver approved by the Secretary of Agriculture or designee.

Name of Construction Company (PRINT)

By Authorized Representative (SIGNATURE)

Title

This certification is to be submitted to the Engineer upon Substantial Completion of the project

END OF SECTION

SECTION 00510

NOTICE OF AWARD

Date of Issuance:

Owner: City of San Juan Bautista

Owner’s Project No.:

Engineer: Stantec Consulting Services Inc.

Engineer’s Project No.: 184031441

Project: City of San Juan Bautista Sanitary Sewer Force Main to Hollister Project

Contract Name:

Bidder:

Bidder’s Address:

You are notified that Owner has accepted your Bid dated _____ for the above Contract, and that you are the Successful Bidder and are awarded a Contract for:

City of San Juan Bautista Sanitary Sewer Force Main to Hollister Project

The Contract Price of the awarded Contract is \$_____. Contract Price is subject to adjustment based on the provisions of the Contract, including but not limited to those governing changes, Unit Price Work, and Work performed on a cost-plus-fee basis, as applicable.

Three (3) unexecuted counterparts of the Agreement accompany this Notice of Award, and one copy of the Contract Documents accompanies this Notice of Award, or has been transmitted or made available to Bidder electronically.

Drawings will be delivered separately from the other Contract Documents.

You must comply with the following conditions precedent within 15 days of the date of receipt of this Notice of Award:

1. Deliver to Owner two (2) counterparts of the Agreement, signed by Bidder (as Contractor).
2. Deliver with the signed Agreement(s) the Contract security (such as required performance and payment bonds) and insurance documentation, as specified in the Instructions to Bidders and in the General Conditions, Articles 2 and 6.
3. Other conditions precedent (if any):

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within 10 days after you comply with the above conditions, Owner will return to you one fully signed counterpart of the Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

Owner: **City of San Juan Bautista**

By (signature): _____

Name (printed): _____

Title:

Copy: Engineer

SECTION 00520

AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

This Agreement is by and between **City of San Juan Bautista** (“Owner”) and _____ (“Contractor”).

Terms used in this Agreement have the meanings stated in the General Conditions and the Supplementary Conditions.

Owner and Contractor hereby agree as follows:

ARTICLE 1—WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows: **the San Juan Bautista Sanitary Sewer Force Main to Hollister Project includes, but is not limited to constructing a force main extending from the San Juan Bautista WWTP to the Hollister Domestic WWTP, installing a new Primary Pump Station, making improvements to the existing influent pump station to serve as the Storage Pump Station, making improvements necessary to drain the emergency storage basins, demolishing existing San Juan Bautista WWTP equipment, installing a Chemical Feed System, site grading, yard piping, and electrical and instrumentation.**

ARTICLE 2—THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: **San Juan Bautista Sanitary Sewer Force Main to Hollister**

ARTICLE 3—ENGINEER

3.01 The Owner has retained **Stantec Consulting Services Inc.** (“Engineer”) to act as Owner’s representative, assume all duties and responsibilities of Engineer, and have the rights and authority assigned to Engineer in the Contract.

3.02 The part of the Project that pertains to the Work has been designed by **Engineer**.

ARTICLE 4—CONTRACT TIMES

4.01 *Time is of the Essence*

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 *Contract Times: Dates*

A. The Work will be substantially complete on or before **May 30, 2024**, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before **June 26, 2024**.

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4.03 *Contract Times: Days*

- A. The Work will be substantially complete within 371 calendar days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within 398 calendar days after the date when the Contract Times commence to run.

4.04 *Milestones*

- A. Parts of the Work must be substantially completed on or before the following Milestone(s):
1. Milestone 1 Completion and operation of the Primary Pump Station, Odor Control Facility, Force Main (including all appurtenances), and road paving and restoration, 300 calendar days.
 2. Milestone 2 Completion of the San Juan Bautista wastewater treatment plant improvements (improvements to and changes to existing facilities), 371 calendar days (Substantial Completion).
 3. Milestone 3 Completion of all facility start-up, testing, demolition, and clean-up work, 398 calendar days (Final Completion).

4.05 *Liquidated Damages*

- A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the Contract Times, as duly modified. The parties also recognize the delays, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):
1. *Substantial Completion:* Contractor shall pay Owner \$3,000 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for Substantial Completion, until the Work is substantially complete.
 2. *Completion of Remaining Work:* After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner \$2,000 for each day that expires after such time until the Work is completed and ready for final payment.
 3. *Milestones:* Contractor shall pay Owner \$2,000 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for achievement of Milestone 1, until Milestone 1 is achieved, or until the time specified for Substantial Completion is reached, at which time the rate indicated in Paragraph 4.05.A.1 will apply, rather than the Milestone rate.
 4. Liquidated damages for failing to timely attain Milestones, Substantial Completion, and final completion are not additive, and will not be imposed concurrently.
- B. If Owner recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Owner's sole and exclusive remedy for such delay, and Owner is

precluded from recovering any other damages, whether actual, direct, excess, or consequential, for such delay, except for special damages (if any) specified in this Agreement.

- C. Penalties imposed on the Owner as a result of any bypass caused entirely or in part by the actions of the Contractor, his/her employees, or subcontractors, shall be borne in full by the Contractor, including legal fees and other expenses to the Owner resulting directly or indirectly from the bypass. Under the terms of discharge permits issued to the Owner, in the event accidental bypassing occurs, the Owner is liable for the following penalties: Up to \$25,000 per day per violation per federal law.

4.06 *Special Damages*

- A. Contractor shall reimburse Owner (1) for any fines or penalties imposed on Owner as a direct result of the Contractor's failure to attain Substantial Completion according to the Contract Times, and (2) for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Substantial Completion (as duly adjusted pursuant to the Contract), until the Work is substantially complete.
- B. After Contractor achieves Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times, Contractor shall reimburse Owner for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Work to be completed and ready for final payment (as duly adjusted pursuant to the Contract), until the Work is completed and ready for final payment.
- C. The special damages imposed in this paragraph are supplemental to any liquidated damages for delayed completion established in this Agreement.

ARTICLE 5—CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents, the amounts that follow, subject to adjustment under the Contract:

- A. For all Unit Price Work, an amount equal to the sum of the extended prices (established for each separately identified item of Unit Price Work by multiplying the unit price times the actual quantity of that item as listed in the Bid Form).

The extended prices for Unit Price Work set forth as of the Effective Date of the Contract are based on estimated quantities. As provided in Paragraph 13.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by Engineer.

- C. Total of Lump Sum Amount and Unit Price Work (subject to final Unit Price adjustment) \$_____.
- D. For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit.

ARTICLE 6—PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

- A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

- A. Owner shall make progress payments on the basis of Contractor's Applications for Payment on or about the 30th day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.
 - 1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract.
 - a. 95 percent of the value of the Work completed (with the balance being retainage).
 - b. 95 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).
- B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 95 percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less 200 percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

6.03 *Final Payment*

- A. Upon final completion and acceptance of the Work, Owner shall pay the remainder of the Contract Price in accordance with Paragraph 15.06 of the General Conditions.

6.04 *Consent of Surety*

- A. Owner will not make final payment, or return or release retainage at Substantial Completion or any other time, unless Contractor submits written consent of the surety to such payment, return, or release.

6.05 *Interest*

- A. All amounts not paid when due will bear interest at 1 percent per annum.

ARTICLE 7—CONTRACT DOCUMENTS

7.01 *Contents*

- A. The Contract Documents consist of all of the following:

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1. This Agreement.
2. Bonds:
 - a. Performance bond (together with power of attorney).
 - b. Payment bond (together with power of attorney).
3. General Conditions.
4. Supplementary Conditions.
5. Specifications as listed in the table of contents of the project manual (copy of list attached). Specification appendices include:
 - a. Geotechnical Report, San Juan Bautista to Hollister Sanitary Force Main Project, San Benito County, California (Crawford & Associates, Inc., September 2022)
 - b. San Juan Bautista to Hollister Force Main Mitigation Monitoring and Reporting Program CEQA & NEPA, September 9, 2022 (EMC Planning Group Inc.)
 - c. Biological Opinion for the San Juan Bautista to Hollister Sewer Force Main Project, San Benito County, California (USFWS 2022)
 - d. Water Quality Certification, San Juan Bautista to Hollister Sewer Force Main Project (RWQCB 2022)
 - e. Section 2081 Incidental Take Permit, San Juan Bautista to Hollister Sewer Force Main Project (2081-2022-033-04) (CDFW)
 - f. Streambed Alteration Agreement, San Juan Bautista to Hollister Sewer Force Main Project (EPIMS Notification No. SBO-29921) (CDFW)
 - g. County of San Benito Encroachment Permit Application
6. Drawings (not attached but incorporated by reference) consisting of 129 sheets (plus 36 reference drawing sheets) bearing the following general title: **San Juan Bautista Sanitary Sewer Force Main to Hollister Project.**
7. Addenda (numbers _____ to _____, inclusive).
9. Exhibits to this Agreement (enumerated as follows):
 - a. Contractor's Bid;
 - b. Documentation submitted by Contractor prior to Notice of Award;
 - c. List of Subcontractors;
 - d. List of Equipment Manufacturers;
 - e. Certification of Electrical Subcontractor's Experience and Qualifications;
 - f. Certifications of System Integrator Experience and Qualifications;
10. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
 - a. Notice to Proceed.
 - b. Work Change Directives.

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- c. Change Orders.
 - d. Field Orders.
 - e. Warranty Bond, if any.
- B. The Contract Documents listed in Paragraph 7.01.A are attached to this Agreement (except as expressly noted otherwise above).
- C. There are no Contract Documents other than those listed above in this Article 7.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

ARTICLE 8—REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

8.01 Contractor's Representations

- A. In order to induce Owner to enter into this Contract, Contractor makes the following representations:
1. Contractor has examined and carefully studied the Contract Documents, including Addenda.
 2. Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 3. Contractor is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
 4. Contractor has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
 5. Contractor has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
 6. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (c) Contractor's safety precautions and programs.
 7. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price,

within the Contract Times, and in accordance with the other terms and conditions of the Contract.

8. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
9. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
10. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
11. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

8.02 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 8.02:
 1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;
 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

8.03 *Standard General Conditions*

- A. Owner stipulates that if the General Conditions that are made a part of this Contract are EJCDC® C-700, Standard General Conditions for the Construction Contract (2018), published by the Engineers Joint Contract Documents Committee, and if Owner is the party that has furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process such as highlighting or "track changes" (redline/strikeout), or in the Supplementary Conditions.

8.04 *Funding Requirements*

- A. This project is funded, in part, by a loan or grant from the U.S. Department of Agriculture Rural Development (USDA). Bidders are required to comply with all of the provisions for these funding programs in accordance with these specifications related to wage requirements (Specification 00300), and American Iron and Steel (AIS) procurement (Specification 00200 and 00481).

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on _____ (which is the Effective Date of the Contract).

Owner:

City of San Juan Bautista

(typed or printed name of organization)

By:

(individual's signature)

Date:

(date signed)

Name:

(typed or printed)

Title:

(typed or printed)

Attest:

(individual's signature)

Title:

(typed or printed)

Address for giving notices:

Designated Representative:

Name:

(typed or printed)

Title:

(typed or printed)

Address:

Phone:

Email:

(If [Type of Entity] is a corporation, attach evidence of authority to sign. If [Type of Entity] is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)

Contractor:

(typed or printed name of organization)

By:

(individual's signature)

Date:

(date signed)

Name:

(typed or printed)

Title:

(typed or printed)

(If [Type of Entity] is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest:

(individual's signature)

Title:

(typed or printed)

Address for giving notices:

Designated Representative:

Name:

(typed or printed)

Title:

(typed or printed)

Address:

Phone:

Email:

License No.:

(where applicable)

State:

CERTIFICATE OF OWNERS ATTORNEY AND AGENCY CONCURRENCE

This attachment is to the Contract made and entered into on **{Insert Date of Contract}** , by and between the **{Insert Name of Owner}** hereinafter "Owner", and **{Insert Name of Contractor}** hereinafter called "Contractor." This Contract is for that Work described in the Contract Documents entitled **{Insert Name of Contract}**.

CERTIFICATE OF OWNER'S ATTORNEY

I, the undersigned, _____, the duly authorized and acting legal representative of _____, do hereby certify as follows:

I have examined the attached Contract(s) and performance and payment bond(s) and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements is adequate and has been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the foregoing agreements constitute valid and legally binding obligations upon the parties attached Contract agreement constitutes a valid and legally binding obligation upon the parties executing the same in accordance with terms, conditions, and provisions thereof.

(Attorney's Signature)

Date

AGENCY CONCURRENCE

As lender or provider of funds to the Owner to provide for the costs of this Contract, and without any liability for any payments thereunder, the Agency hereby concurs in the form, content, and execution of this Agreement.

Agency Representative

Date

Name

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SECTION 00550

NOTICE TO PROCEED

Owner: City of San Juan Bautista Owner's Project No.: _____
Engineer: Stantec Consulting Services Inc. Engineer's Project No.: 184031441
Contractor: _____ Contractor's Project No.: _____
Project: San Juan Bautista Sanitary Sewer to Hollister Project
Contract Name: _____
Effective Date of Contract: _____

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on May 26, 2023 pursuant to Paragraph 4.01 of the General Conditions.

On that date, Contractor shall start performing its obligations under the Contract Documents. No Work will be done at the Site prior to such date.

In accordance with the Agreement:

The date by which Substantial Completion must be achieved is **May 30, 2024** and the date by which readiness for final payment must be achieved is **June 26, 2024**.

Owner: **City of San Juan Bautista**
By (signature): _____
Name (printed): _____
Title: _____
Date Issued: _____
Copy: Engineer

SECTION 00610

PERFORMANCE BOND

<p>Contractor</p> <p>Name: _____</p> <p>Address <i>(principal place of business)</i>: _____</p>	<p>Surety</p> <p>Name: _____</p> <p>Address <i>(principal place of business)</i>: _____</p>
<p>Owner</p> <p>Name: City of San Juan Bautista</p> <p>Mailing address <i>(principal place of business)</i>: 311 2nd Street, PO Box 1420, San Juan Bautista, CA 95045</p>	<p>Contract</p> <p>Description <i>(name and location)</i>: San Juan Bautista Sanitary Sewer Force Main to Hollister Project</p> <p>Contract Price: _____</p> <p>Effective Date of Contract: _____</p>
<p>Bond</p> <p>Bond Amount: _____</p> <p>Date of Bond: _____ <i>(Date of Bond cannot be earlier than Effective Date of Contract)</i></p> <p>Modifications to this Bond form: <input type="checkbox"/> None <input type="checkbox"/> See Paragraph 16</p>	
<p>Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Performance Bond, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.</p>	
Contractor as Principal	Surety
_____ <i>(Full formal name of Contractor)</i>	_____ <i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature)(Attach Power of Attorney)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
<p><i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i></p>	

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1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.
2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond will arise after:
 - 3.1. The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice may indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 will be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement does not waive the Owner's right, if any, subsequently to declare a Contractor Default;
 - 3.2. The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
 - 3.3. The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.
4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 does not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.
5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:
 - 5.1. Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;
 - 5.2. Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;
 - 5.3. Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or
 - 5.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

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- 5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
 - 5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.
6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment, or the Surety has denied liability, in whole or in part, without further notice, the Owner shall be entitled to enforce any remedy available to the Owner.
7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner will not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety will not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:
 - 7.1. the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
 - 7.2. additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and
 - 7.3. liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.
8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.
9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price will not be reduced or set off on account of any such unrelated obligations. No right of action will accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.
10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
11. Any proceeding, legal or equitable, under this Bond must be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and must be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit will be applicable.
12. Notice to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears.
13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted therefrom and provisions conforming to such

statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

14. Definitions

- 14.1. *Balance of the Contract Price*—The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.
 - 14.2. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.
 - 14.3. *Contractor Default*—Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.
 - 14.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
 - 14.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.
15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.
16. Modifications to this Bond are as follows: **none**

SECTION 00615

PAYMENT BOND

<p>Contractor</p> <p>Name: _____</p> <p>Address <i>(principal place of business)</i>: _____</p>	<p>Surety</p> <p>Name: _____</p> <p>Address <i>(principal place of business)</i>: _____</p>
<p>Owner</p> <p>Name: City of San Juan Bautista</p> <p>Mailing address <i>(principal place of business)</i>: 311 2nd Street, PO Box 1420, San Juan Bautista, CA 95045</p>	<p>Contract</p> <p>Description <i>(name and location)</i>: San Juan Bautista Sanitary Sewer Force Main to Hollister Project</p> <p>Contract Price: _____</p> <p>Effective Date of Contract: _____</p>
<p>Bond</p> <p>Bond Amount: _____</p> <p>Date of Bond: _____ <i>(Date of Bond cannot be earlier than Effective Date of Contract)</i></p> <p>Modifications to this Bond form: <input type="checkbox"/> None <input type="checkbox"/> See Paragraph 18</p>	
<p>Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Payment Bond, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.</p>	
Contractor as Principal	Surety
_____ <i>(Full formal name of Contractor)</i>	_____ <i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature)(Attach Power of Attorney)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
<p><i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i></p>	

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The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

1. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.
2. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond will arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
3. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.
4. The Surety's obligations to a Claimant under this Bond will arise after the following:
 - 4.1. Claimants who do not have a direct contract with the Contractor
 - 4.1.1. have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
 - 4.1.2. have sent a Claim to the Surety (at the address described in Paragraph 13).
 - 4.2. Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).
5. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.
6. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:
 - 6.1. Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
 - 6.2. Pay or arrange for payment of any undisputed amounts.
 - 6.3. The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 will not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety

shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

7. The Surety's total obligation will not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond will be credited for any payments made in good faith by the Surety.
8. Amounts owed by the Owner to the Contractor under the Construction Contract will be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfying obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
9. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.
10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
11. No suit or action will be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit will be applicable.
12. Notice and Claims to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, will be sufficient compliance as of the date received.
13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted here from and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.
14. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.
15. Definitions
 - 15.1. *Claim*—A written statement by the Claimant including at a minimum:
 - 15.1.1. The name of the Claimant;
 - 15.1.2. The name of the person for whom the labor was done, or materials or equipment furnished;

- 15.1.3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
 - 15.1.4. A brief description of the labor, materials, or equipment furnished;
 - 15.1.5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
 - 15.1.6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
 - 15.1.7. The total amount of previous payments received by the Claimant; and
 - 15.1.8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.
- 15.2. *Claimant*—An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic’s lien or similar statute against the real property upon which the Project is located. The intent of this Bond is to include without limitation in the terms of “labor, materials, or equipment” that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor’s subcontractors, and all other items for which a mechanic’s lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.
- 15.3. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.
- 15.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
- 15.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.
16. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.
17. Modifications to this Bond are as follows: **none**

SECTION 00620

CONTRACTORS APPLICATION FOR PAYMENT

Contractor's Application for

Application Period:		Application Date:
To (Owner): City of San Juan Bautista	From (Contractor):	Via (Engineer): Stantec Consulting Services Inc.
Project: San Juan Bautista Sanitary Sewer Force Main to Hollister Project	Contract:	
Owner's Contract No.:	Contractor's Project No.:	Engineer's Project No.: 184031441

**Application for Payment
Change Order Summary**

Approved Change Orders		
Number	Additions	Deductions
Totals		
Net Change by COs		

1. ORIGINAL CONTRACT PRICE \$ _____
2. Net change by Change orders \$ _____
3. Current Contract Price (Line 1±2) \$ _____
4. TOTAL COMPLETED & STORED \$ _____
(Column F total on Progress Estimates)
5. RETAINAGE:
 - a. ___% X _____ Work Completed \$ _____
 - b. ___% X _____ Stored Material \$ _____
 - c. Total Retainage (line 5.a + 5.b) \$ _____
6. AMOUNT ELIGIBLE TO DATE (Line 4 – Line 5.c)
\$ _____
7. LESS PREVIOUS PAYMENTS (Line 6 from prior Application)
\$ _____
8. AMOUNT DUE THIS APPLICATION
\$ _____
9. BALANCE TO FINISH, PLUS RETAINAGE
\$ _____
(Column G total on Progress Estimates + 5.c above)

Contractor's Certification

The undersigned Contractor certifies, to the best of its knowledge, the following:

1. All previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with the Work covered by prior Applications for Payment;
2. Title to all Work, materials and equipment incorporated in said Work, or otherwise listed in or covered by this Application for Payment, will pass to Owner at time of payment free and clear of all Liens, security interests, and encumbrances (except such as are covered by a bond acceptable to Owner indemnifying Owner against any such Liens, security interest, or encumbrances); and
3. All the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

Payment of: \$ _____
(Line 8 or other- attach explanation of the other amount)

Is recommended by: _____ (Date) _____ (Engineer)

Approved by: _____ (Date) _____ Funding Agency (If applicable)

Progress Estimate - Unit Price Work

Contractor's Application

For (Contract):							Application Number:				
Application Period:							Application Date:				
A				B		C	D	E	F		
Item		Contract Information				Estimated	Value of	Materials	Total	% (F / B)	Balance to Finish (B - F)
Bid Item No.	Description	Item Quantity	Units	Unit Price	Total Value of Item (\$)	Quantity Installed	Work Installed to Date				
Totals											

Stored Material Summary

Contractor's Application

For (Contract):							Application Number:				
Application Period:							Application Date:				
Bid Item No.	A	B	C		D		E	Subtotal Amount Completed and Stored to Date (D + E)	F		G
	Supplier Invoice No.	Submittal No. (w. Spec Section No.)	Storage Location	Description of Materials or Equipment Stored	Date Placed into Storage (Mo/Yr)	Amount (\$)	Amount Stored this Month (\$)		Incorporated in		Materials Remaining in Storage (\$) (D + E - F)
									Date (Mo/Yr)	Amount (\$)	
				Totals							

END OF SECTION

SECTION 00625

CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner: City of San Juan Bautista Owner's Project No.:
Engineer: Stantec Consulting Services Inc. Engineer's Project No.: 184031441
Contractor: Contractor's Project No.:
Project: San Juan Bautista Sanitary Sewer Force Main to Hollister Project
Contract Name:

This Preliminary Final Certificate of Substantial Completion applies to:

All Work The following specified portions of the Work:

The force main and all related appurtenances; the primary pump station and all related appurtenances including odor control (temporary odor control is acceptable, as approved by the engineer), electrical, instrumentation and programming and pigging facilities, including the wastewater treatment plant polyethylene storage tank volume, required for pigging.

Date of Substantial Completion: **May 30, 2024**

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Work or portion thereof designated above is hereby established, subject to the provisions of the Contract pertaining to Substantial Completion. The date of Substantial Completion in the final Certificate of Substantial Completion marks the commencement of the contractual correction period and applicable warranties required by the Contract.

A punch list of items to be completed or corrected is attached to this Certificate. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

Amendments of contractual responsibilities recorded in this Certificate should be the product of mutual agreement of Owner and Contractor; see Paragraph 15.03.D of the General Conditions.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance, and warranties upon Owner's use or occupancy of the Work must be as provided in the Contract, except as amended as follows:

Amendments to Owner's Responsibilities: None As follows:

Amendments to Contractor's Responsibilities: None As follows:

The following documents are attached to and made a part of this Certificate: *[punch list; others]*

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents, nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents.

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Engineer

By *(signature)*: _____

Name *(printed)*: _____

Title: _____

SECTION 00700

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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SECTION 00700

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
 3. *Application for Payment*—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 5. *Bidder*—An individual or entity that submits a Bid to Owner.
 6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
 7. *Bidding Requirements*—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
 8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
 9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.

10. *Claim*

- a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract.
- b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.
- c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.
- d. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.

13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.

14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.

15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.

16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.

17. *Cost of the Work*—See Paragraph 13.01 for definition.

18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.

19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.

20. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.
21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.
22. *Engineer*—The individual or entity named as such in the Agreement.
23. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
24. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.
 - a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.
 - b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.
 - c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.
25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.
28. *Notice of Award*—The written notice by Owner to a Bidder of Owner’s acceptance of the Bid.
29. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.

30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
31. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor’s plan to accomplish the Work within the Contract Times.
32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.
34. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals.
36. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.
37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
38. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.
39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
40. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers’ instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other

such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.

42. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion of such Work.
43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.
44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
45. *Supplier*—A manufacturer, fabricator, supplier, distributor, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
46. *Technical Data*
 - a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.
 - b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.
 - c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.
47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.
48. *Unit Price Work*—Work to be paid for on the basis of unit prices.

49. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

- A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives*: The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. *Day*: The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective*: The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
1. does not conform to the Contract Documents;
 2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 3. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or Paragraph 15.04).
- E. *Furnish, Install, Perform, Provide*
1. The word “furnish,” when used in connection with services, materials, or equipment, means to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word “install,” when used in connection with services, materials, or equipment, means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, means to furnish and install said services, materials, or equipment complete and ready for intended use.
 4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.
- F. *Contract Price or Contract Times*: References to a change in “Contract Price or Contract Times” or “Contract Times or Contract Price” or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term “or both” is not expressed.
- G. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2—PRELIMINARY MATTERS

2.01 *Delivery of Performance and Payment Bonds; Evidence of Insurance*

- A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.
- C. *Evidence of Owner’s Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract

available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

- A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), Contractor shall submit to Engineer for timely review:
1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
 2. a preliminary Schedule of Submittals; and
 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work, and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other Submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will be made to Contractor until acceptable schedules are submitted to Engineer.
1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.
- B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.
- F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.
- G. Nothing in the Contract Documents creates:
 1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or
 2. any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations.

3.02 *Reference Standards*

A. *Standards Specifications, Codes, Laws and Regulations*

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
2. No provision of any such standard specification, manual, reference standard, or code, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner or Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer take precedence in

resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

- a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
- b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.
- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers shall not:
 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media versions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein precludes Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work may be done at the Site prior to such date.

4.03 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times must be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption,

and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
 - 1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 - 2. Abnormal weather conditions;
 - 3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and
 - 4. Acts of war or terrorism.
- D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:
 - 1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.
 - 2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.
 - 3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.
- E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:
 - 1. The circumstances that form the basis for the requested adjustment;
 - 2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;
 - 3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;
 - 4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and
 - 5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.

Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.

- F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.
- G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor in writing of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b)

promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.
- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading of Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
 - 1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;
 - 2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and
 - 3. Technical Data contained in such reports and drawings.
- B. *Underground Facilities:* Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.
- C. *Reliance by Contractor on Technical Data:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.

- D. *Limitations of Other Data and Documents:* Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;
 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;
 3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or
 4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

- A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site:
1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;
 2. is of such a nature as to require a change in the Drawings or Specifications;
 3. differs materially from that shown or indicated in the Contract Documents; or
 4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

- C. *Owner's Statement to Contractor Regarding Site Condition*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- E. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. Such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,
 - c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.
 2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise;
 - b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
 - c. Contractor failed to give the written notice required by Paragraph 5.04.A.
 3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
 4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

- F. *Underground Facilities; Hazardous Environmental Conditions*: Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 *Underground Facilities*

- A. *Contractor's Responsibilities*: Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:
1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 2. complying with applicable state and local utility damage prevention Laws and Regulations;
 3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;
 4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor*: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.
- C. *Engineer's Review*: Engineer will:
1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;
 2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;
 3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and
 4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.

During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- F. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
 - b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and
 - c. Contractor gave the notice required in Paragraph 5.05.B.
 2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.
 4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 *Hazardous Environmental Conditions at Site*

- A. *Reports and Drawings*: The Supplementary Conditions identify:
1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;
 2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
 3. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;
 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely

obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.
- H. If, after receipt of such written notice, Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.
- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone

for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.
- B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.
- C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or Regulations, and must be issued and signed by a surety named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.
- D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.
- E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.
- F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.
- G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.
- H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

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6.02 Insurance—General Provisions

- A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Alternative forms of insurance coverage, including but not limited to self-insurance and “Occupational Accident and Excess Employer’s Indemnity Policies,” are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.
- D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.
- E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.
- F. Failure of Owner or Contractor to demand such certificates or other evidence of the other party’s full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the other party’s obligation to obtain and maintain such insurance.
- G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner’s option, may purchase and maintain Owner’s own liability insurance. Owner’s liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner’s liability policies for any of Contractor’s obligations to the Owner, Engineer, or third parties.

- H. Contractor shall require:
1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and
 2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.
- I. If either party does not purchase or maintain the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.
- K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price will be adjusted accordingly.
- L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.
- M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.
- N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 *Contractor's Insurance*

- A. *Required Insurance:* Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.
- B. *General Provisions:* The policies of insurance required by this Paragraph 6.03 as supplemented must:
1. include at least the specific coverages required;

2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;
 3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;
 4. apply with respect to the performance of the Work, whether such performance is by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable; and
 5. include all necessary endorsements to support the stated requirements.
- C. *Additional Insureds*: The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:
1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;
 2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;
 3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);
 4. not seek contribution from insurance maintained by the additional insured; and
 5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

6.04 *Builder's Risk and Other Property Insurance*

- A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.
- B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.

- C. *Property Insurance for Substantially Complete Facilities:* Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.
- D. *Partial Occupancy or Use by Owner:* If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.
- E. *Insurance of Other Property; Additional Insurance:* If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

- A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.
 - 1. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils, risks, or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused.
 - 2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to

Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.

1. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.
- C. The waivers in this Paragraph 6.05 include the waiver of rights due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other insured peril, risk, or cause of loss.
- D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.
- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

ARTICLE 7—CONTRACTOR’S RESPONSIBILITIES

7.01 *Contractor’s Means and Methods of Construction*

- A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor’s responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor’s expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor’s determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.03 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall maintain good discipline and order at the Site.
- B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor’s employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor’s own acts and omissions.
- C. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner’s written consent, which will not be unreasonably withheld.

7.04 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.

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- B. All materials and equipment incorporated into the Work must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment must be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.05 *“Or Equals”*

- A. *Contractor’s Request; Governing Criteria:* Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or “or equal” item is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an “or equal” item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that the proposed item:
 - 1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) has a proven record of performance and availability of responsive service; and
 - 4) is not objectionable to Owner.
 - b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor’s Expense:* Contractor shall provide all data in support of any proposed “or equal” item at Contractor’s expense.
- C. *Engineer’s Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each “or-equal” request. Engineer may require Contractor to furnish additional data about the proposed “or-equal” item. Engineer will be the sole judge of acceptability. No “or-

equal” item will be ordered, furnished, installed, or utilized until Engineer’s review is complete and Engineer determines that the proposed item is an “or-equal,” which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

- D. *Effect of Engineer’s Determination:* Neither approval nor denial of an “or-equal” request will result in any change in Contract Price. The Engineer’s denial of an “or-equal” request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.
- E. *Treatment as a Substitution Request:* If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an “or-equal” item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 *Substitutes*

- A. *Contractor’s Request; Governing Criteria:* Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.
 - 1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.
 - 2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
 - 3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:
 - a. will certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design;
 - 2) be similar in substance to the item specified; and
 - 3) be suited to the same use as the item specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and

- 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from the item specified; and
 - 2) available engineering, sales, maintenance, repair, and replacement services.
 - d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- E. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination:* If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 Concerning Subcontractors and Suppliers

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.

- B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.
- E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.
- F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.
- H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.
- J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.
- K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.
- L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.

- M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If an invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights will be disclosed in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.09 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

7.10 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.11 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.
- C. Owner or Contractor may give written notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.12 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.
- B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.
- C. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
 - 1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- E. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.
- F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
- G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.
- H. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).
- J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.14 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as material safety data sheets) or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

1. Before submitting a Shop Drawing or Sample, Contractor shall:
 - a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determine and verify:
 - 1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;
 - 2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - 3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;
 - c. confirm that the Submittal is complete with respect to all related data included in the Submittal.
2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.
3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.

- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.

1. *Shop Drawings*

- a. Contractor shall submit the number of copies required in the Specifications.

- b. Data shown on the Shop Drawings must be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide, and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.C.

2. *Samples*

- a. Contractor shall submit the number of Samples required in the Specifications.
 - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the Submittal for the limited purposes required by Paragraph 7.16.C.
3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Engineer's Review of Shop Drawings and Samples*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. Engineer's review and approval will be only to determine if the items covered by the Submittals will, after installation or incorporation in the Work, comply with the requirements of the Contract Documents, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction, or to safety precautions or programs incident thereto.
3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.
5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.
6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

D. Resubmittal Procedures for Shop Drawings and Samples

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous Submittals.
2. Contractor shall furnish required Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

E. Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:
 - a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.
 - b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.
 - c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.
 - d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.
 2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03, 2.04, and 2.05.
- F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

7.17 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer is entitled to rely on Contractor's warranty and guarantee.
- B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:
 - 1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and
 - 2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.
- C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 - 1. abuse, or improper modification, maintenance, or operation, by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 - 2. normal wear and tear under normal usage.
- D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:
 - 1. Observations by Engineer;
 - 2. Recommendation by Engineer or payment by Owner of any progress or final payment;
 - 3. The issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 - 4. Use or occupancy of the Work or any part thereof by Owner;
 - 5. Any review and approval of a Shop Drawing or Sample submittal;
 - 6. The issuance of a notice of acceptability by Engineer;
 - 7. The end of the correction period established in Paragraph 15.08;
 - 8. Any inspection, test, or approval by others; or
 - 9. Any correction of defective Work by Owner.
- E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from losses, damages, costs, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A will not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

7.19 *Delegation of Professional Design Services*

- A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.
- B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.
- C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.
- D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.

- E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:
 - 1. Checking for conformance with the requirements of this Paragraph 7.19;
 - 2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and
 - 3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.
- F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.
- G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.
- D. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.
- E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work.

Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

- F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
 - 1. The identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
 - 2. An itemization of the specific matters to be covered by such authority and responsibility; and
 - 3. The extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

- A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.
- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.

1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.
 2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.
- C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents will be that of the former Engineer.

9.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

- B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
- C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
- B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe, as an experienced and qualified design professional, the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.07. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Resident Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.
- B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 *Engineer's Authority*

- A. Engineer has the authority to reject Work in accordance with Article 14.
- B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.
- C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.
- D. Engineer's authority as to changes in the Work is set forth in Article 11.
- E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.06 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.07 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, will create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Contractor under Paragraph 15.06.A, will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs of which Engineer has been informed.

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

- A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
- B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.

- C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

11.02 *Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders covering:
 - 1. Changes in Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
 - 2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 - 3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and
 - 4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.
- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 *Work Change Directives*

- A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.
- B. If Owner has issued a Work Change Directive and:
 - 1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.
 - 2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 *Field Orders*

- A. Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly.
- B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.05 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.
- B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.
- C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.06 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

11.07 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:
 - 1. Where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);
 - 2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or

3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).
- C. *Contractor's Fee:* When applicable, the Contractor's fee for overhead and profit will be determined as follows:
1. A mutually acceptable fixed fee; or
 2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. For costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;
 - b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 percent;
 - c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;
 - d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
 - e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and
 - f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

11.08 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.

- B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

11.09 *Change Proposals*

A. *Purpose and Content:* Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.

B. *Change Proposal Procedures*

1. *Submittal:* Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.
2. *Supporting Data:* The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.
 - a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.
 - b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

3. *Engineer's Initial Review:* Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.
4. *Engineer's Full Review and Action on the Change Proposal:* Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

- 5. *Binding Decision*: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- C. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.
- D. *Post-Completion*: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12—CLAIMS

12.01 *Claims*

- A. *Claims Process*: The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:
 - 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
 - 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;
 - 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and
 - 4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.
- B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.
- C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the

exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.

D. *Mediation*

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.
 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.
 3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13—COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
 2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those

additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

- B. *Costs Included:* Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will include only the following items:
1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will be included in the above to the extent authorized by Owner.
 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will accrue to Owner, and Contractor shall make provisions so that they may be obtained.
 3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, which will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
 4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work.
 5. Other costs consisting of the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

- 1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.
- c. *Construction Equipment Rental*
- 1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.
 - 2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.
 - 3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price (“changed Work”), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.
- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
 - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
 - f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of builder’s risk or other property insurance established in accordance with Paragraph 6.04), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor’s fee.
 - g. The cost of utilities, fuel, and sanitary facilities at the Site.

- h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded*: The term Cost of the Work does not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
2. The cost of purchasing, renting, or furnishing small tools and hand tools.
3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
6. Expenses incurred in preparing and advancing Claims.
7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee*

1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:
 - a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.
 - b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:
 - 1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.
 - 2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.
2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

- E. *Documentation and Audit*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

13.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. *Cash Allowances*: Contractor agrees that:
1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment for any of the foregoing will be valid.
- C. *Owner's Contingency Allowance*: Contractor agrees that an Owner's contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor for Work covered by allowances, and the Contract Price will be correspondingly adjusted.

13.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual

conditions or more accurate data) upon Owner and Contractor, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:
 - a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 - b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.
2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.
3. Adjusted unit prices will apply to all units of that item.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply with such procedures and programs as applicable.

14.02 *Tests, Inspections, and Approvals*

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
 3. by manufacturers of equipment furnished under the Contract Documents;
 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests will be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt written notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final

payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work will be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work will not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace defective Work as required by Engineer, then Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15—PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 *Progress Payments*

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments*
 - 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work

completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.

2. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
4. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. Review of Applications

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress,

- or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
- b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work;
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
 5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
 6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
 - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. Payment Becomes Due

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
 - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. The Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. The Contract Price has been reduced by Change Orders;
 - i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;
 - j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens; or
 - l. Other items entitle Owner to a set-off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.
3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.
- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.
 - 2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 - 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
 - 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.04 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

A. *Application for Payment*

- 1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.

2. The final Application for Payment must be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
 - d. a list of all duly pending Change Proposals and Claims; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
 3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.
- B. *Engineer's Review of Final Application and Recommendation of Payment:* If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.
- C. *Notice of Acceptability:* In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.
- D. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.
- E. *Final Payment Becomes Due:* Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by

Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 *Waiver of Claims*

- A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim, appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.
- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. correct the defective repairs to the Site or such adjacent areas;
 - 2. correct such defective Work;
 - 3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.
- B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.
- C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under

Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.

- D. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times directly attributable to any such suspension. Any Change Proposal seeking such adjustments must be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
 - 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment, or failure to adhere to the Progress Schedule);
 - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 - 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:
 - 1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and
 - 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take

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possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.

- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.
- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate for Convenience*

- A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
 - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 days' written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, 7 days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17—FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this article:
 - 1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and
 - 2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this article, Owner or Contractor may:
 - 1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;
 - 2. agree with the other party to submit the dispute to another dispute resolution process; or
 - 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18—MISCELLANEOUS

18.01 *Giving Notice*

- A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:
 - 1. in person, by a commercial courier service or otherwise, to the recipient's place of business;
 - 2. by registered or certified mail, postage prepaid, to the recipient's place of business; or
 - 3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

18.02 *Computation of Times*

- A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

- A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination of the Contract or of the services of Contractor.

18.07 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Assignment of Contract*

- A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party to this Contract of any rights under or interests in the Contract will be binding on the other party without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract.

18.09 *Successors and Assigns*

- A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

18.10 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

SECTION 00800

SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

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SECTION 00800

SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

These Supplementary Conditions amend or supplement EJCDC® C-700, Standard General Conditions of the Construction Contract (2018). The General Conditions remain in full force and effect except as amended.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added—for example, "Paragraph SC-4.05."

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

SC-1.01.A.8 Add the following language to the end of Paragraph 1.01.A.8:

The Change Order form to be used on this Project is EJCDC No. C-941. Agency approval is required before Change Orders are effective.

SC-1.01.A.50. Add the following language at the end of the last sentence of Paragraph 1.01.A.50:

A Work Change Directive cannot change Contract Price or Contract Times without a subsequent Change Order.

SC-1.01.A Add the following new Paragraph after Paragraph 1.01.A.50:

51. Abnormal Weather Conditions- Conditions of extreme or unusual weather for a given region, elevation, or season as determined by Engineer. Extreme or unusual weather that is typical for a given region, elevation, or season should not be considered Abnormal Weather Conditions.
52. Agency- The Project is financed in whole or in part by in part, through an agreement with the United States Department of Agriculture (USDA). Therefore, the Agency for these documents is USDA.
53. Defective - The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - A. does not conform to the Contract Documents, or
 - B. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents, or
 - C. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with the Contract Documents).
54. Holidays - Legal holidays shall include the following holidays designated by the Owner: New Year's Day, Martin Luther King Jr. Day, President's Day, Memorial Day,

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Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, the day after Thanksgiving and Christmas Day

55. State of California Specifications - The State of California Department of Transportation Standard Specifications in effect at the date of Section 00100 Invitation to Bid. Also referred to as State Standard Specifications and Caltrans Standard Specifications.
56. Weather Day - A day in which weather conditions prevent work on critical activities for more than seventy-five percent (75%) of the Contractor's scheduled workday and equipment force engaged in the current critical activity item(s) as shown on the latest Progress Schedule for a period of at least five (5) hours per day and the crew is dismissed as a result thereof.
57. Work Day - A working day is defined as any day, except Saturdays, Sundays and Owner Legal Holidays. A working day may also be referred to as a "Business Day". Any work scheduled by the Contractor on non-working days (Saturdays, Sundays, and Owner Legal Holidays) shall be verified with the Owner at least 72 hours in advance. The Owner shall be compensated for inspection work, at an hourly rate, for any work on non-working days and for overtime.

ARTICLE 2—PRELIMINARY MATTERS

2.01 Delivery of Bonds and Evidence of Insurance

SC-2.01 Delete Paragraphs 2.01.B. and C. in their entirety and insert the following in their place:

- B. *Evidence of Contractor's Insurance:* When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner copies of the policies (including all endorsements, and identification of applicable self-insured retentions and deductibles) of insurance required to be provided by Contractor in this Contract. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- C. *Evidence of Owner's Insurance:* After receipt from Contractor of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor copies of the policies of insurance to be provided by Owner in this Contract (if any). Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

2.02 Copies of Documents

SC-2.02 Amend the first sentence of Paragraph 2.02.A. to read as follows:

Owner shall furnish to Contractor five printed copies of the Contract Documents (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF).

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

No modifications.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

*SC-4.01.A Amend the last Paragraph of 4.01.A by striking out the following words:
In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.*

*SC-4.05.C.2 Amend Paragraph 4.05.C.2 by striking out the following text: “abnormal weather conditions;” and inserting the following text:
Abnormal Weather Conditions;*

ARTICLE 5—SITE, SUBSURFACE AND PHYSICAL CONDITIONS, HAZARDOUS ENVIRONMENTAL CONDITIONS

5.03 *Subsurface and Physical Conditions*

SC-5.03 Add the following new paragraphs immediately after Paragraph 5.03.D:

- E. The following table lists the reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data, and specifically identifies the Technical Data in the report upon which Contractor may rely:

Report Title	Date of Report	Technical Data
Geotechnical Report, San Juan Bautista to Hollister Sanitary Force Main Project, San Benito County, California (see Appendix A)	September 2022	Geotechnical Data

- F. The following table lists the drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data, and specifically identifies the Technical Data upon which Contractor may rely:

Drawings Title	Date of Drawings	Technical Data
NONE		

SC-5.04.A Add the following paragraphs immediately after Paragraph 5.04.A.4:

- 5. Contractor shall notify Owner of site condition changes within two days of discovery.

5.06 *Hazardous Environmental Conditions*

SC-5.06 *Add the following new paragraphs immediately after Paragraph 5.06.A.3:*

4. The following table lists the reports known to Owner relating to Hazardous Environmental Conditions at or adjacent to the Site, and the Technical Data (if any) upon which Contractor may rely:

Report Title	Date of Report	Technical Data
NONE		

5. The following table lists the drawings known to Owner relating to Hazardous Environmental Conditions at or adjacent to the Site, and Technical Data (if any) contained in such Drawings upon which Contractor may rely:

Drawings Title	Date of Drawings	Technical Data
NONE		

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

SC-6.01 *Add the following paragraphs immediately after Paragraph 6.01.A:*

1. *Required Performance Bond Form:* The performance bond that Contractor furnishes will be in the form of EJCDC® C-610, Performance Bond (2018 edition).
2. *Required Payment Bond Form:* The payment bond that Contractor furnishes will be in the form of EJCDC® C-615, Payment Bond (2018 edition).

6.03 *Contractor’s Insurance*

SC-6.03 *Supplement Paragraph 6.03 with the following provisions after Paragraph 6.03.C:*

- E. *Workers’ Compensation and Employer’s Liability:* Contractor shall purchase and maintain workers’ compensation and employer’s liability insurance, including, as applicable, United States Longshoreman and Harbor Workers’ Compensation Act, Jones Act, stop-gap employer’s liability coverage for monopolistic states, and foreign voluntary workers’ compensation (from available sources, notwithstanding the jurisdictional requirement of Paragraph 6.02.B of the General Conditions).

Workers’ Compensation and Related Policies	Policy limits of not less than:
Workers’ Compensation	
State	Statutory
Applicable Federal (e.g., Longshoreman’s)	Statutory

Workers' Compensation and Related Policies	Policy limits of not less than:
Foreign voluntary workers' compensation (employer's responsibility coverage), if applicable	Statutory
Employer's Liability	
Each accident	\$1,000,000
Each employee	\$1,000,000
Policy limit	\$1,000,000

- F. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against claims for:
1. damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees,
 2. damages insured by reasonably available personal injury liability coverage, and
 3. damages because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- G. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy must be written on a 1996 (or later) Insurance Services Organization, Inc. (ISO) commercial general liability form (occurrence form) and include the following coverages and endorsements:
1. Products and completed operations coverage.
 - a. Such insurance must be maintained for three years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
 2. Blanket contractual liability coverage, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
 3. Severability of interests and no insured-versus-insured or cross-liability exclusions.
 4. Underground, explosion, and collapse coverage.
 5. Personal injury coverage.
 6. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together). If Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.
 7. For design professional additional insureds, ISO Endorsement CG 20 32 07 04 "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.

- H. *Commercial General Liability—Excluded Content:* The commercial general liability insurance policy, including its coverages, endorsements, and incorporated provisions, must not include any of the following:
1. Any modification of the standard definition of “insured contract” (except to delete the railroad protective liability exclusion if Contractor is required to indemnify a railroad or others with respect to Work within 50 feet of railroad property).
 2. Any exclusion for water intrusion or water damage.
 3. Any provisions resulting in the erosion of insurance limits by defense costs other than those already incorporated in ISO form CG 00 01.
 4. Any exclusion of coverage relating to earth subsidence or movement.
 5. Any exclusion for the insured’s vicarious liability, strict liability, or statutory liability (other than worker’s compensation).
 6. Any limitation or exclusion based on the nature of Contractor’s work.
 7. Any professional liability exclusion broader in effect than the most recent edition of ISO form CG 22 79.
- I. *Commercial General Liability—Minimum Policy Limits*

Commercial General Liability	Policy limits of not less than:
General Aggregate	\$5,000,000
Products—Completed Operations Aggregate	\$1,000,000
Personal and Advertising Injury	\$1,000,000
Bodily Injury and Property Damage—Each Occurrence	\$1,000,000

- J. *Automobile Liability:* Contractor shall purchase and maintain automobile liability insurance for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy must be written on an occurrence basis.

Automobile Liability	Policy limits of not less than:
Bodily Injury	
Each Person	\$1,000,000
Each Accident	\$1,000,000
Property Damage	
Each Accident	\$1,000,000

- K. *Umbrella or Excess Liability:* Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer’s liability, commercial general liability, and automobile liability insurance described in the Paragraphs above. The coverage afforded must be at least as broad as that of each and every one of the underlying policies.

Excess or Umbrella Liability	Policy limits of not less than:
Each Occurrence	\$2,000,000
General Aggregate	\$2,000,000

- L. *Using Umbrella or Excess Liability Insurance to Meet CGL and Other Policy Limit Requirements:* Contractor may meet the policy limits specified for employer’s liability, commercial general liability, and automobile liability through the primary policies alone, or through combinations of the primary insurance policy’s policy limits and partial attribution of the policy limits of an umbrella or excess liability policy that is at least as broad in coverage as that of the underlying policy, as specified herein. If such umbrella or excess liability policy was required under this Contract, at a specified minimum policy limit, such umbrella or excess policy must retain a minimum limit of **\$2,000,000** after accounting for partial attribution of its limits to underlying policies, as allowed above.
- M. *Contractor’s Pollution Liability Insurance:* Contractor shall purchase and maintain a policy covering third-party injury and property damage, including cleanup costs, as a result of pollution conditions arising from Contractor’s operations and completed operations. This insurance must be maintained for no less than three years after final completion.

Contractor’s Pollution Liability	Policy limits of not less than:
Each Occurrence/Claim	\$1,000,000
General Aggregate	\$1,000,000

- N. *Contractor’s Professional Liability Insurance:* If Contractor will provide or furnish professional services under this *Contract*, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance must cover negligent acts, errors, or omissions in the performance of professional design or related services by the insured or others for whom the insured is legally liable. The insurance must be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. The retroactive date on the policy must pre-date the commencement of furnishing services on the Project.

Contractor’s Professional Liability	Policy limits of not less than:
Each Claim	\$1,000,000
Annual Aggregate	\$1,000,000

- O. *Contractor’s General Liability Insurance and Insured Endorsement for the State of California, California Department of Transportation, County of San Benito, City of San Juan Bautista, and City of Hollister:* Contractor shall provide a certificate of liability insurance and an additional insured endorsement to cover the aforementioned parties’ potential liability for the permitted work. The certificate and endorsement must name “the State of California, California Department of Transportation, the directors, officers, employees, and/or agents of the State of California and/or the California Department of Transportation”, “County of

San Benito”, “City of San Juan Bautista”, and “City of Hollister” as additional insured for the minimum liability insurance limits noted below. The Certificate will need to have the Caltrans and County of San Benito Encroachment Permit numbers written on it.

Contractor’s Professional Liability	Policy limits of not less than:
General Liability Aggregate	\$2,000,000
General Liability per Occurrence	\$1,000,000
Non-Owned Vehicle Property Damage	\$100,000

6.04 *Builder’s Risk and Other Property Insurance*

SC-6.05. *Add the following new paragraph after Paragraph 6.04.A of the General Conditions with the following provisions:*

Contractor, not Owner, will be responsible for purchasing and maintaining property insurance on the work in the form of a “all risk” Builder’s Risk policy.

ARTICLE 7—CONTRACTOR’S RESPONSIBILITIES

SC-7.03 *Add the following new paragraph immediately after Paragraph 7.03.C:*

- D. Contractor shall be responsible for the cost of any overtime pay or other expense incurred by the Owner for Engineer’s services (including those of the Resident Project Representative, if any), Owner's representative, and construction observation services, occasioned by the performance of Work on Saturday, Sunday, any legal holiday, or as overtime on any regular work day. If Contractor is responsible but does not pay, or if the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.

SC-7.05.A *Amend the third sentence of the paragraph by striking out the following words: Unless the specification or description contains or is followed by words reading that no like, equivalent, or “or-equal” item is permitted.*

SC-7.05.A.1 *Amend the last sentence of Paragraph a.3 by striking out “and:” and adding a period at the end of Paragraph a.3.*

SC-7.05.A.1 *Delete paragraph 7.05.A.1.a.4 in its entirety and insert the following in its place:*
[Deleted]

SC-7.07.A *Amend Paragraph 7.07.A by adding the following text to the end of the Paragraph: The Contractor shall not award work valued at more than fifty percent of the Contract Price to Subcontractor(s), without prior written approval of the Owner.*

SC-7.07.B *Delete Paragraph 7.07.B in its entirety and insert the following in its place:*
[Deleted]

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SC 7.07.E Amend the second sentence of Paragraph 7.07.E by striking out “Owner may also require Contractor to retain specific replacements; provided, however, that”.

SC-7.09.A *Permits: Add the following paragraphs immediately after Paragraph 7.09.A.*

The Contractor shall comply with these permit requirements.

B. The Contractor shall obtain and pay for permits and any permitting agency inspection fees for the following permits:

Name or Type of Permit	Permitting Agency
Air Permit	California Air Resources Board
Caltrans Encroachment Permit (must become Permit Rider)	Caltrans
City of San Juan Bautista Encroachment Permit	City of San Juan Bautista
City of Hollister Encroachment Permit	City of Hollister
County of San Benito Encroachment Permit (see Specification Section 00200 and Appendix G)	County of San Benito
County of San Benito Grading Permit	County of San Benito
North Central Coast Air Basin Permit to Construct	North Central Coast Air Basin
Occupational Safety and Health Administration (OSHA) Excavation and Overhead Utility Proximity	OSHA
California State Water Resources Control Board (SWRCB) General Construction Activity Storm Water Permit	SWRCB
Discharge permits for discharging water used for pipe pressure testing, leakage testing, disinfection, and for dewatering as necessary.	California RWQCB

The permits contain requirements, which affect the cost of project work, and some permanent permits require supplementary work permits and fees to execute construction. The Contractor is required to comply with the permit requirements and obtain and pay the fees involved with the supplementary work permits, including inspection fees.

SC-7.09.B *Permits: Add the following paragraphs immediately after Paragraph 7.09.B.*

C. The following documents list specific mitigation measures and monitoring requirements for this project. The requirements within these documents are the responsibility of the

Contractor. The documents below shall be reviewed by the Contractor to ensure all conditions and binding responsibilities are met.

1. Appendix B - San Juan Bautista to Hollister Force Main Mitigation Monitoring and Reporting Program CEQA & NEPA, September 9, 2022 (EMC Planning Group Inc.)
2. Appendix C - Biological Opinion for the San Juan Bautista to Hollister Sewer Force Main Project, San Benito County, California (USFWS 2022)
3. Appendix D - Water Quality Certification, San Juan Bautista to Hollister Sewer Force Main Project (RWQCB 2022)
4. Appendix E - Section 2081 Incidental Take Permit, San Juan Bautista to Hollister Sewer Force Main Project (2081-2022-033-04) (CDFW)
5. Appendix F - Streambed Alteration Agreement, San Juan Bautista to Hollister Sewer Force Main Project (EPIMS Notification No. SBO-29921) (CDFW)

7.13 Safety and Protection

SC-7.13. Add the following new paragraph immediately after Paragraph 7.13.J:

- K. For all excavations in excess of five (5) feet, the Contractor shall, pursuant to Labor Code Section 6705, submit in advance of any excavation hereunder a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from caving ground. No such excavation shall be made until said detailed plan is submitted by Contractor and accepted by Engineer.
1. The plan shall be prepared by a registered civil or structural engineer in the State of California. As a part of the plan, a note shall be included stating that the registered civil or structural engineer certifies that the plan complies with applicable requirements of the United States Department of Labor regulations (29 CFR Part 1926) and the Cal-OSHA Construction Safety Orders, whichever are more stringent, or that the registered civil or structural engineer certifies that the plan is not less effective than the shoring, bracing, sloping, or other provisions of OSHA and the Safety Orders. The plan showing the design of shoring, etc., shall include surcharge loads for nearby embankments and structures, for spoil banks, and for construction equipment and other construction loadings. The plan shall indicate for all trench conditions the minimum horizontal distances from the side of the trench at its top to the near side of the surcharge loads.
 2. Nothing contained in this Paragraph 7.13.K. shall be construed as relieving Contractor of the full responsibility for providing shoring, bracing, sloping, or other provisions which are adequate for worker protection. Review of the plan by Owner and/or Engineer is only for general conformance to OSHA and the Safety Orders. Their failure to note exception(s) to the submittal does not relieve Contractor of any responsibility or liability for the plan. Contractor remains solely and completely responsible for all trench safety and for the means, methods, procedures, and materials therefore.
 3. Owner or Engineer or their consultants may have made investigations of subsurface conditions in areas where the work is to be performed. If so, these investigations are identified in the Contract Documents and the records of such investigations are available for inspection at Engineer's office. The detailed plan showing the design of shoring, etc.,

which Contractor is required to submit to Owner for acceptance of excavation will be not accepted by Owner if the plan is based on subsurface conditions which are more favorable than those revealed by the investigations made by Owner or Engineer or their consultants; nor will the plan be accepted if it is based on soils-related criteria which is less restrictive than the criteria set forth in the report on the aforesaid investigations of subsurface conditions.

ARTICLE 8—OTHER WORK AT THE SITE

No modifications.

ARTICLE 9—OWNER’S RESPONSIBILITIES

9.13 Owner’s Site Representative

SC-9.13 Add the following new paragraph immediately after Paragraph 9.12 of the General Conditions:

9.13 Owner’s Site Representative

- A. Owner will furnish an “Owner’s Site Representative” to represent Owner at the Site and assist Owner in observing the progress and quality of the Work. The Owner’s Site Representative is not Engineer’s consultant, agent, or employee. Owner’s Site Representative will be identified at the pre-construction meeting. The authority and responsibilities of Owner’s Site Representative follow:

To function as the Owner’s Project Representative for all technical, construction and contract issue. To coordinate with the Owner, Engineer, and other parties the Contractor’s correspondences and notices. To issue the Contractor notices and responses on behalf of the Owner, Engineer, and other parties.

ARTICLE 10—ENGINEER’S STATUS DURING CONSTRUCTION

10.03 Resident Project Representative

SC-10.03 Add the following new subparagraph immediately after Paragraph 10.03.A:

1. On this Project, by agreement with the Owner, the Engineer will not furnish a Resident Project Representative to represent Engineer at the Site or assist Engineer in observing the progress and quality of the Work.

ARTICLE 11—CHANGES TO THE CONTRACT

SC-11.02.C Add the following new Paragraph after Paragraph 11.02.B:

- C. All Contract Change Orders must be concurred in by Agency before they are effective.

SC 11.08. Change of Contract Times: Add the following new Paragraph 11.08.C:

The Contract Time includes the following allowances for working days lost due to Weather Days:

1. Through Substantial Completion: 10 days.
2. Between Substantial and Final Completion: 2 days.

Abnormal weather as used in Article 4.05 of the General Conditions shall mean Weather Days in excess of the number of days indicated above.

SC-11.07.C Add the following new Paragraph after Paragraph 11.07.B:

- C. All Contract Change Orders must be concurred in by Agency before they are effective.

ARTICLE 12—CLAIMS

SC-12.01. Add the following new paragraph immediately after paragraph 12.01.G:

- H. If this is a “Public Works Contract” as defined in Section 22200 of the California Public Contract Code, claims shall be resolved pursuant to Section 9204 of the California Public Contract Code. Key provisions of that section are summarized as follows:
 1. “Claim” means a separate demand by a contractor sent by registered mail or certified mail with return receipt requested, for one or more of the following:
 - (A) A time extension, including, without limitation, for relief from damages or penalties for delay assessed by a public entity under a contract for a public works project.
 - (B) Payment by the public entity of money or damages arising from work done by, or on behalf of, the contractor pursuant to the contract for a public works project and payment for which is not otherwise expressly provided or to which the claimant is not otherwise entitled.
 - (C) Payment of an amount that is disputed by the public entity.
 2. Upon receipt of a claim pursuant to this section, Owner shall conduct a reasonable review of the claim and, within a period not to exceed 45 days, shall provide Contractor a written statement identifying what portion of the claim is disputed and what portion is undisputed. Upon receipt of a claim, Owner and Contractor may, by mutual agreement, extend the time period provided in this subdivision.
 3. Contactor shall furnish reasonable documentation to support the claim.
 4. Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after Owner issues its written statement.
 5. If Contractor disputes Owner’s written response, or if Owner fails to respond to a claim, Contractor may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand in writing sent by registered mail or certified mail, return receipt requested, Owner shall schedule a meet and confer conference within 30 days for settlement of the dispute.

6. Within 10 business days following the conclusion of the meet and confer conference, if the claim or any portion of the claim remains in dispute, Owner shall provide Contractor a written statement identifying the portion of the claim that remains in dispute and the portion that is undisputed. Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after Owner issues its written statement, Any undisputed portion of the claim, as identified by the Contractor in writing, shall be submitted to nonbinding mediation with the public entity and Contractor sharing the associated costs equally. If the mediation is unsuccessful, the parts of the claim remaining in dispute shall be subject to applicable procedures outside this section.
7. Failure by Owner to respond to a claim from Contractor within the time periods described herein or to otherwise meet the time requirements of this section shall result in the claim being rejected in its entirety. A claim that is denied by reason of the public entity's failure to have responded to a claim, or its failure to otherwise meet the time requirements of this section, shall not constitute an adverse finding with regard to the merits of the claim or the responsibility or qualifications of the claimant.
8. Amounts not paid in a timely manner as required by this section shall bear interest at 7 percent per annum.

ARTICLE 13—COST OF WORK; ALLOWANCES, UNIT PRICE WORK

SC 13.01.B.5.c Delete Paragraph 13.01.B.5.c in its entirety and insert the following in its place:

- c. Construction Equipment and Machinery:
 1. Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
 2. Costs for equipment and machinery owned by Contractor will be paid at a rate that shall not exceed that which is shown for such equipment in the State of California Department of Transportation publication entitled "Labor Surcharge and Equipment Rental Rates" which is in effect on the date upon which the work is performed. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs. Costs will include the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, shall cease to accrue when the use thereof is no longer necessary for the changed Work. Equipment or machinery with a value of less than \$1,000 will be considered small tools.

13.03 Unit Price Work

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SC-13.03 Delete Paragraph 13.03.E in its entirety and insert the following in its place:

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:
 - a. the extended price of a particular item of Unit Price Work amounts to 25% percent or more of the Contract Price (based on estimated quantities at the time of Contract formation) and the variation in the quantity of that particular item of Unit Price Work actually furnished or performed by Contractor differs by more than 25% percent from the estimated quantity of such item indicated in the Agreement; and
 - b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.
2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.
3. Adjusted unit prices will apply to all units of that item.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

No suggested Supplementary Conditions in this Article.

ARTICLE 15—PAYMENTS TO CONTRACTOR, SET OFFS; COMPLETIONS; CORRECTION PERIOD

SC-15.01.B Amend the second sentence of Paragraph 15.01.B.2 by striking out the following text: "a bill of sale, invoice, copies of subcontract or purchase order payments, or other"

SC-15.01.B.4 Add the following language at the end of paragraph 15.01.B.4:
No payments will be made that would deplete the retainage, place in escrow any funds that are required for retainage, or invest the retainage for the benefit of the Contractor.

SC-15.01.B5. Add the following new paragraph after Paragraph 15.01.B.4
The Application for Payment Form to be used on this Project is EJCDC No. C-620. The Agency must approve all Applications for Payment before payment is made.

SC-15.01.D.1 Delete Paragraph 15.01.D.1 in its entirety and insert the following in its place:
The Application for Payment with Engineer's recommendations will be presented to the Owner and Agency for consideration. If both the Owner and Agency find the application for Payment acceptable, the recommended amount less any reduction under the provisions of Paragraph 15.01.E will become due twenty (20) days after the Application for Payment is presented to the Owner, and the Owner will make payment to the Contractor.

SC-15.02.A Amend Paragraph 15.02.A by striking out the following text:

“no later than seven days after the time of payment by Owner” and insert “no later than the time of payment by Owner.”

SC-15.03.A Substantial Completion: Add the following subparagraphs immediately after Paragraph 15.03.A:

1. Substantial Completion for the Work of this Contract is defined to occur when all structures, facilities, equipment, and ancillary items are installed, and I/O loop tests have been completed by the Contractor and witnessed by the Systems Integrator. Fully functional is defined as occurring after the Engineer approves of the 5-day performance testing period (facility startup and operational testing with full automated control and communication). Final Completion shall include all remaining work not included under Substantial Completion.
2. A Milestone Completions shall be required prior to Substantial Completion and is defined in accordance with Section 00520. Fully functional is defined as post-approval by the engineer of the 5-day performance testing period (facility startup and operational testing in accordance with Section 01670.

SC-15.06.E Delete Paragraph 15.06.E in its entirety and insert the following in its place:

Thirty-five days after the filing of a Notice of Completion with the County Recorder and after presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer’s recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

No suggested Supplementary Conditions in this Article.

ARTICLE 17—FINAL RESOLUTIONS OF DISPUTES

17.02 Arbitration

SC-17.02 Add the following new paragraph immediately after Paragraph 17.01.

17.02 Arbitration

- A. All matters subject to final resolution under this Article will be settled by arbitration administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules (subject to the conditions and limitations of this Paragraph SC-17.02). Any controversy or claim in the amount of \$100,000 or less will be settled in accordance with the American Arbitration Association’s supplemental rules for Fixed Time and Cost Construction Arbitration. This agreement to arbitrate will be specifically enforceable under the prevailing law of any court having jurisdiction.
- B. The demand for arbitration will be filed in writing with the other party to the Contract and with the selected arbitration administrator, and a copy will be sent to Engineer for

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information. The demand for arbitration will be made within the specific time required in Article 17, or if no specified time is applicable within a reasonable time after the matter in question has arisen, and in no event will any such demand be made after the date when institution of legal or equitable proceedings based on such matter in question would be barred by the applicable statute of limitations.

- C. The arbitrator(s) must be licensed engineers, contractors, attorneys, or construction managers. Hearings will take place pursuant to the standard procedures of the Construction Arbitration Rules that contemplate in-person hearings. The arbitrators will have no authority to award punitive or other damages not measured by the prevailing party's actual damages, except as may be required by statute or the Contract. Any award in an arbitration initiated under this clause will be limited to monetary damages and include no injunction or direction to any party other than the direction to pay a monetary amount.
- D. The Arbitrators will have the authority to allocate the costs of the arbitration process among the parties, but will only have the authority to allocate attorneys' fees if a specific Law or Regulation or this Contract permits them to do so.
- E. The award of the arbitrators must be accompanied by a reasoned written opinion and a concise breakdown of the award. The written opinion will cite the Contract provisions deemed applicable and relied on in making the award.
- F. The parties agree that failure or refusal of a party to pay its required share of the deposits for arbitrator compensation or administrative charges will constitute a waiver by that party to present evidence or cross-examine witness. In such event, the other party shall be required to present evidence and legal argument as the arbitrator(s) may require for the making of an award. Such waiver will not allow for a default judgment against the non-paying party in the absence of evidence presented as provided for above.
- G. No arbitration arising out of or relating to the Contract will include by consolidation, joinder, or in any other manner any other individual or entity (including Engineer, and Engineer's consultants and the officers, directors, partners, agents, employees or consultants of any of them) who is not a party to this Contract unless:
 - 1. the inclusion of such other individual or entity will allow complete relief to be afforded among those who are already parties to the arbitration;
 - 2. such other individual or entity is substantially involved in a question of law or fact which is common to those who are already parties to the arbitration, and which will arise in such proceedings;
 - 3. such other individual or entity is subject to arbitration under a contract with either Owner or Contractor, or consents to being joined in the arbitration; and
 - 4. the consolidation or joinder is in compliance with the arbitration administrator's procedural rules.
- H. The award will be final. Judgment may be entered upon it in any court having jurisdiction thereof, and it will not be subject to modification or appeal, subject to provisions of the Laws and Regulations relating to vacating or modifying an arbitral award.
- I. Except as may be required by Laws or Regulations, neither party nor an arbitrator may disclose the existence, content, or results of any arbitration hereunder without the prior

written consent of both parties, with the exception of any disclosure required by Laws and Regulations or the Contract. To the extent any disclosure is allowed pursuant to the exception, the disclosure must be strictly and narrowly limited to maintain confidentiality to the extent possible.

ARTICLE 18—MISCELLANEOUS

No suggested Supplementary Conditions in this Article.

ARTICLE 19—FEDERAL REQUIREMENTS

SC-19 Add the following new Article:

ARTICLE 19 – FEDERAL REQUIREMENTS

SC 19.01 Agency Not a Party

- A. This Contract is expected to be funded in part with funds provided by Agency. Neither Agency, nor any of its departments, entities, or employees is a party to this Contract.

SC 19.02 Contract Approval

- A. Concurrence by Agency in the award of the Contract is required before the Contract is effective.

SC 19.03 Conflict of Interest & Gratuities

- A. Contractor may not knowingly contract with a supplier or manufacturer if the individual or entity who prepared the plans and specifications has a corporate or financial affiliation with the supplier or manufacturer. Owner's officers, employees, or agents shall not engage in the award or administration of this Contract if a conflict of interest, real or apparent, would be involved. Such a conflict would arise when: (i) the employee, officer or agent; (ii) any member of their immediate family; (iii) their partner or (iv) an organization that employs, or is about to employ, any of the above, has a financial interest in Contractor. Owner's officers, employees, or agents shall neither solicit nor accept gratuities, favors or anything of monetary value from Contractor or subcontractors.
- B. No member of or delegate to the Congress of the United States, and no resident commissioner, shall be admitted to any share or part of this Agreement or to any benefit to arise from the same.
- C. Pursuant to 24 CFR 570.489(h), no member, officer, or employee of the Contractor or Sub-grantee, or its designees or agents, no member of the governing body of the locality in which the program is situated, and no other public official of such locality or localities who exercise or have exercised any functions or responsibilities with respect to USDA activities assisted under this part, or who are in a position to participate in a decision-making process or gain inside information with regard to such activities, may obtain a financial interest or benefit from a USDA -assisted activity, or have a financial interest in any contract, subcontract or agreement with respect to a USDA-assisted activity or its proceeds, either for themselves or those with whom they have business or immediate family ties, during their tenure, or for one (1) year thereafter. The Contractor or Sub-grantee shall incorporate, or

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cause to be incorporated, in all such contracts or subcontracts a provision prohibiting such interest pursuant to the purposes of this section.

SC 19.04 Gratuities

- A. If Owner finds after a notice and hearing that Contractor, or any of Contractor's agents or representatives, offered or gave gratuities (in the form of entertainment, gifts, or otherwise) to any official, employee, or agent of Owner or Agency in an attempt to secure this Contract or favorable treatment in awarding, amending, or making any determinations related to the performance of this Contract, Owner may, by written notice to Contractor, terminate this Contract. Owner may also pursue other rights and remedies that the law or this Contract provides. However, the existence of the facts on which Owner bases such findings shall be an issue and may reviewed in proceedings under the dispute resolution provisions of this Contract.
- B. In the event this Contract is terminated as provided in paragraph 19.04.A, Owner may pursue the same remedies against Contractor as it could pursue in the event of a breach of this Contract by Contractor. As a penalty, in addition to any other damages to which it may be entitled by law, Owner may pursue exemplary damages in an amount (as determined by Owner) which shall not be less than three nor more than ten times the costs Contractor incurs in providing any such gratuities to any such officer or employee.

SC-19.05 Audit and Access to Records and Retention/Inspection of Records

- A. Owner, Agency, the Comptroller General of the United States, or any of their duly authorized representatives shall have access to any books, documents, papers, and records of the Contractor and Engineer which are pertinent to the Agreement, for the purpose of making audits, examinations, excerpts, and transcriptions. Contractor and Engineer shall maintain all required records for three years after final payment is made and all other pending matters are closed.
- B. Access by the Department, the Subgrantee, the federal grantor agency, the State, the Comptroller General of the United States, or any of their duly authorized representatives to any books, documents, papers, and records of the contractor which are directly pertinent to that specific contract for the purpose of making audit, examination, excerpts, and transcriptions pursuant to 24 CFR 85.36(i)(10).
- C. The Contractor or Sub-grantee must have intact, auditable fiscal and program records at all times. If the Contractor or Sub-grantee is found to have missing audit reports from the California State Controller's Office (SCO) during the term of this Agreement, the Contractor or Sub-grantee will be required to submit a plan to the State, with task deadlines, for submitting the audit to the SCO. If the deadlines are not met, the Contractor or Sub-grantee will be subject to termination of this Agreement and is encumbrance of the funds awarded. The Contractor or Sub-grantee 's audit completion plan is subject to prior review and approval by the Department.
- D. The Contractor or Sub-grantee agrees that the Department or its designee will have the right to review, obtain, and copy all records pertaining to performance of this Agreement. The Contractor or Sub-grantee agrees to provide the Department or its designee with any relevant information requested and shall permit the Department or its designee access to its premises, during normal business hours for the purpose of interviewing employees and inspecting and copying such books, records, accounts, and other material that may be

relevant to a matter under investigation for the purpose of determining compliance with California Public Contract Code (PCC) Section 10115 et seq., Government Code (GC) Section 8546.7 and 2 CCR 1896.60 et seq. The Contractor or Sub-grantee further agrees to maintain such records for a minimum period of five (5) years after the Department notifies the Contractor or Sub-grantee that the contract has been closed. The Grantee shall comply with the caveats and be aware of the penalties for violations of fraud and for obstruction of investigation as set forth in PCC 10115.10.

- E. An expenditure which is not authorized by this Agreement or which cannot be adequately documented shall be disallowed and must be reimbursed to the Department or its designee by the Contractor or Sub-grantee. Expenditures for grant activity(ies) not described in Exhibit A shall be deemed authorized if the performance of such grant activity(ies) is approved in writing by the Department prior to the commencement of such grant activity(ies).
- F. Absent fraud or mistake on the part of the Department, the determination by the Department of the allowance of any expenditure shall be final.
- G. Pursuant to 2 CFR Subpart F-Audit Requirements, the Contractor or Sub-grantee shall perform an annual audit at the close of each fiscal year in which this Agreement is in effect. Audit costs for this Agreement are general administration expenses and are subject to the general administration expenditure limits associated with this Agreement. Notwithstanding the foregoing, the Department will not reimburse the Contractor or Sub-grantee for any audit cost incurred after the expenditure deadline of this Agreement.
 - 1. The audit shall be performed by a qualified State, department, local or independent auditor. The agreement/contract for audit shall include a clause which permits access by the Department to the independent auditor's working papers.
 - 2. If there are audit findings, the Contractor or Sub-grantee must submit a detailed response to the Department for each audit finding. The Department will review the response and, if it agrees with the response, the audit process ends and the Department will notify the Contractor or Sub-grantee in writing. If the Department is not in agreement, the Contractor or Sub-grantee will be contacted in writing and informed what corrective actions must be taken. This action may include the repayment of disallowed costs or other remediation.
 - 3. The Department shall not approve reimbursement for any expenditures for the audit, prior to receiving an acceptable audit report.
 - 4. If so directed by the Department upon termination of this Agreement, the Contractor or Sub-grantee shall cause all records, accounts, documentation and all other materials relevant to the grant activity(ies) to be delivered to the Department as depository

SC-19.07 Anti-Kickback

- A. Contractor shall comply with the Copeland Anti-Kickback Act (18 U.S.C. 874 and 40 U.S.C. 276c) as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Buildings or Public Works Financed in Whole or in Part by Loans and Grants of the United States.") The Act provides that Contractor or subcontractor shall be prohibited from inducing, by any means, any person employed in the

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construction, completion, or repair of public facilities, to give up any part of the compensation to which they are otherwise entitled. Owner shall report all suspected or reported violations to Agency.

SC-19.08 Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended

- A. Contractor to agree to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).

SC-19.09 State Energy Policy

- A. Contractor shall comply with the Energy Policy and Conservation Act (P.L. 94-163). Mandatory standards and policies relating to energy efficiency, contained in any applicable State Energy Conservation Plan, shall be utilized.

SC-19.10 Equal Opportunity Requirements

- A. The Contract is considered a federally assisted construction contract. Except as otherwise provided under 41 CFR Part 60, all contracts that meet the definition of “federally assisted construction contract” in 41 CFR Part 60-1.3 must include the equal opportunity clause provided under 41 CFR 60-1.4(b), in accordance with Executive Order 11246, “Equal Employment Opportunity” (30 FR 12319, 12935, 3 CFR Part, 1964-1965 Comp., p. 339), as amended by Executive Order 11375, “Amending Executive Order 11246 Relating to Equal Employment Opportunity,” and implementing regulations at 41 CFR part 60, “Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor.

SC-19.11 Byrd Anti-Lobby Amendment (31 U.S.C 1352)

- A. Contractors that apply or bid for an award exceeding \$100,000 must file the required certification (RD Instruction 1940-Q, Exhibit A-1). The Contractor certifies to the Owner and every subcontractor certifies to the Contractor that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining the Contract if it is covered by 31 U.S.C. 1352. The Contractor and every subcontractor must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the Owner. Necessary certification and disclosure forms shall be provided by Owner.

SC-19.12 Environmental Requirements

When constructing a project involving trenching and/or other related earth excavations, Contractor shall comply with the following environmental constraints:

- A. Wetlands- When disposing of excess, spoil, or other construction materials on public or

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private property, Contractor shall not fill in or otherwise convert wetlands.

- B. Floodplains- When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert 100 year floodplain areas delineated on the latest Federal Emergency Management Agency Floodplain maps, or other appropriate maps, i.e., alluvial soils on NRCS Soil Survey maps.
- C. Historic Preservation- Any excavation by Contractor that uncovers an historical or archaeological artifact shall be immediately reported to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further direction issued by Agency after consultation with the State Historic Preservation Officer (SHPO).
- D. Endangered Species- Contractor shall comply with the Endangered Species Act, which provides for protection of endangered and/or threatened species and critical habitat. Should any evidence of the presence of endangered and/or threatened species or their critical habitat be brought to the attention of Contractor, Contractor will immediately report this evidence to Owner and a representative of Agency. Construction shall be temporarily halted pending notification process and further directions issued by Agency after consultation with the U.S. Fish and Wildlife Service.
- E. Mitigation Measures- The following environmental mitigation measures are required on this Project:
 - i. Greenhouse gas emissions caused by construction activities has been found to require mitigation. Greenhouse gas control strategies must be employed by the Contractor, including carpool encouragement, reduced trip generation, no idle vehicles longer than five minutes, off-road construction diesel engines shall meet Tier 2 California Emissions Standards.
 - ii. A Dust and Emission Control Program, provided by the Contractor for engineering review and acceptance, must be in place prior to any construction activities. Once accepted by Engineer, Contractor must submit plan to the appropriate regulatory agency for their approval.
 - iii. Contractor shall satisfactorily produced the required Stormwater Pollution Prevention Plan (SWPPP) and Monitoring and Reporting Plan (M&RP) and implemented appropriate stormwater runoff control facilities as further defined in the Contract Specifications.
 - iv. Contractor shall limit tree trimming and removal activities to avoid breeding season (no trimming allowed between March 1 and September 1 of each year).
 - v. Contractor and all construction personnel shall attend awareness training for biological and cultural resources.

SC-19.13 Contract Work Hours and Safety Standards Act (40 U.S.C 3701-3708)

- A. Where applicable, for contracts awarded by the Owner in excess of \$100,000 that involve the employment of mechanics or laborers, the Contractor must comply with 40 U.S.C. 3702 and 3704. Under 40 U.S.C. 3702 of the Act, the Contractor must compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in

excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence

SC-19.14 Debarment and Suspension (Executive Orders 12549 and 12689):

- A. A contract award (see 2 CFR 180.220) must not be made to parties listed on the governmentwide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), "Debarment and Suspension." SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.

SC-19.15 Procurement of Recovered Materials

- A. The Contractor must comply with 2 CFR Part 200.322, "Procurement of recovered materials."

SC-19.16 Monitoring Requirements

- A. The Department shall perform a program and/or fiscal monitoring of the grant. The Contractor or Sub-grantee shall be required to resolve any monitoring findings to the Department's satisfaction by the deadlines set by the Department. If findings are not adequately resolved in a timely manner, the Department may deduct points from the Contractor or Sub-grantee's performance score on future solicitations or applications for funding.
- B. In determining appropriate monitoring for each grant, the Department shall consider prior grant administration, audit findings, as well as factors such as complexity of the project and the amount of funding. The Department shall determine the areas to be monitored, the number of monitoring visits, and their frequency. The monitoring will address program compliance with contract provisions, including to but not limited to national objective, financial management, the requirements of HCDA. 24 CFR Part 85, 24 CFR 570 Part I, and all applicable federal overlay requirements.

SC-19.17 Additional Rights

- A. Title VI of the Civil Rights Act of 1964: This act provides that no person shall be excluded from participation, denied program benefits, or subject to discrimination based on race, color, and/or national origin under any program or activity receiving federal financial assistance.
- B. Title VII of the Civil Rights Act of 1968 (The Fair Housing Act): This act prohibits discrimination in housing on the basis of race, color, religion, sex and/or national origin. This law also requires actions which affirmatively promotes fair housing.
- C. Restoration Act of 1987: This act restores the broad scope of coverage and clarifies the

application of the Civil Rights Act of 1964. It also specifies that an institution which receives federal financial assistance is prohibited from discriminating on the basis of race, color, national origin, religion, sex, disability or age in a program or activity which does not directly benefit from such assistance.

- D. Section 109 of Title 1 of the Housing and Community Development Act of 1974 [42 U.S.C. 5309]: This section of Title 1 provides that no person shall be excluded from participation (including employment), denied program benefits, or subject to discrimination on the basis of race, color, national origin, or sex under any program or activity funded in whole or in part under Title 1 of the Act.
- E. The Fair Housing Amendment Act of 1988: This act amended the original Fair Housing Act to provide for the protection of families with children and people with disabilities, strengthen punishment for acts of housing discrimination, expand the Justice Department jurisdiction to bring suit on behalf of victims in federal district courts, and create an exemption to the provisions barring discrimination on the basis of familial status for those housing developments that qualify as housing for person's age 55 or older.
- F. The Housing for Older Persons Act of 1995 (HOPA): Retained the requirement that housing facilities must have one person who is 55 years of age or older living in at least 80% of its occupied units. The act also retained the requirement that housing facilities publish and follow policies and procedures that demonstrate intent to be housing for persons 55 or older.
- G. The Age Discrimination Act of 1975: This act provides that no person shall be excluded from participation, denied program benefits, or subject to discrimination on the basis of age under any program or activity receiving federal funding assistance. Effective January 1987, the age cap of 70 was deleted from the laws. Federal law preempts any State law currently in effect on the same topic including: KRS 18A.140; KRS 344.040; 101 KAR 1:350 Paragraph 11; 101 KAR 1:375 Paragraph 2(3); 101 KAR 2:095 Paragraphs 6 and 7.
- H. Section 504 of the Rehabilitation Act of 1973: It is unlawful to discriminate based on disability in federally assisted programs. This Section provides that no otherwise qualified individual shall, solely by reason of his or her disability, be excluded from participation (including employment), denied program benefits, or subjected to discrimination under any program or activity receiving federal funding assistance. Section 504 also contains design and construction accessibility provisions for multi-family dwellings developed or substantially rehabilitated for first occupancy on or after March 13, 1991.
- I. The Americans with Disabilities Act of 1990 (ADA): This act modifies and expands the Rehabilitation Act of 1973 to prohibit discrimination against "a qualified individual with a disability" in employment and public accommodations. The ADA requires that an individual with a physical or mental impairment who is otherwise qualified to perform the essential functions of a job, with or without reasonable accommodation, be afforded equal employment opportunity in all phases of employment.
- J. Executive Order 11063: This Executive Order provides that no person shall be discriminated against on the basis of race, color, religion, sex, or national origin in housing and related facilities provided with federal assistance and lending practices with respect to residential property when such practices are connected with loans insured or guaranteed by the federal government.
- K. Executive Order 11259: This Executive Order provides that the administration of all federal programs and activities relating to housing and urban development be carried out in

a manner to further housing opportunities throughout the United States.

- L. The Equal Employment Opportunity Act: This act empowers the Equal Employment Opportunity Commission (EEOC) to bring civil action in federal court against private sector employers after the EEOC has investigated the charge, found "probable cause" of discrimination, and failed to obtain a conciliation agreement acceptable to the EEOC. It also brings federal, state, and local governments under the Civil Rights Act of 1964.
- M. The Immigration Reform and Control Act (IRCA) of 1986: Under IRCA, employers may hire only persons who may legally work in the U.S., i.e., citizens and nationals of the U.S. and aliens authorized to work in the U.S. The employer must verify the identity and employment eligibility of anyone to be hired, which includes completing the Employment Eligibility Verification Form (I-9).
- N. The Uniform Guidelines on Employee Selection Procedures adopted by the Equal Employment Opportunity Commission in 1978: This manual applies to employee selection procedures in the areas of hiring, retention, promotion, transfer, demotion, dismissal and referral. It is designed to assist employers, labor organizations, employment agencies, licensing and certification boards in complying with the requirements of federal laws prohibiting discriminatory employment.
- O. The Vietnam Era Veterans' Readjustment Act of 1974 (revised Jobs for Veterans Act of 2002): This act was passed to ensure equal employment opportunity for qualified disabled veterans and veterans of the Vietnam War. Affirmative action is required in the hiring and promotion of veterans.
- P. Executive Order 11246: This Executive Order applies to all federally assisted construction contracts and subcontracts. It provides that no person shall be discriminated against on the basis of race.

ARTICLE 20—PROJECT SIGN

SC-20 Add the following new Article:

ARTICLE 20 - PROJECT SIGN

- 20.01 Contractor will place a temporary construction project sign at a location designated by the Engineer, in accordance with specification section 00810.

ARTICLE 21—CALIFORNIA STATE REQUIREMENTS

SC-21 Add the following new Article:

ARTICLE 21 – CALIFORNIA STATE REQUIREMENTS

- 21.01 This project is a “public works” project as defined in California Labor Code Section 1720 through 1743. In accordance with California Labor Code Article 1725.5, Contractor and all subcontractors are required to be registered with the California Department of Industrial

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Relations (DIR) in order to bid or be listed on a bid and/or work on a public works project.

- 21.02 In entering into a public works contract or a subcontract to supply goods, services, or materials pursuant to a public works contract, the Contractor or Subcontractor offers and agrees to assign to the awarding body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Section 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the public works contract or the subcontract. This assignment shall be made and become effective at the time the awarding body tenders final payment to the Contractor, without further acknowledgment by the parties.
- 21.03 Contractor shall be responsible for marking all excavations and notifying Underground Service Alert (USA) at least 48 hours before digging and follow all other provisions of California Government Code Sections 4216 through 4216.9 . Contractor shall maintain an active USA ticket number for the entire duration of the excavation.
- 21.04 Unless otherwise indicated in the Contract Documents, all utility lines, conduits, wires, or structures shall be maintained by the Contractor and shall not be disturbed, disconnected, or damaged by him during the progress of the Work, provided, that should the Contractor in the performance of the Work disturb, disconnect, or damage any of the above, all expenses arising from such disturbance or in the replacement or repair thereof shall be borne by the Contractor. However, in accordance with Section 4215 of the California Government Code, the Contractor shall be compensated for all costs of locating and repairing damage to main or trunkline utility facilities located on the work site and for costs of operating equipment on the work site necessarily idled during such work where the Contractor has exercised reasonable care in removing or relocating utility facilities which are inaccurately indicated in the Contract Documents.

SC-22 Add the following new Article:

ARTICLE 22—RESERVED

22.01 Reserved

ARTICLE 23—EXAMINATION OF PLANS. SPECIFICATIONS AND SITE WORK

SC-23 Add the following new Article:

ARTICLE 23 – EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE OF WORK

- 23.01 The Contractor shall carefully examine the site of work, the plans and specifications and satisfying themselves as to the materials, obstacles, and conditions to be encountered, the character, quality and quantity of work to be performed, materials and equipment to be furnished, and all requirements of the drawings and specifications.

ARTICLE 24—PERMITS

SC-24 Add the following new Article:

ARTICLE 24 – PERMITS

- 24.01 Owner has obtained or will obtain the following permits, and rights for the work.
- 24.02 The permits listed above are described more fully in other Special Provisions. The Contractor may be required to obtain duplicate permits or be a signatory on the Owner obtained permits.
- 24.03 The obtainment of additional property, easements, use permits or agreements, environmental permits or requirements, and other rights or approvals required for the project or for the convenience of the Contractor shall be the responsibility of the Contractor. Any delays resulting from the lack of these additional permits or approvals will not be the responsibility of the Contractor and it will not be granted any extension of time for such delays.
- 24.04 The contractor shall be responsible for complying with all conditions of the permits and right-of-way agreements obtained for the project.
- 24.05 The references to “Working Day and “Calendar Day” in the General Specifications shall not apply to this project.

ARTICLE 25—RECORD DRAWINGS

SC-25 Add the following new Article:

ARTICLE 25 – RECORD DRAWINGS

- 25.01 The Contractor shall maintain a neatly and accurately marked set of record drawings. The drawings shall be subject to the inspection of the Engineer at all times and shall be kept current weekly with all work instructions, change orders, and construction adjustments shown thereon and initialed by the inspector. Progress payments or portions thereof may be withheld if drawings are not maintained as stated above. At the time of final inspection the Contractor shall submit to the Engineer for review and comment, four (4) sets of record drawings. The work will not be formally accepted until record drawings are accepted by the Engineer.

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END OF SECTION

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SECTION 00810

TEMPORARY CONSTRUCTION SIGN, USDA

PART 1 GENERAL

1.1 SUMMARY

This section covers the fabrication and installation of a project identification sign for projects receiving funding through the United States Department of Agriculture Rural Development Service.

1.2 SUBMITTALS

- A. In accordance with Section 01300, submit manufacturer's literature and drawings showing complete layout, dimensions, design loadings, materials of construction, etc.

PART 2 MATERIALS

2.1 GENERAL

- A. The project sign shall be fabricated and erected within 21 days following the notice to proceed and shall be purchased and maintained by the Contractor until completion of construction.
- B. For projects which include greater than one funding source, the information specified for USDA projects may be combined with other project signage requirements onto one sign, as allowed and approved by the funding agencies.
- C. There should be one project sign per project. If the project has multiple locations, one project sign centrally located as directed by the Engineer is sufficient.

2.2 MATERIALS AND FABRICATION

- A. Refer to attached figure titled "Temporary Construction Sign for Rural Develop Projects" for typical layout of a sign. The size and spacing of the lettering on the sign may change to accommodate the addition of other funding agencies.

- B. Sign Panel: The sign panel shall be constructed of 3/4-inch APA rated, A-B grade exterior plywood capable of withstanding typical weather conditions common to the project site. Sign shall be 8' wide by 4' tall (2400 mm x 1200 mm x 19 mm).
- C. Fasteners: All fasteners used in the fabrication of the sign shall be 304 SST.
- D. Sign Supports: The sign shall be adequately supported and braced to remain in the proper positioning and alignment, including resistance to wind loads and toppling of the sign. Supply a minimum of two (2) 2" schedule 40 GSP posts with welded top caps to support the sign 4-feet above grade (from grade to the bottom of the sign) and 2'-6" below grade.
- E. Coating: All paint or exterior coverings used shall be exterior grade coating suitable for use on wood or the material of construction. The sign face background shall be white and shall consist of a minimum two coats of paint.
- F. Lettering and Emblems: The lettering shall be of the size and color as specified on the attached figure. The size and spacing of the lettering on the sign may change to accommodate the addition of other funding agencies. The logo emblems shall be of the size specified on the attached figure and colors shall be per the USDA website:

<http://www.usda.gov/rus/water/ees/englib/contract.htm>

PART 3 EXECUTION

3.1 INSTALLATION

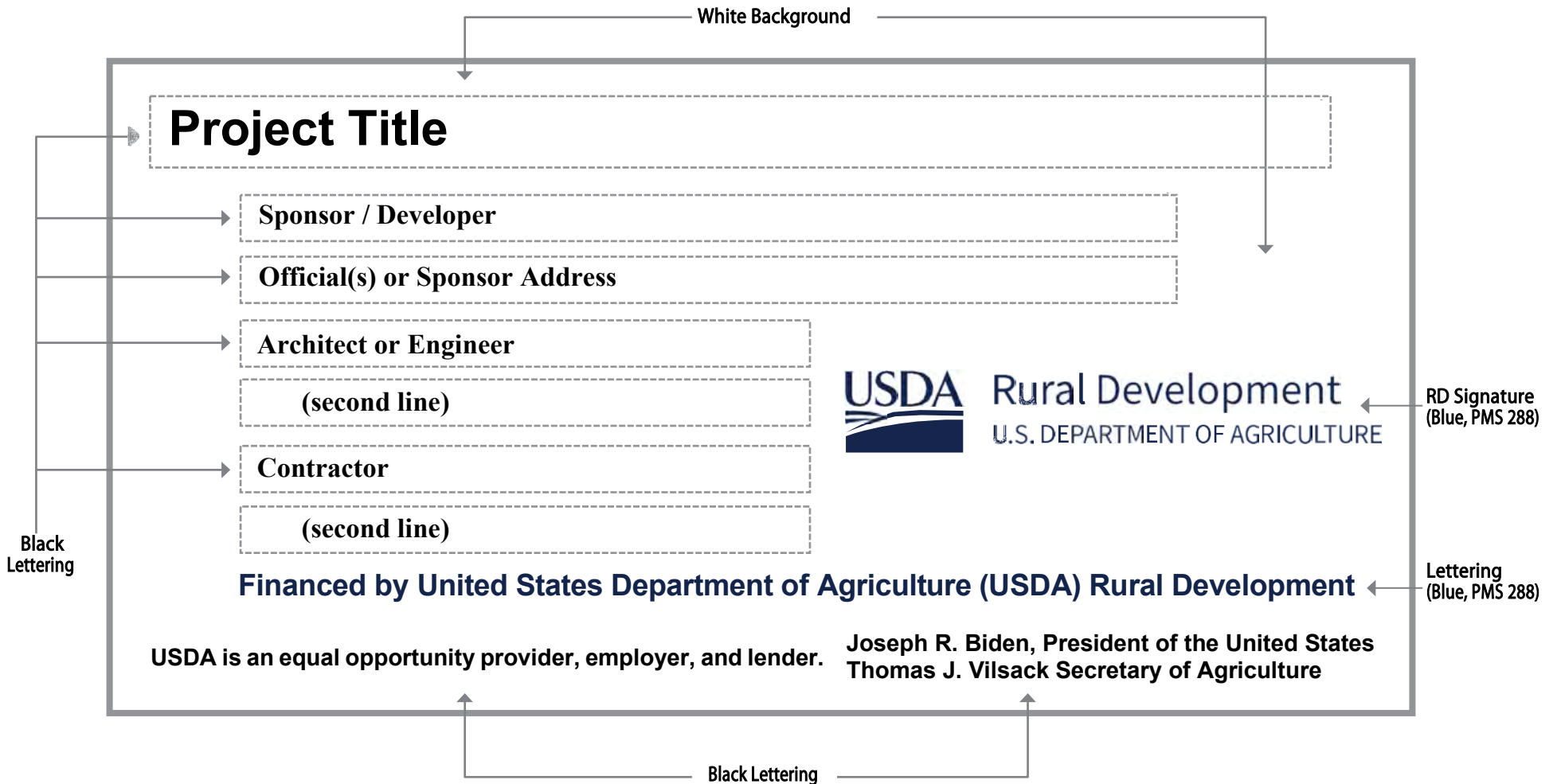
The project sign shall be erected in the location and alignment, as directed by the Engineer, with the bottom of the sign panel a minimum of four feet above existing grade.

3.2 MAINTENANCE

- A. The Contractor shall provide any and all materials required to maintain the sign in good condition throughout the duration of the Contract.
- B. The Contractor shall remove the project sign from the construction site upon completion of construction and Owner's acceptance of the work, or when directed by the Engineer.

TEMPORARY CONSTRUCTION SIGN FOR RURAL DEVELOPMENT PROJECTS

Recommended Fonts: Helvetica or Arial



SIGN DIMENSIONS : 1200 mm x 2400 mm x 19 mm (approx. 4' x 8' x 3/4")
PLYWOOD PANEL (APA RATED A-B GRADE-EXTERIOR)

SECTION 00940

WORK CHANGE DIRECTIVE

Work Change Directive No.: _____

Owner:	City of San Juan Bautista	Owner's Project No.:	
Engineer:	Stantec Consulting Services Inc.	Engineer's Project No.:	184031441
Contractor:		Contractor's Project No.:	
Project:	San Juan Bautista Sanitary Sewer Force Main to Hollister Project		
Contract Name:			
Date Issued:		Effective Date of Work Change Directive:	

Contractor is directed to proceed promptly with the following change(s):

Description:

Attachments:

Purpose for the Work Change Directive:

Directive to proceed promptly with the Work described herein, prior to agreeing to change in Contract Price and Contract Time, is issued due to:

Non-agreement on pricing of proposed change. Necessity to proceed for schedule or other reasons.

Estimated Change in Contract Price and Contract Times (non-binding, preliminary):

Contract Price: \$ _____ **[increase] [decrease] [not yet estimated].**

Contract Time: _____ days **[increase] [decrease] [not yet estimated].**

Basis of estimated change in Contract Price:

Lump Sum Unit Price Cost of the Work Other

Recommended by Engineer

Authorized by Owner

By: _____

Title: _____

Date: _____

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SECTION 00941

CHANGE ORDER

Change Order No.: _____

Owner:	City of San Juan Bautista	Owner's Project No.:	
Engineer:	Stantec Consulting Services Inc.	Engineer's Project No.:	184031441
Contractor:		Contractor's Project No.:	
Project:	San Juan Bautista Sanitary Sewer Force Main to Hollister Project		
Contract Name:			
Date Issued:	Effective Date of Change Order:		

The Contract is modified as follows upon execution of this Change Order:

Description:

Attachments:

Change in Contract Price	Change in Contract Times
Original Contract Price: \$ _____	Original Contract Times: Substantial Completion: _____ Ready for final payment: _____
[Increase] [Decrease] from previously approved Change Orders No. 1 to No. [Number of previous Change Order] : \$ _____	[Increase] [Decrease] from previously approved Change Orders No.1 to No. [Number of previous Change Order] : Substantial Completion: _____ Ready for final payment: _____
Contract Price prior to this Change Order: \$ _____	Contract Times prior to this Change Order: Substantial Completion: _____ Ready for final payment: _____
[Increase] [Decrease] this Change Order: \$ _____	[Increase] [Decrease] this Change Order: Substantial Completion: _____ Ready for final payment: _____
Contract Price incorporating this Change Order: \$ _____	Contract Times with all approved Change Orders: Substantial Completion: _____ Ready for final payment: _____

Recommended by Engineer (if required)	Authorized by Owner
By: _____	_____
Title: _____	_____
Date: _____	_____
Authorized by Owner	Approved by Funding Agency (if applicable)
By: _____	_____

Title:

Date:

SECTION 00942

FIELD ORDER

FIELD ORDER NO.: _____

Owner:	City of San Juan Bautista	Owner's Project No.:	
Engineer:	Stantec Consulting Services Inc.	Engineer's Project No.:	184031441
Contractor:		Contractor's Project No.:	
Project:	San Juan Bautista Sanitary Sewer Force Main to Hollister Project		
Contract Name:			
Date Issued:		Effective Date of Field Order:	

Contractor is hereby directed to promptly perform the Work described in this Field Order, issued in accordance with Paragraph 11.04 of the General Conditions, for minor changes in the Work without changes in Contract Price or Contract Times. If Contractor considers that a change in Contract Price or Contract Times is required, submit a Change Proposal before proceeding with this Work.

Reference:

Specification Section(s):

Drawing(s) / Details (s):

Description:

Attachments:

Issued by Engineer

By: _____

Title: _____

Date: _____

END OF SECTION

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SECTION 01010

GENERAL CONSTRUCTION INFORMATION AND REQUIREMENTS

PART 1 GENERAL

1.1 DESCRIPTION

This section covers the general requirements for the Contractor's temporary facilities at the job site and for the prosecution of the work.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01020 - Modification of Existing Facilities and Order of Work
- B. Section 01700 - Contract Closeout
- C. Section 01300 - Submittals
- D. Section 01330 - Safety Plan
- E. Section 02270 - Stormwater Runoff Control Program
- F. Section 02513 - Asphalt Concrete Paving
- G. Section 11010 - General Mechanical Equipment Provisions
- H. Section 16010 - Electrical System General Requirements
- I. Section 17010 - Instrumentation General Requirements

1.3 GENERAL NATURE OF THE WORK

The work generally involves furnishing of labor, equipment, and materials necessary to construct the San Juan Bautista Sanitary Sewer Force Main to Hollister Project complete and ready for operation. The Project includes: constructing a force main extending from the San Juan Bautista WWTP to the Hollister Domestic WWTP, installing a net Primary Pump Station, making

improvements to the existing influent pump station to serve as the Storage Pump Station, making improvements necessary to drain the emergency storage basins, demolishing existing San Juan Bautista WWTP equipment, installing a Chemical Feed System, site grading, yard piping, and electrical and instrumentation.

1.4 LOCATION OF THE PROJECT SITE

The project site is located at San Juan Bautista and Hollister, California

1.5 ACCESS TO THE SITE

Access to the project site shall be as shown on the Drawings or as directed by the Engineer.

PART 2 MATERIALS

2.1 MATERIALS

See Divisions 2 through 17 for materials and methods of installation.

PART 3 EXECUTION

3.1 CONTRACTOR'S OFFICE TOOLS AND EQUIPMENT

- A. Security: The Contractor shall at all times be responsible for the security of his site and equipment. The Owner will not take any responsibility for missing or damaged equipment, tools or personal belongings.
- B. Contractor's Field Office: During the performance of the contract, the Contractor shall maintain a suitable office at the work site which shall be the headquarters of the Contractor's representative. The Contractor shall provide furnishings for the Contractor's field office, including desks, chairs, conference table for 6 persons, and whatever electrical and computing devices needed by the Contractor to complete the project and as described in subsequent sections. The Contractor shall maintain a cleaning service, garbage service, and arrange for utility repairs should repairs be necessary for the operation and maintenance of the services.
- C. Workshop and Storage Facilities: Contractor shall provide storage buildings for the protection of equipment, materials, supplies and tools. The building used for the storage of materials which deteriorate when exposed to moisture shall be moisture-proof. Workshops and storage buildings shall be located as designated by the Engineer, and shall be clean and in proper order at all times.

- D. Parking Facilities: Contractor shall provide temporary parking areas, at locations on the project site approved by the Engineer, for visitor parking, employee vehicles, and the vehicles used by the Contractor's construction employees.

3.2 CONTRACTOR'S UTILITIES

- A. Power: The Contractor shall provide and maintain power to the field offices. The Contractor shall be responsible for obtaining and maintaining power for the purposes of construction, and for any field offices or ancillary structures installed by the Contractor for his use during construction.
- B. Water: Potable water used for the purposes of construction or for the Contractor's use shall be furnished by the Contractor at no charge to the Owner. See specification Section 02233 for information on availability of water. Arrangements for the purchase of this water from the San Benito County Water District shall be the responsibility of the Contractor. All equipment and labor for water storage, pumping, and conveyance shall be furnished and paid for by the Contractor.
- C. Telephone: The Contractor shall be responsible for connecting and maintaining telephone/DSL service to the field offices.
- D. Sanitary Facilities: The Contractor shall provide sanitary facilities for the field offices. The Contractor shall be responsible for obtaining and maintaining sanitary facilities for the purposes of construction, and for any additional field offices or ancillary structures installed by the Contractor for his use during construction. Currently, there are no available sanitary facilities on the site.
- E. Temporary Heating: The Contractor shall be responsible for providing temporary heating, covering and enclosures as necessary to protect all work and material against damage by dampness and cold and to facilitate completion of the work. The Contractor shall supply all the fuel, equipment and materials required for temporary heating, in accordance with manufacturer's recommendations.
- F. The Contractor's use of the project site and facilities for personnel housing shall be prohibited.
- G. Use of the Owner's equipment is prohibited without written approval from the Owner. The Contractor shall obtain written permission from the Owner before using owner's equipment. The Contractor shall take care to protect Owner's equipment from misuse. Any damage of Owner's equipment or failure of the equipment as a result of abuse or overloading shall be Contractor's responsibility.

3.3 LANDS PROVIDED BY OWNER

The Owner will provide all lands required for the Work under the contract, together with the right of access to such lands, as indicated. The Contractor shall not unreasonably encumber the premises with his equipment or materials. Periodic clean-up and debris removal may be requested by the Engineer as site maintenance at no extra cost to the Owner. Unless otherwise indicated, Owner's facilities on the site must remain in operation throughout the duration of project construction.

3.4 LANDS PROVIDED BY CONTRACTOR

- A. The Contractor shall provide, with no liability or additional cost to the Owner, any additional land and access thereto not shown or described that may be required for temporary construction facilities or storage of materials. He shall construct all access roads, detour roads or other temporary works as required by his operations.
- B. The Contractor shall confine his equipment, storage of materials and operation of his workmen to those areas shown and described and such additional areas as he may provide.

3.5 PRECONSTRUCTION PRINTS

The Contractor shall, before mobilization begins, submit two binders of hard copy printouts, and electronic files of digital preconstruction photos of the work area. Each photo shall include a date stamp as part of the image. The electronic photo files shall be provided in JPEG format at the highest quality compression setting with a camera resolution of 3.3 megapixels minimum on a USB flash drive shall be provided with each binder. The hard copy image printouts shall be full color, a maximum of two prints to a page, each print a minimum size of 5 inches by 7 inches, with a printed image quality of at least 300dpi and shall be printed on photo glossy white photo paper. Each printed image shall be labeled with the electronic image file name, the location and direction it was taken, and a short description of the subject. The Engineer may designate the locations and subject of up to 50 photos, but the Contractor may wish to take more images to fully document the existing conditions of the site or facilities before work begins. All such photos shall be included in the aforementioned submittal.

3.6 PRECONSTRUCTION VIDEO

The Contractor shall provide a video, on USB flash drives, to the Owner. The video shall clearly show the pre-construction condition of the project site and roadways to be utilized for access to the project site during construction, a minimum distance of one mile from the project site. The video shall clearly display the date and time it was taken. Two copies of the video shall be transmitted to the Owner prior to mobilization.

3.7 CONSTRUCTION PRINTS

The Contractor shall submit, each month during the construction, two binders of hard copy printouts, and two copies of electronic files of digital construction photos documenting the

progress of the Work. Each photo shall include a date stamp as part of the image. The electronic photo files shall be provided in JPEG format at the highest quality compression setting with a camera resolution of 3.3 megapixels minimum on a USB flash drive shall be provided with each binder. The hard copy image printouts shall be full color, a maximum of two prints to a page, each print a minimum size of 5 inches by 7 inches, with a printed image quality of at least 300dpi, and shall be printed on photo glossy white photo paper. Each printed image shall be labeled with the electronic image file name, the location and direction it was taken, and a short description of the subject. The Engineer may designate the locations and subject of up to 50 photos each monthly submittal. Upon completion of the Work, additional photos shall be taken of the subjects and locations depicted in the preconstruction photographs and submitted as described above.

3.8 SHIPPING AND PROTECTION OF EQUIPMENT

- A. Provide product handling and protection of the equipment and materials in accordance with Section 01640 – Product Handling

3.9 TESTS AND INSPECTION

- A. General Requirements: All materials, equipment, installation and workmanship included in this contract, if so required by the Engineer, shall be tested and inspected to prove compliance with the contract requirements. No tests specified herein shall be applied until the item to be tested has been inspected and approval given for the application of such test.
- B. Tests and inspections shall include:
 - 1. The delivery acceptance test and inspections.
 - 2. The installed tests and inspections of items as installed.
- C. Tests and inspections, unless otherwise specified or accepted, shall be in accordance with the recognized standards of the industry.
- D. The form of evidence of satisfactory fulfillment of delivery acceptance test and of installed test and inspection requirements shall be, at the discretion of the Engineer, either by tests and inspections carried out in his presence or by certificates or reports of tests and inspections carried out by approved persons or organizations.
- E. Delivery Acceptance Tests and Inspections: The delivery acceptance tests and inspections shall be at the Contractor's expense for any materials or equipment specified and shall include the following:
 - 1. Test of items during the process of manufacture and/or on completion of manufacture, comprising material tests, hydraulic pressure tests, electric tests, performance and operating tests and inspections in accordance with the relevant

standards of the industry and more particularly as detailed in individual sections of these specifications, or as may be required by the Engineer to satisfy himself that the items tested and inspected comply with the requirements of this contract.

2. Inspection of all items delivered at the site in order to satisfy the Engineer that such items are of the specified quality and workmanship and are in good order and condition at the time of delivery.

F. Installed Tests and Inspection:

1. All mechanical and electrical equipment shall be tested by the Contractor to the satisfaction of the Engineer before any facility is put into operation. Tests shall be specified herein and shall be made to determine whether the equipment has been properly assembled, aligned, adjusted and connected. Any changes, adjustments or replacements required to make the equipment operate as specified shall be carried out by the Contractor as part of the work and be pre-approved by the manufacturer.
2. At least 30 days before the time allowed in his construction schedule for commencing testing and start-up procedures, the Contractor shall submit to the Engineer, in duplicate, details of the procedures he proposes to adopt for testing and start-up of all mechanical and electrical equipment to be operated singly and together.
3. During the testing of equipment, the Contractor shall make available experienced factory trained representatives of the manufacturers of all the various pieces of equipment, or other qualified persons who shall instruct the Owner's personnel in the operation and care thereof. Instruction shall include step-by-step troubleshooting procedures with all necessary test equipment. All manufacturer's instructions shall be provided in writing.
4. During the performance tests, data shall be taken and recorded to demonstrate that all equipment and systems comply with manufacturer's submitted data and other requirements of the contract.
5. If under test, any portion of the work should fail to fulfill the contract requirements and is altered, renewed or replaced, tests on that portion when so altered, removed or replaced, together with all other portions of the work as are affected thereby, shall, if so required by the Engineer, be repeated within reasonable time and in accordance with the specified conditions, and the Contractor shall pay to the Owner all reasonable expenses incurred by the Owner as a result of the carrying out of such tests.
6. If any doubt, dispute or difference should arise between the Engineer and the Contractor regarding the test results or the methods or equipment used in the carrying out of a test, the Engineer may order the test to be repeated using modified methods or equipment. If the repeat test substantially confirms the Engineer's position on the previous test, all costs in connection with the repeat test will be paid by the Contractor, otherwise the costs shall be borne by the Owner. Where the results of any installed test fail to meet the contract requirements, repeat tests to achieve the contract requirements shall be made at the Contractor's expense.

G. Plant Operational and Performance Tests

1. After all individual equipment is tested and certified by the factory-trained representatives, the Contractor shall perform a 5-day plant operational test of the entire treatment process train. Contractor shall be responsible for any recirculation pumping required during this test as specified in Section 01020. The 5-day operational test shall be conducted using clean water and shall include all operational facilities. The testing shall be completed under the supervision of plant operations staff. Operational testing shall include automatic control and instrumentation systems. Any equipment or control systems that fail to perform properly shall be corrected and retested by the Contractor. Successful completion of the 5-day plant operational test is required prior to substantial completion.
2. In addition to the 5-day plant operational test, certain mechanical equipment and pumps, when required in the specifications, shall be given a field performance test in accordance with Section 11010.

3.10 OPERATION AND MAINTENANCE MANUALS

- A. Before receiving payment for more than 85 percent of the work or prior to the start-up of individual equipment, the Contractor shall deliver to the Engineer five sets of acceptable manufacturer's operating and maintenance instructions, as detailed below.
- B. Operating and maintenance information shall be provided for each maintainable piece of equipment, equipment assembly or subassembly, and material provided or modified under this Contract in accordance with Section 01680 – Operation and Maintenance Manuals.

3.11 TRAINING

The Contractor shall provide training of the Owner's personnel in the proper operation and maintenance of the equipment and systems installed under this Contract in accordance with Section 01675 – Training.

3.12 RESTORATION OF STRUCTURES AND SURFACES

- A. Structures, Equipment and Pipework: The Contractor shall remove such existing structures, equipment, and pipework as may be necessary for the performance of the work and shall rebuild or replace the items thus removed to original or better condition. He shall repair any existing structures which may be damaged as a result of his work.
- B. Roads and Streets: All roads and streets in which the surface is removed, broken or damaged, or in which the ground has caved or settled due to work under this contract, shall be completely restored and brought to the original grade and crown section unless otherwise indicated. Before resurfacing material is placed, edges of pavements shall be trimmed back far enough to provide clean, solid, vertical faces, and shall be free of any loose material. Roadways used by the Contractor for hauling materials, equipment,

supplies, etc., shall be cleaned and repaired if the condition of the roadway is damaged or otherwise affected due to the Contractor's operations. Repaving and repairs shall be done in accordance with Section 02513 – Asphalt Concrete Paving.

- C. Cultivated Areas and Other Surface Improvements: All cultivated and natural areas, either agricultural or lawns, and other surface improvements which are damaged by actions of the Contractor shall be restored, including roadside drainage ditches, as nearly as possible to their original condition or better.

3.13 SAFETY

- A. The Contractor shall execute and maintain his work so as to avoid injury or damage to any person or property. All work shall be done in conformance with the State of California Division of Industrial Relations and OSHA Standards.
- B. Safety precautions as applicable shall include, but not be limited to, adequate life protection, and life saving equipment; adequate illumination for underground and night operations; instructions in accident prevention for all employees; such machinery guards, walkways, scaffolds, ladders, bridges, and other safety devices, equipment and wearing apparel as are necessary or lawfully required to prevent accidents or injuries, and the proper inspection and maintenance of all safety measures.
- C. The names and telephone numbers of at least two medical doctors practicing in the vicinity and the telephone number of the local ambulance shall be prominently displayed adjacent to all telephones.
- D. The Contractor shall develop and maintain a Construction Safety Plan as stipulated in Section 01330.
- E. Nothing in this Section shall dilute the Contractor's complete and continuous responsibility for Site health, safety, and security as set forth on Paragraphs 7.12 through 7.13 and 9.12 of Section 00700 – General Conditions.

3.14 CONTRACTOR'S PERSONNEL PROTECTION

- A. The Contractor is warned that sewage may contain infectious bacteria, viruses and other disease-bearing organisms. It is the Contractor's responsibility to urge his personnel to observe a strict regimen of proper hygienic precautions, including any inoculations recommended by the public health officer.
- B. Because of the danger of solvents, gasoline and other hazardous materials being carried in raw sewage, sewer lines and manholes, certain areas around the treatment plant are considered hazardous to open flame, sparks or unventilated occupancy. The Contractor

shall be aware of these dangers and shall take the necessary measures to assure his personnel observe proper safety precautions when working in these areas.

3.15 TRENCH SAFETY

- A. Attention is directed to the provisions of Section 6705 of the Labor Code of the State of California.
- B. Excavation for any trench 5 feet or more in depth shall not begin until the Contractor has submitted to the Engineer, with the resolution of "No exceptions taken" of the Contractor's detailed plan for worker protection from the hazards of caving ground during the excavation of such trench. Such plan shall be submitted in accordance with Section 01300 and shall show the details of the design of shoring, bracing, sloping, or other provisions to be made for worker protection during such excavation. No such plans shall allow the use of shoring, sloping or a protective system less effective than that required by the Construction Safety Orders of the Division of Industrial Safety and if such plan varies from the shoring system standards established by the Construction Safety Orders, the plan shall be prepared and signed by an Engineer who is registered as a Civil or Structural Engineer in the State of California.
- C. In addition, the Contractor shall obtain, pay for, and comply with all provisions of the permit required by Section 6500 of the California Occupational Safety and Health Act of 1973. A copy of permit must be submitted per Section 01300.
- D. In accordance with the provisions of Section 6707 of the State Labor Code, each bidder shall list, in the Bid Items indicated, the amount contained in his proposal for adequate trench and excavation, sheeting, shoring, and bracing or equivalent method for the protection of life and limb which shall conform to applicable Safety Orders. By listing this sum in his proposal, the bidder warrants that his action does not convey tort liability to the Owner, the Owner's employees, or the Engineer.

END OF SECTION

SECTION 01020

MODIFICATION OF EXISTING FACILITIES AND ORDER OF WORK

PART 1 GENERAL

1.1 SCOPE

- A. This section covers the care of and work to be done on existing facilities at the site of the work, the requirements for providing continuous wastewater treatment and disposal operations during construction activities, and other requirements affecting the sequence of construction.
- B. Existing facilities at the site consist of an influent pump station and headworks, secondary and tertiary treatment processes, and interconnecting transfer piping and structures. Wastewater processed on the site is secondary or tertiary treated effluent that is discharged to San Juan Creek. Facility operations are governed by a waste discharge permit issued to the City of San Juan Bautista by the Regional Water Quality Control Board (RWQCB). These facilities must remain in service while the new force main and pump station and all related improvements are constructed. The requirements of the existing facilities while new facilities are implemented are the basis of the requirements of this Section. The Order of Work contained herein specifies required sequencing and/or timing of construction activities.

PART 2 MATERIALS

2.1 MATERIALS

See Divisions 2 through 16 for materials required.

PART 3 EXECUTION

3.1 GENERAL

- A. The existing treatment facilities will be maintained in continuous operation during construction of the project, until the force main and Primary Pump Station are operational, except for limited shut-downs as described herein. To this end, the Contractor shall

establish a schedule of activities in cooperation with the Engineer and City of San Juan Bautista operating staff, which shall be updated from time to time, shall meet the requirements of this section, and shall be approved by the Engineer.

- B. Plans and specifications from which most of the existing facilities were constructed are available from the Engineer.
- C. Existing treatment processes include a headworks, sequencing batch reactor ponds, pressure sand filter, ultraviolet disinfection, and chlorine contact basins (not used).
- D. Work Sequence and Constraints described hereinafter are critical events in work sequence which are presented to underscore the importance of proper sequencing, scheduling and coordination so that it is integrated with the required wastewater treatment. The work sequence and constraints presented do not describe all items affecting the completion of the Work, but are intended to describe important events necessary to minimize disruption of the existing facilities and to ensure compliance with wastewater discharge permit requirements.
- E. The existing facility where Contractor's work is to be done will be occupied by the Owner throughout the construction period. The Contractor shall provide all necessary access to the Owner's personnel as required to safely and efficiently operate/maintain the facilities. At all times during the Contract duration, the Contractor is to provide the Owner's personnel and representatives safe and immediate access to all process control equipment. Additionally, the Contractor is to provide for unimpeded access for all delivery vehicles transporting materials, chemicals and equipment to the facility for the Owner's operations.
- F. Existing systems or individual equipment items shall be isolated, decommissioned, de-energized, or depressurized only as allowed by the Engineer and the City of San Juan Bautista's plant personnel. This work will be done in accordance with the detailed outage plan and schedule to be submitted by the Contractor and the conditions specified in this section.
- G. The Contractor shall design and provide all necessary bulkheads, cofferdams, and support structures to allow isolation of work areas from tanks, pipes, and/or channels which are in service. Bulkheads, cofferdams, and support structures shall conform to applicable CAL/OSHA requirements.
- H. The Contractor shall provide all necessary temporary pumps, piping, power, electrical wiring, controls, and labor during and subsequent to all shutdown activities as required. The Contractor shall maintain adequate access to the plant facilities, utilities, and equipment during construction to allow continued operation and maintenance by plant personnel to take place.
- I. If valves need to be opened or closed, or pumps turned off or on, or similar operations performed, this is to be performed by the Owner's treatment plant operations staff working in coordination with Contractor personnel.

- J. The Contractor shall minimize shutdown times through advanced planning. Work shall not proceed prior to the approval of associated submittals, for example excavation plans shall be approved prior to the initiation of excavation, piping installation drawings shall be approved prior to the initiation of piping installation, etc. Contractor shall have all equipment, materials, and labor on hand at time of shutdown.
- K. By following the suggested sequence for any procedure described in this section, the Contractor assumes full responsibility for its use.
- L. Protect all existing utilities, including but not limited to, electrical, water, sanitary, gas, data and telephone. Existing utilities are to remain in service during construction. Provide temporary utilities as necessary and as approved by the Engineer.

3.2 BYPASSING DURING CONSTRUCTION

- A. Bypassing of untreated or partially treated wastewaters to surface waters or drainage courses will not be permitted.
- B. In the event accidental bypassing is caused by the Contractor's operations, the Owner shall immediately be entitled to employ others to stop the bypassing without giving written notice to the Contractor. All costs incurred by the Owner to stop or prevent the bypass shall be paid by the Contractor.
- C. Penalties imposed on the Owner as a result of any bypass caused entirely or in part by the actions of the Contractor, his/her employees, or subcontractors, shall be borne in full by the Contractor, including legal fees and other expenses to the Owner resulting directly or indirectly from the bypass. Under the terms of discharge permits issued to the Owner, in the event accidental bypassing occurs, the Owner is liable for the following penalties: Up to \$25,000 per day per violation per federal law.

3.3 REMOVAL OF EXISTING STRUCTURES AND EQUIPMENT

- A. The Contractor shall remove all existing equipment, structures, piping, valves, and other items as indicated on the Drawings. Where the plans indicate "Remove and Save", the Contractor shall carefully remove the item and protect it so as to avoid damage, shall thoroughly clean it, and stockpile it at a location on the site designated by the Engineer. Where the plans indicate "Remove and Reinstall", or "Relocate", the items shall be carefully removed and re-erected or reinstalled at another location as shown, after cleaning and such repairs and adjustments made as are necessary. Where indicated to be "Remove and Waste", the Contractor shall remove the item and dispose of it off the site at his expense or may salvage it for his own gain.
- B. The Owner reserves the first right of refusal if a need is identified for removed items. If a request is made by the Owner, the Contractor shall provide a schedule of values to identifying their associated value. After all parties agree to terms of change order,

Contractor shall deliver the items to the Owner at an area identified by the Engineer on the plant site or storage area.

3.4 COORDINATION WITH PLANT OPERATIONS

- A. The Contractor shall coordinate his operations with the operations of the plant. The Contractor shall notify the Engineer in writing of the Contractor's planned procedure for each specific alteration of existing facilities at least two weeks before the alteration begins. The Contractor shall not begin an alteration until specific permission has been granted by the Engineer in each case. The Engineer will coordinate the Contractor's planned procedure with the plant operating personnel. The making of connections to existing facilities or other operations that interfere with the operation of existing equipment shall be completed only after written approval has been granted by the Engineer and shall be completed as quickly as possible and with as little delay as possible.
- B. Any operational functions of the existing plant that are required to be done to facilitate Contractor's operation will be done by the plant personnel only.
- C. The plant operation and maintenance personnel will cooperate in every way that is practicable in order to expedite Contractor's operation; however, if it is necessary for the proper operation or maintenance of portions of the plant, the Contractor shall reschedule his operations so there shall be no conflict with necessary operations or maintenance of the plant.

3.5 SHUTDOWNS

- A. Shutdowns of the plant operations shall be accomplished by City of San Juan Bautista operating personnel only when properly coordinated in advance by the Contractor with the Engineer in accordance with the requirements of this section.
 - 1. The Contractor shall submit a detailed outage plan and time schedule for operations which will make it necessary to remove a tank, pipeline, channel, electrical conduit, equipment or structure from service.
 - 2. The plan shall be submitted to the Engineer for review and approval at least two weeks prior to the scheduled outage.
 - 3. The schedule shall be coordinated with the overall construction schedule and shall meet the restrictions and conditions specified in this section. The detailed plan shall describe the Contractor's method for preventing bypassing of other treatment units, the length of time required to complete said operation, the necessary personnel and equipment which the Contractor shall provide in order to prevent bypassing of associated treatment units.
 - 4. The plan shall also include a contingency plan if the work cannot be completed as scheduled.

5. The Contractor shall not proceed with the subject work until the submitted plan has been returned to the Contractor with the approval of both the Engineer and the Owner. All costs for preparing and implementing both the outage and contingency plans shall be borne by the Contractor.
 6. Contractor shall provide a minimum of two weeks advanced notice in writing for all shutdowns.
- B. Shutdowns shall be allowed only when, in the opinion of City of San Juan Bautista operating personnel and the Engineer, projected sewage flows can be safely stored or handled for the duration of the shutdown.
 - C. All shutdowns shall be kept to the absolute minimum in duration and number.
 - D. Shutdowns shall be coordinated so that as many items of work requiring such shutdowns as possible can be executed concurrently.
 - E. The Contractor shall seal off all potential sources of leaks and/or overflows associated with the construction and shall remove all loose materials from the structures and piping prior to resumption of flow at the end of a shutdown.
 - F. No scheduled shutdown of flow shall begin until all necessary materials and equipment for completion of that work are on the job site and have been checked by the Engineer. This requirement shall not relieve the Contractor of any of his responsibility for completion of the project within the period allowed, but is only to reassure the City of San Juan Bautista and the Engineer that the work item can be completed as scheduled.
 - G. Piping shutdowns shall be scheduled by the Contractor in coordination with the Engineer and plant operating personnel at least two weeks in advance.
 - H. Shutdowns shall be initiated and completed only during normal working hours of plant operating personnel.
 - I. Equipment required for bypass pumping or flow diversions during construction shall be provided, maintained and operated by the Contractor continuously on a 24 hour daily basis. The Contractor shall arrange for refueling of equipment as necessary and shall make appropriate arrangements for back-up equipment in case of failures.

3.6 INTERFERENCE WITH EXISTING LINES AND FACILITIES

- A. The Contractor will be required to relocate or replace any pipe lines, electric conduits, or other facilities which must be disturbed for new construction work and which are required for plant operation, or make other arrangements satisfactory to the Engineer. Such relocation and replacement may be of temporary type, to be used until work is completed. In the event of accidental damage to existing lines resulting in interruption of service to yard or building lighting circuits or to any other facility which may be needed for use by

the Owner prior to the Contractor's next regularly scheduled work period, the Contractor shall repair to the satisfaction of the Engineer such lines prior to stopping work on the day of such damage.

- B. At no cost to the owner, the Contractor will be required to relocate or replace any vaults, boxes, posts, or other facilities which must be disturbed for new construction work and which are required for plant operation, or make other arrangements satisfactory to the Engineer. This includes, but is not limited to, raising or lowering elevations of existing facilities to align with new finish grade.

3.7 DEWATERING AND CLEANING OF STRUCTURES AND PIPELINES

- A. The operating staff will dewater structures and pipelines to the extent this can be accomplished through existing valving and facilities. It will be the Contractor's responsibility to provide necessary pumps, piping, and other equipment to complete the drainage of the structures and pipelines. Dewatering operations shall be conducted in close coordination with operating staff, and no discharges to drainage courses will be permitted.
- B. All flushing and cleaning of dewatered structures shall be done by the Contractor in a manner satisfactory to the Engineer. In all cases the Contractor shall conform with OSHA requirements for work in confined spaces, including the provision of adequate ventilation.

3.8 WORK CONSTRAINTS

- A. There are protected or endangered species on the project site or in the project vicinity. Contractor is responsible for adhering to all environmental and procedural constraints, as detailed in the following documents:
 - 1. Appendix B - San Juan Bautista to Hollister Force Main Mitigation Monitoring and Reporting Program CEQA & NEPA, September 9, 2022 (EMC Planning Group Inc.)
 - 2. Appendix C - Biological Opinion for the San Juan Bautista to Hollister Sewer Force Main Project, San Benito County, California (USFWS 2022)
 - 3. Appendix D - Water Quality Certification, San Juan Bautista to Hollister Sewer Force Main Project (RWQCB 2022)
 - 4. Appendix E - Section 2081 Incidental Take Permit, San Juan Bautista to Hollister Sewer Force Main Project (2081-2022-033-04) (CDFW)
 - 5. Appendix F - Streambed Alteration Agreement, San Juan Bautista to Hollister Sewer Force Main Project (EPIMS Notification No. SBO-29921) (CDFW)
- B. New pipe tie-ins to existing pipe lines: The City does not guarantee that existing valves, gates, and stop plates will completely stop flow within pipe line or structure. The Contractor is to include all costs in its bid to isolate existing flows as needed for new construction.

- C. Pacific Gas and Electric (PG&E) Service: The City has submitted an application with PG&E to provide a new transformer and meter service for the SJB WWTP. Contractor shall coordinate the Work with PG&E and be responsible for scheduling the new service. Contractor will be required to make arrangements for temporary power supply if needed.
- D. A Toxic Materials Control and Spill Response Plan, provided by the Contractor for engineering review and acceptance, must be in place prior to any construction activities.
- E. Prior to shutdown of the existing primary service transformer, Contractor shall provide a temporary power and construction sequencing plan for review and approval by the Engineer and Pacific Gas and Electric (PG&E). Primary power shutdown shall be limited to 24 hours maximum (allowing to treatment plant processes to receive power from existing backup diesel generator) and shall take place during the during dry weather conditions (May – August). Contractor shall provide and pay for diesel required to operate generator during the shutdown.
 - 1. Shutdown plan shall include construction sequencing (including shutdown and service transformer installation, tie-in, demolition) and temporary power details.
 - a. For outages longer than 24hours, Contractor shall provide temporary power facilities capable of handling the connected loads detailed on the electrical drawings (prior to new process equipment operation, 2,000 kVA is required). Contractor shall provide duty and fully redundant backup power equipment including but not limited to: generators, alarms, wires, etc., at all times during temporary power connection.
 - b. Contractor shall submit a detailed temporary power facilities plan for review and approval by the Engineer at least two months before beginning the service transformer replacement. This plan shall provide specific manufacturer’s product information for all temporary equipment, instrumentation and electrical to be used by Contractor. All equipment used for temporary power facilities shall be in excellent condition.
 - 2. Once the new service transformer is installed and satisfactorily functionally tested, PG&E can reconnect the service to the new transformer.

3.9 SEQUENCE OF CONSTRUCTION

- A. General: The work shall be accomplished in an order that will allow continued operation (except for temporary shutdowns as specified herein) of the wastewater treatment plant as required to prevent the discharge of untreated or partially treated wastewater. To that end, basic requirements that cannot be violated unless specifically approved by the Engineer are established and a suggested order of work is presented below. The Contractor shall be responsible for final determination of the order of work, subject to the basic rules and other requirements herein.
- B. Basic Requirements

1. Except for authorized bypasses to accommodate required modifications, all existing plant operations shall be maintained functionally operable until all new work to be installed under this Contract is completely operable, has been functionally tested in a satisfactory manner, and written notice of acceptance has been received from the Engineer.
 2. No work may begin on the project site(s) until all contracts, bonds, and insurance coverage documents have been fully executed and a written Notice to Proceed has been issued to the Contractor.
 3. No work within the California Department of Transportation (Caltrans) right-of-way for Highway 156 work may begin until the Contractor has been approved by Caltrans to be a Permit Rider on the City's Caltrans Encroachment Permit. It is anticipated that the City Caltrans Encroachment Permit will be provided by July 1, 2023, at which time the Contractor shall apply to become a Permit Rider. Work within the Caltrans right-of-way may begin once the Contractor is approved as a Permit Rider.
 4. No other work may begin at the project site(s) until the Contractor has satisfactorily produced the required Stormwater Pollution Prevention Plan (SWPPP) and Monitoring and Reporting Plan (M&RP) and implemented appropriate stormwater runoff control facilities, all in accordance with requirements set forth in Specification Section 02270 – Stormwater Runoff Control Program.
 5. Provisions for adequate stormwater runoff collection and conveyance, and protection of the environment in accordance with these Specifications and the project Stormwater Pollution Prevention Plan (SWPPP) shall be maintained at all times.
 6. No work may begin in areas requiring excavation until a groundwater dewatering plan has been submitted and approved by the Engineer in accordance with Specification Section 02140 – Dewatering.
 7. No work may begin until Contractor has satisfactorily produced and implemented all mitigation monitoring and reporting requirements identified in Appendix B as well as other environmental requirements identified in Appendix C through Appendix F.
- C. Piping Interties and Connections: The Contractor shall complete tie-ins to, but not necessarily limited to, the following lines:
1. The existing Influent Pump Station (to be repurposed as the Storage Pump Station)
 2. EQ Tanks
 3. Pond inlet/outlet
 4. Effluent piping
- D. Recommended Sequences
1. Prior to fabrication of piping or submittal of shop drawings, contractor shall pothole to determine location and depth of existing underground piping that will be impacted and modified by this project. Report findings to engineer.

2. The existing treatment facilities (Headworks, Influent Pump Station, SBR, filters, and UV disinfection) shall remain in operation until the Primary Pump Station and force main are operational and satisfactorily functionally tested, per specification section 01670. The exact order of work shall be proposed by the Contractor and approved by the Engineer, but an approximate sequence is as follows:
 - a. Construct force main and conduit and all related appurtenances including pressure testing.
 - b. Commence new paving and stripping improvements upon completion of the force main and conduit facilities.
 - c. Modify existing WWTP piping as required to retain service and create space for new improvements.
 - d. Construction primary pump station and all related appurtenances, including electrical and instrumentation improvements.
 - e. Install temporary odor control facilities.
 - f. Initiate primary pump station start-up and testing.
 - g. Complete storage basin improvements.
 - h. Initiate pigging startup and testing through complete pipeline (all pigging stages).
 - i. After all primary pump, flushing and pigging acceptance testing, demolish filter related improvements and install permanent chemical feed facilities and bring online.
 - j. Complete storage pump station and screen improvements
 - k. Install ESB1 sump pump manhole and related appurtenances.
 - l. Complete all demolition improvements and site work.
3. Installation of the new Emergency Generator shall be satisfactorily functionally tested, per specification section 01670, prior to removal of the existing generator equipment.
4. A temporary chemical feed system shall be provided for startup, shall be operational prior to the Primary Pump Station and force main beginning operation, and shall remain in operation until the permanent Chemical Feed System is operational and satisfactorily functionally tested, per specification section 01670.
5. Temporary bypass piping as shown on the drawings shall be provided to avoid bypass pumping and to allow the existing treatment facilities to remain in operation until the Primary Pump Station and force main are operational and satisfactorily functionally tested, per specification section 01670.
6. The Hollister WWTP manhole into which the force main will connect, shall be rehabilitated in accordance with specification Section 02961 prior to connecting the force main.

END OF SECTION

SECTION 01050

SURVEY CONTROL

PART 1 GENERAL

1.1 DESCRIPTION

This section describes the survey information the Owner will provide to the Contractor.

1.2 SURVEY CONTROL INFORMATION

The Contractor will provide all construction survey controls and construction staking necessary to complete the work to the lines and grades shown in the contract documents. Contractor may utilize design surveyor F3. F3 provided the project survey.

1.3 TOLERANCES FOR CONTRACTOR'S MEASUREMENTS

The Contractor's measurements for all stakes, marks, or points set for line, grade, or distance shall be to the nearest 1/100 foot and shall not deviate by more than 2/100 foot from the control line, grade, or distance except as follows:

- A. Slope stakes for rough excavation may be set to the nearest 1/10 foot;
- B. Trench subgrade shall be established to within 1/10 foot above plan subgrade. The use of a grade pole to establish trench subgrade will be permitted; and
- C. Pipe subgrade and joint stakes shall be set to within 2/100 foot of plan subgrade and joint station. Use conventional survey instruments and techniques whenever this degree of accuracy cannot be obtained by use of a grade pole.

The Contractor's measurements of lines, grades, and distances will be subject to checking by the Owner's Representative. The Contractor shall correct immediately any such measurements that do not comply with the above tolerances.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

3.1 DESCRIPTION

The Contractor is responsible for protecting and maintaining all survey control on the project at no additional cost to the Owner.

END OF SECTION

SECTION 01155

MAINTAINING TRAFFIC

PART 1 GENERAL

1.1 GENERAL

This section defines the Contractor's responsibility with regard to convenience of the public and public traffic in connection with the contractor's operations.

1.2 SUBMITTALS

In accordance with Section 01300.

1.3 CONTRACTOR'S RESPONSIBILITY

Attention is directed to Sections 7-1.08, "Public Convenience," 7-1.09 "Public Safety" and 12 "Construction Area Traffic Control Devices," of the Caltrans Standard Specifications and these Special Provisions. Nothing in these Special Provisions shall be construed as relieving the Contractor from his responsibility as provided in said Section 7-1.09.

PART 2 MATERIALS

2.1 MATERIALS

Temporary Traffic Delineation (Section 01170), Construction Area Signs (Section 01180), and other materials as needed to direct and protect traffic.

PART 3 EXECUTION

3.1 NOTIFICATION REQUIREMENTS

The Contractor shall notify local authorities of his intent to begin work at least 5 days before work is begun. The Contractor shall cooperate with local authorities relative to handling traffic through the limits of the project and shall make his own arrangements relative to keeping the

work area clear of parked vehicles. The Contractor may move parked vehicles only in accordance with Section 22654(c)(d) of the State of California Vehicle Code. Signs required by said Section of the Vehicle Code shall be furnished, placed and maintained by the Contractor.

3.2 MODIFICATION TO CALTRANS SECTION 7-1.08 OF THE STANDARD SPECIFICATIONS

The fourteenth, fifteenth, sixteenth and nineteenth paragraphs of Section 7-1.08, "Public Convenience," of the Standard Specifications, shall be amended to read as follows:

- A. Upon completion of rough grading at the grading plane, or placing any subsequent layer thereon, the surface of the roadbed shall be brought to and maintained at a smooth, even condition, free of humps and depressions, satisfactory for the use of public traffic.
- B. After the surface of the roadbed has been brought to a smooth, even condition for the passage of public traffic as above provided, any work ordered by the Engineer (in addition to maintaining a smooth, even condition as above provided) for accommodation of public traffic prior to commencing subgrade operations will be paid for as extra work as provided in Section 4-1.03D, of the Standard Specifications. After subgrade preparation for a specified layer of material has been completed, the Contractor shall, at his own expense, repair any damage to the roadbed or completed subgrade, including damage caused by his operations or use by public traffic.
- C. Except during periods of road closure, when allowed by the Special Provisions, a minimum of one traffic lane, not less than twelve feet in width, shall be open for use by public traffic. Public traffic may be permitted to use the shoulders and, if half-width construction methods are used, may also be permitted to use the side of the roadbed opposite to the one under construction. No additional compensation will be allowed for any shaping of shoulders or reshaping of subgrade necessary for the accommodation of public traffic thereon during subgrade preparation and paving operations.
- D. In order to expedite the passage of public traffic through or around the work and where ordered by the Engineer, the Contractor shall, at his own expense, furnish, install and maintain construction area signs, lights, flares, temporary railing (Type K), barricades, and other facilities for the sole convenience and direction of public traffic. Also, where directed by the Engineer, the Contractor shall furnish competent flaggers whose sole duties shall consist of directing the movement of public traffic through or around the work. When deemed necessary by the City, C18 "Road Construction Ahead" and C13 "End Construction" signs shall be furnished, installed and maintained by the Contractor at locations as directed by the Engineer at least 48 hours in advance of any construction.
- E. The Contractor shall, at his expense, furnish and place portable delineators and C31 "Low Shoulder" signs off of and adjacent to new surfacing which is opened to public traffic under either of the following conditions:
 1. Where the edge of the new surfacing is adjacent at existing unpaved shoulders, or

2. Where the new surfacing produces a drop-off of 0.15' or more at the edge of traveled way adjacent to existing paved shoulders.
- F. A portable delineator and a C31 sign shall be placed at the beginning of the drop-off in the direction of travel on the adjacent lane. Successive C31's shall be placed no more than 2,000 feet apart and portable delineators shall be placed no more than 200 feet apart on curves and 500 feet apart on tangents along the drop-off.
 - G. The portable delineators and C31 signs shall be maintained in place at each location until the drop-off is eliminated at that location until the project is accepted. Portable delineators and signs shall conform to the requirements in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications, except the signs may be set on temporary portable supports or on barricades.
 - H. Whenever traffic lanes are to be closed to public traffic, the Contractor shall close lanes as shown in the current Manual of Traffic Controls.

END OF SECTION

SECTION 01160

FIELD ENGINEERING

PART 1 GENERAL

1.1 DATUM

- A. Vertical and horizontal datum are based on the coordinates and benchmarks shown on the Drawings or as provided by Owner prior to the start of construction. The Contractor is to locate and protect Owner furnished control points prior to starting the Work and preserve control points during construction. The Contractor shall re-establish all control points disturbed by its operations at no cost to Owner.
- B. The Contractor shall establish other vertical and horizontal control from these Owner furnished reference points as required to properly layout and construct the Work. All connections shall be installed based on actual elevations of existing structures to which connections are made.
- C. The Contractor's layout shall be based upon existing structures and the vertical and horizontal datum established by the Owner.
- D. The Contractor shall be responsible for the preservation of all existing survey monuments or permanent bench marks. Any monuments or bench marks disturbed or destroyed by Contractor shall be referenced and replaced by a licensed land surveyor. A corner record or record of survey, as appropriate, shall be filed by the licensed land surveyor as required by the Land Surveyor's Act with the appropriate local government agencies.

1.2 QUALITY ASSURANCE

- A. The Contractor's Surveyor shall be a land surveyor registered in California or civil engineer qualified and licensed in California with at least five (5) years surveying experience of similar projects.
- B. Dimensions for all existing structures, piping, paving, and other nonstructural items are taken from the available information during the Owner's planning and design. The Contractor shall field verify all dimensions and conditions in advance of any construction in the area. Any discrepancy between the field survey by the Contractor and the information indicated in the Contract Documents shall be immediately brought to the

Engineers attention by written notification. In all questions arising as to proper location of lines and grades, the Engineer's decision will be final.

- C. Accuracy of the Contractor's stakes, alignments and grades may be periodically and randomly checked by the Engineer. If requested by Engineer, the Contractor shall supply field labor as required, at no extra charge to Owner, to aid and assist the Engineer in checking location and grades of the work as set by the Contractor. This shall include postponing parts of the Work affected by survey check, moving materials and equipment that interfere with a clear line of sight between horizontal control points and the construction work. The Contractor is not to assume that Engineer's check substitutes or complements the Contractor's required field quality control procedures.
- D. The Contractor's registered land surveyor to check the line and grade of the slab or footing concrete forms prior to the first slab or footing pour at each structure and building.

1.3 PROJECT SURVEY REQUIREMENTS

- A. As part of the bid price for the construction of the improvements the Contractor shall provide and be responsible for the layout of all work specified in the contract. The Contractor shall provide all necessary surveys, field staking, and positioning for the construction of all components at the proper alignment, elevations, grades, and positions, as indicated on the Drawings and as required for the proper operation and function.
- B. The Contractor shall establish a minimum of two (2) permanent bench marks on site referenced to data established by Owner's survey control points. Record permanent bench mark locations with horizontal and vertical data on Project Record Documents.
- C. The Contractor shall stake the work limits and right-of-way lines prior to the start of sitework.
- D. The Contractor shall lay out all work, including structures and pipelines, and shall be solely responsible for executing the Work in accordance with the lines and grades indicated on the Drawings.

1.4 SUBMITTALS

Contractor to furnish Engineer one copy of all land surveyor notes, calculations, sketches and drawings within 48 hours after completion of each survey task.

1.5 RECORD DOCUMENTS

The Contractor is to prepared, maintain and submit Record Documents as specified in Section 01700 – Contract Closeout. The Contractor's land surveyor is to affix his signature and registration number to applicable record drawings certifying the accuracy of lines and grades

shown.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 01170

TEMPORARY TRAFFIC DELINEATION

PART 1 GENERAL

1.1 GENERAL

The purpose of temporary traffic delineation is to provide temporary pavement markings to channelize traffic during construction and/or prior to placement of permanent striping and marking.

1.2 SUBMITTALS

See Section 01300.

PART 2 MATERIALS

2.1 TEMPORARY DELINEATION

Temporary delineation consists of reflective traffic tape applied in pieces not less than 6 inches long nor less than 4 inches wide, spaced no more than 20 feet apart on tangents and no more than 10 feet apart on curves.

PART 3 EXECUTION

3.1 APPLICATION

Immediately after construction or when directed by the Engineer, replace all obliterated pavement delineation with temporary delineation during the same work period, and in no case later than 6:00 p.m. following such work period. Apply reflective traffic line tape in accordance with the manufacturer's instructions. Temporary delineation must be the same color as the permanent delineation.

3.2 REMOVAL

Remove temporary delineation applied to asphalt concrete patches immediately prior to applying asphaltic emulsion tackcoat for asphalt concrete overlay.

3.3 CHANGES IN DELINEATION

A striping plan will be made available to the Contractor or a field directive will be issued when traffic delineation is to be modified by the Owner.

END OF SECTION

SECTION 01180

CONSTRUCTION AREAS SIGNS

PART 1 GENERAL

1.1 GENERAL

This section sets forth requirements concerning flagging, traffic handling equipment and devices.

1.2 CONSTRUCTION AREA SIGNS

Construction area signs shall be furnished, installed, maintained and removed when no longer required in accordance with the provisions in Section 12, "Construction Area Traffic Control Devices," of the Caltrans Standard Specifications and these special provisions.

Contractor shall install all construction signs, including those required by funding agencies. See Specification 00810.

1.3 CONTRACTOR'S RESPONSIBILITY

Attention is directed to the Manual of Traffic Contracts published by Caltrans. Nothing in this section is to be construed as to reduce the minimum standard of the Standard Specifications.

1.4 SUBMITTALS

In accordance with Section 01300.

PART 2 MATERIALS

2.1 REFLECTORS, ADHESIVE, SIGNS, RAILING AND OTHER HARDWARE AND EQUIPMENT

The contractor shall furnish reflectors, adhesive, signs, temporary "K" railing and other hardware and equipment as required by the Standard Specifications and State of California Manual of Traffic Controls.

2.2 REFLECTIVE SHEETING

Type IV reflective sheeting for sign panel for portable construction area signs shall conform to the requirements specified under "Prequalified and Tested Signing and Delineation Materials" elsewhere in these special provisions.

2.3 SUBSTRATES FOR STATIONARY MOUNTED SIGNS

Sign substrates for stationary mounted construction area signs may be fabricated from fiberglass reinforced plastic as specified under "Prequalified and Tested Signing and Delineation Materials" elsewhere in these special provisions.

PART 3 EXECUTION

3.1 MODIFICATIONS TO THE CALTRANS STANDARD SPECIFICATIONS:

- A. The first paragraph in Section 12-2.02, "Flagging Costs," of the Standard Specifications is amended to read:

The cost of furnishing all flaggers, including transporting flaggers, to provide for passage of public traffic through the work under the provisions in Section 7-1.08, "Public Convenience" and Section 7-1.09, "Public Safety," will be borne by the Contractor. The costs of placing and moving flagging signs and the cost of providing stands or towers for use of flaggers shall be considered as part of the cost of furnishing flaggers.

- B. The second sentence in the fourteenth paragraph of Section 12-3.08, "Temporary Railing (Type K)" of the Standard Specifications is amended to read:

Reflectors and adhesive shall be furnished by Contractor.

3.2 EXCAVATIONS

All excavations required to install construction area signs shall be performed by hand methods without the use of power equipment, except that power equipment may be used if it is determined that there are no utility facilities in the area of the proposed post holes.

END OF SECTION

SECTION 01200

PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

Section includes procedures for submitting applications for payment and means used as a basis for Progress Payments, including:

- A. Cost Summaries.
- B. Payment for Mobilization.
- C. Start-up.
- D. Demobilization.

1.2 RELATED SECTIONS

Section 01320: Schedule of Values.

1.3 BASIS FOR PROGRESS PAYMENTS

- A. Base Application for Payment on the breakdown of costs for each scheduled activity in the Progress Schedule and the Percentage of Completion for each activity.
- B. Generate Application for Payment by downloading cost data from the Progress Schedule to a spreadsheet type format. Identify each activity on the Progress Schedule that has a cost associated with it, the cost of each activity, the estimated Percent Complete for each activity, and the Value of Work Completed for both the payment period and job to date.
- C. A condition of the processing of Progress Payments shall be the satisfactory maintenance and final submittal of the Contractor's record documents, as determined by the Engineer.

1.4 COST SUMMARIES

- A. Prepare Summary of Cost Information for each subcategory of each Major Item of Work listed in the Schedule of Values. Identify the Value of Work Completed for both the payment period and job to date.
- B. Cash Flow Summary: Prepare cash flow summary, indicating total dollar amount of work planned for each month of the project. Equate sum of monthly amounts to Lump Sum contract price.

1.5 PAYMENT FOR MOBILIZATION

- A. Limit amounts included under Mobilization to the following items:
 - 1. Moving on the site any equipment required for first month operations.
 - 2. Installing temporary construction power and wiring.
 - 3. Establishing fire protection system.
 - 4. Developing construction water supply.
 - 5. Providing field office trailers complete with all specified furnishings and utility services including telephones.
 - 6. Providing on-site sanitary facilities and potable water facilities as specified.
 - 7. Arranging for and erection of Contractor's work and storage yard.
 - 8. Subcontractor insurance and bonds.
 - 9. Obtaining all required permits, licenses, and fees.
 - 10. Developing construction schedule.
 - 11. Provide and erect the project sign.
 - 12. Contractor bonds and insurance.
- B. Furnish data and documentation to substantiate the amounts claimed under mobilization.
- C. Limit price for mobilization to no more than 2 percent of Contract Price.

1.6 PAYMENT FOR START-UP AND DEMOBILIZATION

Prices for start-up and demobilization must total at least 1 percent of Contract Price.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.1 DESCRIPTION

Submittals covered by these requirements include manufacturers' information, shop drawings, test procedures, test results, samples, requests for substitutions, trench safety plan and miscellaneous work-related submittals. Submittals shall also include, but not be limited to, all mechanical, electrical and electronic equipment and systems, materials, reinforcing steel, fabricated items, detailed piping layout drawings, and conduit details. The Contractor shall furnish all drawings, specifications, descriptive data, certificates, samples, tests, methods, schedules, and manufacturer's installation and other instructions as specifically required in the contract documents to demonstrate fully that the materials and equipment to be furnished and the methods of work comply with the provisions and intent of the Contract Documents. All calculations and dimensions included in submittals shall be provided in English units.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 00481 – American Iron and Steel Requirements
- B. Section 01010 - General Construction Information and Requirements
- C. Section 01200 - Payment Procedures
- D. Section 01310 - Construction Schedule
- E. Section 01320 - Schedule of Values
- F. Section 01680 – Operation and Maintenance Manuals

1.3 SUBMITTAL PROCEDURE

- A. The Contractor shall prepare and submit to the Owner within two weeks after the date of the Preconstruction Conference a complete list of shop drawings and material submittals intended to be delivered. No payment will be made to the Contractor until this list is reviewed and found acceptable to the Owner and the Resident Engineer.
- B. At least 30 days prior to his need for approval the Contractor shall forward to the Engineer all submittals required by the individual sections of the specifications. Unless a different number is called for in the individual sections, submit five (5) copies of each shop drawing, five copies of all operation and maintenance manuals, and three specimens of each sample requested. Two (2) copies of each submittal will be returned to the Contractor, except all sample specimens will be retained by the Engineer.
 - 1. All submittals shall also be provided in an electronic format which includes all information included in the hard copies. Provide the electronic files on USB

flash drive. All text portions shall be provided in MS Word format, spreadsheets in Excel format, drawings in AutoCAD format, graphical portions shall in JPEG format, and all other documents including but not limited to brochures that need to be scanned shall be provided in a searchable PDF format.

- C. Identify all submittals including schedules and operation and maintenance manuals on the transmittal form as included in this Section. Obtain an electronic or original copy from the Engineer. Submittals must include submittal number, specification section, plan page reference number (where applicable), the supplier, etc. The Contractor shall also indicate under "Remarks", if the submittal is on the critical path and requires an expedited review. If the Contractor desires more than two copies of submittal documents, the Engineer's comments shall be transferred by the Contractor onto additional copies at no additional cost to the Owner.
- D. Submittals that are related to or affect each other shall be forwarded simultaneously as a package to facilitate coordinated review. Uncoordinated submittals will be rejected. Do not combine unrelated materials in the same submittal.
- E. The Engineer reserves the right to require submittals in addition to those called for in individual sections.
- F. The Contractor shall schedule submittals to avoid concentration of submittals in a short time period. Scheduling of submittals shall be included in the Contractor's Progress Schedule.
- G. Each major mechanical equipment, as detailed in specification Section 00436, submittal shall be bound in a three hole-punched binder, which is sized such that when all material is inserted, the binder is not over 3/4 full. Spiral ring type binders are not acceptable.
 - 1. Each binder shall be appropriately labeled on the front cover with the project name, Contract number, equipment supplier's name, specification section(s), and major material contained therein.
 - 2. An index shall be provided on the inside front cover. This index shall itemize the contents of each tab and subtab section. Also list the project name, Contract number, and equipment supplier's name, address, phone number, and contact person on the index page.
- H. If the Contractor submits shop drawings of equipment by manufacturers other than those listed in the specifications, he shall provide the following information with the submittal:
 - 1. The name and address of at least three companies or agencies who are currently using the equipment.
 - 2. The name and telephone number of at least one person at each of the above companies or agencies whom the Engineer may contact.
 - 3. A description of the equipment that was installed at the above locations. The description shall be in sufficient detail to allow the Engineer to compare it with the equipment that is proposed to be installed in this project.
 - 4. Refer to Engineer's approval (1.5, Part C).
- I. A copy of the specification section, and all referenced and applicable sections, with any addendum updates included, shall be submitted with each paragraph check-marked to

indicated specification compliance or marked to indicate requested deviations from specification requirements. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. The submittal shall be accompanied by a detailed, written justification for each deviation. Failure to include a copy for the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

- J. For each resubmittal, provide a copy of submittal comments and a separate letter, on company letterhead, identifying how each submittal comment has been addressed in the resubmittal.

1.4 AMERICAN IRON AND STEEL COMPLIANCE CERTIFICATION

- A. The iron and steel material manufacturers and equipment manufacturer shall certify in writing their understanding of and compliance with Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A - Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference, as described in Specification Section 00200. Manufacturer shall submit a signed copy of this compliance form to the owner or owner's agents with the submittal package. The example Manufacturer Certification can be found in Specification Section 00481.
- B. The Contractor shall certify in writing that all iron and steel products installed for this project by his/her company and by any and all subcontractors and manufacturers his/her company has contracted with for this project comply with Section 746 of Title VII of the Consolidated Appropriations Act of 2017 (Division A - Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference, or are the subject of a waiver approved by the Secretary of Agriculture or designee. The Contractor shall submit to the Engineer the Prime Contractor's Certification (sample provided in Specification 00481).

1.5 BUILD AMERICA BUY AMERICA (BABA)

- A. This Build America Buy America (BABA) provisions of the "Infrastructure Investment and Jobs Act" (IIJA; P.L.117-58) were waived for this Project.

1.6 SHOP DRAWINGS

- A. The term "shop drawings" includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the Contractor to explain in detail specific portions of the work required by the Contract. All dimensions shall be in English units.
- B. The Contractor shall coordinate all such drawings, and review them for legibility, accuracy, completeness, and compliance with contract requirements, and shall indicate his approval

thereon as evidence of such coordination and review. Shop drawings submitted to the Engineer without evidence of the Contractor's approval will be returned for resubmission.

- C. Approval by the Engineer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with requirements of this Contract, except with respect to variations described and approved in accordance with Paragraph D below.
- D. If shop drawings show variations from contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at time of submission. All such variations must be approved by the Engineer.

1.7 ENGINEER'S APPROVAL

- A. The Engineer will indicate his acceptance or disapproval of each submittal, and his reasons for disapproval.
 - 1. If no corrections are required, the copies will be returned marked "NO EXCEPTION NOTED (Confirm)" and work may begin immediately on incorporating the material and equipment covered by the submittal into the project.
 - 2. If limited corrections are required, the copies will be returned marked "NOTE MARKINGS (Confirm)". Work may begin immediately on incorporating the material and equipment covered by the corrected submittal into the project.
 - 3. If insufficient or incorrect data has been submitted, the copies will be returned marked "NOTE MARKINGS (Resubmit)". No work incorporating the material and equipment covered by this submittal into the project may begin until the submittal has been revised, resubmitted, and returned marked either "NO EXCEPTION NOTED (Confirm)" or "NOTE MARKINGS (Confirm)".
 - 4. If the submittal is unacceptable, the copies will be returned marked "REJECTED (Resubmit)". No work incorporating the material and equipment covered by this submittal into the project may begin until a new submittal has been made and returned marked either "NO EXCEPTION NOTED (Confirm)" or "NOTE MARKINGS (Confirm)".
 - 5. If the submittal was not reviewed by Engineer, the copies will be returned marked "NOT REVIEWED".
- B. The Contractor shall not change any drawing after it has been marked "NO EXCEPTION NOTED (Confirm)" or "NOTE MARKINGS (Confirm)", or change any approved equipment or material without written permission of the Engineer. The Contractor shall comply with all submittals as marked by the Engineer, to the extent applicable.
- C. If more than TWO submittals for a single item are required because of incorrect or insufficient data, or the submittal is unacceptable, or because the Contractor wishes to change previously approved material, then all costs incurred by the Owner for the additional review shall be deducted from monies due the Contractor.
- D. Review by Engineer is for the sole purpose of ascertaining general conformity with design. Contractor is responsible for dimensions, fabrication and construction methods,

coordination of sub-trades, detail design of components and errors or omissions on shop drawings.

1.8 OPERATION AND MAINTENANCE MANUALS

Manufacturer's printed instructions shall include installation instructions, operating instructions, schematics for electrical and hydraulic systems, maintenance literature, lubrication requirements, and parts lists. Refer to Section 01680, Operation and Maintenance Manuals, for specifics required for the operation and maintenance instructions.

1.9 CERTIFICATES

For those items called for in individual sections, furnish certificates from manufacturers, suppliers, or others certifying that materials or equipment being furnished under the Contract comply with the requirements of these specifications.

1.10 SAMPLES

Samples submitted for preference selection by the Owner or Engineer shall be of sufficient size to clearly illustrate functional characteristics and full range of color, texture, and pattern. A completed submittal review transmittal form must accompany each submitted sample.

1.11 CONSTRUCTION SCHEDULE

As soon as possible after receiving Notice of Award and before any work starts, submit four copies of a Construction Schedule in accordance with Section 01310 showing estimated starting and completion dates for each part of the work. The first progress payment will not be issued until the progress schedule is submitted and approved.

1.12 SCHEDULE OF VALUES

Submit a Schedule of Values (in dollars) in accordance with Section 01320 for the various portions of the work. The schedule shall be based on the Contract Bid Schedule or Bid Form and shall include all bid items. The approved Schedule of Values in conjunction with the approved Construction Schedule will be the basis of the monthly progress payments.

1.13 REVIEW OF SCHEDULES

Submit Schedule of Values and Construction Schedule as a package. Both the Progress Schedule and the Schedule of Values shall be subject to review by Engineer both for format and content.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

3.1 CONTRACTOR'S JOBSITE DRAWINGS

- A. Provide and maintain on the jobsite one complete set of prints of all drawings which form a part of the Contract. Immediately after each portion of the work is installed, indicate all deviations from the original design shown on the Contract Drawings either by additional sketches or ink thereon. Upon completion of the project, deliver this record set to the Engineer.
- B. A condition of the processing of Progress Payments shall be the satisfactory maintenance and final submittal of the Contractor's record documents, as determined by the Engineer. The Contractor prepared progress payment estimates shall include an initial block for the Contractor's representative and the Engineer to acknowledge the satisfactory maintenance of the documents.

Submittal Review Form

Project Name: San Juan Bautista Sanitary Sewer Force Main to Hollister

Contract No: 184031441

Submittal No:

Resubmittal Received

Submittal Title:

Spec. No:

Bid Item No.:

Contractor/Subcontractor

Routing Sequence	Date Received	Checked By	Date Sent	Number of Copies			
				Orig.	Prints	Email	Mfg.Lit.
XYZ Contractor							
XYZ - CM							
Stantec - Design Engineer							
XYZ - CM							
XYZ Contractor							

Submittal Compliance

- We have verified that the material or equipment contained in this submittal meets all the requirements specified or shown (no exceptions).

- We have verified that the material or equipment contained in this submittal meets all the requirements specified or shown, except for the following deviations (list deviations, attach separate sheet if necessary)

Contractor Remarks

Submittal Status

- A - NO EXCEPTIONS TAKEN**
- B - MAKE CORRECTIONS NOTED**
- C - AMEND AND RESUBMIT**
- D - REJECTED**

Engineer Remarks

REVIEW BY STANTEC IS FOR THE SOLE PURPOSE OF ASCERTAINING GENERAL CONFORMITY WITH DESIGN. CONTRACTOR IS RESPONSIBLE FOR DIMENSIONS, FABRICATION AND CONSTRUCTION METHODS, COORDINATION OF SUB-TRADES, DETAIL DESIGN OF COMPONENTS AND ERRORS OR OMISSIONS ON SHOP DRAWINGS.

Submittal Review Comments:
 1.
 2.
 3.

END OF SECTION

SECTION 01305

PROJECT MEETINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Project meetings and conferences are an important administration and communication requirement of all project participants. Meetings will address issues related to the Work, review and coordinate progress of the Work and other matters of common interest to project participants, and includes the following:
1. Preconstruction Conference
 2. Progress Meetings
 3. Progress Schedule and Progress Billing Methods
 4. Submittal Meetings
 5. Quality Assurance Meetings
 6. Pre-installation Meetings
 7. Post Construction Meetings
 8. Change Order Meetings
 9. Special Meetings
- B. Any time during the progress of the work, the Owner and the Resident Engineer shall have the authority to require the Contractor and any subcontractor, supplier, or service providers to participate in job-site conferences on matters which require immediate or special attention. Any notice of such conference shall be duly observed and complied with by the Contractor and subcontractors, suppliers, or service providers without extra cost to the Owner. Participation to be defined as via teleconference, video conference, or on-site conferences.
- C. This section describes the requirements for calling for and conducting meetings for the Work. Meeting and conference locations and qualified participants will be determined by the Engineer and the Contractor based on the meeting agenda topics.
- D. Minutes will be taken by the Contractor for the Pre-Construction Conference(s) and all Progress and Coordination Meetings hereinafter described. Copies of meeting minutes will

be distributed to all attendees within five (5) days after meeting. Attendees will have three (3) days to submit comments or additions to minutes received from Contractor. Minutes will constitute final documentation of meeting discussion topics, results and action items. Meetings may be recorded by the Resident Engineer for accuracy of meeting minutes.

- E. Representatives of entities participating in meetings shall be qualified and authorized to act on behalf of the entity each represents.

1.2 PRECONSTRUCTION CONFERENCE

- A. Within 20 days after the Contract Time starts to run, but before any Work at the site is started, the Resident Engineer will schedule a preconstruction conference and organizational meeting at a suitable conference room at the Owner's offices or other suitable location. More than one preconstruction conference may be required if the Owner and Contractor deem it is in the best interest of the project to do so. The Resident Engineer will preside at conference.
- B. Attending the Preconstruction Conference: Contractor's Project Manager, Contractor's Superintendent(s), Owner, Resident Engineer, Inspection staff, Design Engineer, Owner's subconsultants, representatives of utilities, major subcontractors and others involved in performance of the Work, and others necessary to agenda.
- C. The preconstruction conference will be held to establish a working understanding among the parties as to the Work, and to discuss the project schedule, procedures for handling shop drawings and other submittals, processing Applications for Payment, and maintaining required records.
- D. The Preconstruction conference agenda will include:
 - 1. Distribution of Contract Documents.
 - 2. Distribution and discussion of list of major subcontractors and suppliers.
 - 3. Proposed progress schedules and critical construction sequencing.
 - 4. Major equipment deliveries and priorities.
 - 5. Project coordination.
 - 6. Designation of responsible personnel.
 - 7. Procedures and Processing of:
 - a. Field decisions.
 - b. Proposal requests.
 - c. Submittals.
 - d. Change Orders.

- e. Applications for Payment.
 - f. Record Documents.
 - 8. Use of Premises:
 - a. Office, construction, and storage areas.
 - b. Owner's requirements.
 - 9. Construction facilities, controls, and construction aids.
 - 10. Temporary utilities.
 - 11. Safety and first aid procedures.
 - 12. Security procedures.
 - 13. Housekeeping procedures.
- E. The Contractor will record minutes of meeting and distribute copies of minutes within five (5) days of the meeting to participants and interested parties.

1.3 PROGRESS MEETINGS

- A. Regular progress meetings shall be conducted at least once a week in the Contractor or Engineer's field office or other mutually agreed upon place.
- B. Written notice and the proposed agenda shall be distributed to each anticipated participant of each meeting at least two (2) days before meeting.
- C. The Contractor's superintendent and subcontractors who are or are actively involved in the Work, or who are necessary to agenda shall attend.
- D. The Owner, Engineer, other Owner's Representatives, representation of the Agency, and others necessary to agenda will attend.
- E. The Contractor shall complete and bring the current Application for Payment, marked up record drawings, and Progress Schedule to each meeting.
- F. The Contractor shall preside at meetings.
- G. The purpose of Progress Meetings is to:
 - 1. Expedite work of subcontractors or other organizations that are not meeting scheduled progress, resolve conflicts, and coordinate and expedite execution of the Work.

2. Review progress of the Work, Progress Schedule, narrative report, Application for Payment, record documents, and additional items of current interest that are pertinent to execution of the Work.
 3. Verify:
 - a. Actual start and finish dates of completed activities since last progress meeting.
 - b. Durations and progress of activities not completed.
 - c. Reason, time, and cost data for Change Order Work that will be incorporated into Progress Schedule and application for payment.
 - d. Percentage completion of items on Application for Payment.
 - e. Reasons for required revisions to Progress Schedule and their effect on Contract Time and Contract Price.
 4. Discuss potential problems which may impede scheduled progress and corrective measures.
- H. Contractor will record minutes of meeting and distribute copies within five (5) days of meeting to participants and interested parties.

1.4 PROGRESS SCHEDULE AND PROGRESS BILLING MEETINGS

- A. Each month the Contractor shall attend a progress schedule and progress payment meeting with the Resident Engineer. At this meeting, the Resident Engineer and Contractor are to review the percentage of the work completed and establish an amount to be requested in the Application for Payment. The meeting date shall be scheduled in accordance with the Owner's deadline for submittal of Progress Pay Estimates. Following review of the proposed billing, the Contractor will prepare an Application of Payment and submit to the Resident Engineer for final review and processing.
- B. These meetings will also discuss time impact evaluations for change orders and time extension requests, actual and anticipated schedule activity sequence/duration changes, and Contractor delays. These meetings are considered a critical component of the overall monthly schedule update submittal and Contractor shall have appropriate personnel attend.
- C. The Resident Engineer can also call for special progress schedule meetings should there be schedule revisions that necessitate such a meeting.

1.5 SUBMITTAL MEETINGS

When required in the individual technical specification, or if requested by the Contractor or the Resident Engineer, a meeting regarding a required submittal will be held to facilitate the timeliness of the submittal preparation and review process. This meeting will convene at a

mutually agreeable place. The party responsible for preparing the submittal shall be in attendance along with the Engineer.

1.6 QUALITY ASSURANCE MEETINGS

The Contractor or the Resident Engineer may request a meeting prior to the start of a particular phase of the project to discuss how the Work shall be accomplished in accordance with the quality requirements of the contract documents, codes, permits and industry standards. All required inspection and testing applicable to this phase of the project will be discussed in detail. The Contractor shall require that all management and quality control personnel employed by the Contractor for this phase of the project are in attendance. Quality assurance meetings might be requested for such phases of the project as site work, concrete, piping, mechanical, specialty subtrades and electrical/instrumentation.

1.7 PRE-INSTALLATION MEETINGS

- A. General: The Contractor shall meet with manufacturers and installers of major units of construction which require coordination between subcontractors. Major units of construction which require pre-installation meetings will be identified at the Progress Meetings.
- B. Meeting Requirements: The Contractor shall:
 - 1. Require attendance of Superintendent, appropriate manufacturers and installers of major units of constructions, and affected subcontractors.
 - 2. Invite Owner, Engineer, and Agency.
 - 3. Preside at meetings.
 - 4. Conduct meetings in Contractor's field office or other mutually agreed upon place.
 - 5. Distribute to each anticipated participant written notice and agenda of each meeting at least four (4) days before meeting.
 - 6. Schedule meeting at least seven (7) days in advance of installation.
- C. The Contractor shall record minutes of meeting and distribute copies of minutes within five (5) days of meeting to participants and interested parties.

1.8 POST CONSTRUCTION MEETING

- A. General: The Contractor shall meet with and inspect the Work eleven (11) months after date of Substantial Completion with Owner, Engineer, and Agency.
- B. Meeting Requirements: The Contractor shall

1. Arrange meeting at least fourteen (14) days before meeting.
2. Meet in Owner's office or other mutually agreed upon place.
3. Inspect the Work and draft list of items to be completed or corrected.
4. Require attendance of Superintendent, appropriate manufacturers and installers of major units of constructions, and affected subcontractors.
5. Review service and maintenance contracts, and follow-up with appropriate corrective action when necessary.
6. After meetings, complete or correct defective work and extend correction period accordingly.

1.9 CHANGE ORDER MEETINGS

- A. Periodic meetings will be held as needed for the purpose of agreeing on change order costs, reviewing quotation requests, and for reviewing time and expense records if necessary.
- B. The Resident Engineer shall preside at meetings.
- C. The Contractor, Owner, Engineer, other Owner's Representatives, Representatives of the Agency, and other necessary shall attend.

1.10 SPECIAL MEETINGS

Any time during progress of the Work, the Owner and the Resident Engineer shall have the authority to require the Contractor and any subcontractor, suppliers, or service providers to attend job-site conferences on matters which require immediate or special attention. Any notice of such conference shall be duly observed and complied with by the Contractor and subcontractors, suppliers, or service providers without extra cost to Owner.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 01310

PROGRESS SCHEDULES AND REPORTS

PART 1 GENERAL

1.1 DESCRIPTION

- A. The Progress Schedule for this Project will also be referred to as the Critical Path Method (CPM) Schedule. A CPM network schedule is a graphical depiction of the Contractor's construction plan, showing the sequential activities necessary to complete the Work within the specified contract times and constraints. The CPM network schedule for this project shall depict events and tasks as activities, showing their interrelationships, and shall identify the progress required for each activity before subsequent activities can start. Activities shall be logically presented in a network showing the activities' interrelationships chronologically. Because each activity has an assigned duration, the completed network shall show the critical path of activities that must be completed on time to ensure timely project completion. The earliest and latest start and finish times for each activity shall also be shown. The CPM network shall be comprehensive and shall include all interdependencies and interactions required to perform the Work.
- B. The construction schedules and accompanying reports outlined in this section are important to the Owner as they budget, plan and administer the project. The Owner and Engineer will regularly analyze the most current progress schedule during construction to monitor progress status of the project relative to contract times. The Schedule Updates and Weekly Schedules will be an agenda item at all project coordination meetings as project participants work together in prioritizing their respective tasks and action items to efficiently perform their duties.
- C. The Time Impact Analyses are very important submittals to the Engineer and Owner as they evaluate activity durations and the relationships between activities before deciding on possible changes to the contract time and/or viable options to mitigate time impacts.
- D. By submitting a bid for this Project, the Contractor represents to the Owner that Contractor will have included all costs within its Total Bid Price to fully comply with all scheduling and reporting requirements hereinafter prescribed in this Section.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

3.1 RESPONSIBLE SCHEDULING PERSON

- A. The Contractor shall designate, in writing within five (5) calendar days after Notice of Award the person responsible for preparation, maintenance, updating and revision of all schedules required in this Section.
- B. The qualifications of this Responsible Scheduling Person shall include:
 - 1. Capable of understanding this project scheduling specification and producing a schedule and reports to the standards defined in this specification.
 - 2. Five (5) years verifiable experience in preparation of complex construction schedules for projects of similar value, size and complexity.
 - 3. Must be very proficient in the use of CPM scheduling utilizing Primavera Project Planner (P6) scheduling software version 6.1 or later.
- C. The Contractor shall provide references of three (3) project Owners who have personal experience with this scheduler on previous projects. References shall include current contact information (telephone and/or email) for Owner to verify the qualifications of the proposed responsible scheduling person.
- D. Contractor's Responsible Scheduling Person shall be available on-site as needed and have authority to act on behalf of the Contractor. All scheduling software and hardware shall be located on-site. Scheduler shall attend project meetings as called for by the Engineer for proper explanation of all schedule updates.
- E. In the event the Contractor does not have an employee with the required scheduling qualifications, as determined by the Engineer, the Contractor will be required to employ a qualified CPM scheduling consultant who regularly performs these services and who in the opinion of the Engineer possesses the required scheduling qualifications and availability to perform the CPM scheduling for this Project.
- F. Engineer reserves the right to remove scheduler from the project if found to be incompetent.

3.2 SCHEDULING FORMAT AND SOFTWARE

- A. Schedule Format: Utilize critical path method (CPM) format.

- B. Prepare computerized schedules utilizing Primavera Contractor or Primavera P6 scheduling software or later versions compatible with Windows 10. The Contractor shall provide four (4) licensed copies of the scheduling software program used to produce the Contractor's Schedule to the Engineer, registered in the Engineer's name. This licensed copy must be provided no later than five (5) days after the Notice to Proceed date.

3.3 PRECONSTRUCTION SCHEDULING MEETING AND PREPARATION

- A. The Engineer will conduct a Preconstruction Scheduling Meeting with Contractor's Project Manager and Responsible Scheduling Person within five days (5) calendar days after approval of the Contractor's designated Scheduler. This meeting is separate from the Preconstruction Conference Meeting and is intended to only cover schedule requirements for this project. These requirements would include formatting, color coding, activity detail, coding structure, calendar requirements, reporting requirements, updates, revisions, and schedule delay analysis.
- B. Contractor shall present their schedule methodology, planned sequence of operations and proposed activity coding structure. The coding structure shall, at a minimum, include code fields for Project Segment or Phase, Area of Work, Type of Work, Submittal/Procurement/Construction and Responsibilities (this would include all subcontractors). The activity code structure shall be sufficient to allow future sorting and/or grouping by responsibility or subcontractor, area/location, CSI division, milestones and change orders. This will allow the "rollup" of the activities in the form of a Summary Schedule.
- C. During preparation of the Preliminary and Baseline Schedules, the Engineer will facilitate Contractor's efforts by being available to answer questions regarding sequencing issues, scheduling constraints, interface points, and dependency relationships.

3.4 PRELIMINARY PROGRESS SCHEDULE

- A. Within ten (10) business days after receipt of Notice to Proceed or Preconstruction Conference, whichever occurs first, the Contractor shall submit a Preliminary Progress Schedule in the form of time scaled logic diagram and a bar chart which shows the Contractor's intention to execute the Work within the specified contract times and constraints. The Preliminary Progress Schedule shall cover the following project phases and activities:
 - 1. Procurement and Submittals, including shop drawings and fabrication and delivery of key and long lead time procurement items. The Contractor's submittal information shall show intended submittal dates and shall include, as a minimum, the maximum allowable review period as specified as a separate predecessor activity.
 - 2. The information shall provide sufficient durations for administration, fabrication and transportation to produce realistic delivery dates for the procurement items.

3. All activities planned for the first ninety (90) days in the execution of the Work.
 4. The approach to scheduling the remaining activities or phases of the Work shall be represented by at least one summary activity for each major phase or activity. The total duration of the summary activities shall equal the Contract Time.
 5. Approximate duration for each summary activity representing the Contractor's best estimate for the work the summary activity represents.
 6. Weather days.
- B. The Contractor shall produce and provide four (4) complete sets of each of time scaled logic diagram and bar charts in color on 22-inch by 34-inch sheets and one electronic copy on a USB Flash Drive with data in P6 format.
 - C. The Preliminary Progress Schedule shall describe the activities to be accomplished and their dependency subject to all requirements under these Construction Schedule provisions, as appropriate. The Preliminary Progress Schedule will be used temporarily to record and monitor the progress of the Work until the Baseline Schedule, specified hereinafter, has been completely developed and favorably reviewed. Recorded data on the Preliminary Progress Schedule shall be incorporated into the Baseline Schedule during the first schedule update.
 - D. The Engineer shall review the Preliminary Progress Schedule and provide any comments, provide favorable review of the Preliminary Progress Schedule, or request a meeting to review the Preliminary Progress Schedule with the Contractor within ten (10) days of receipt of the schedule. If requested, the Contractor shall participate in a review and evaluation of the schedule with the Engineer. Any revisions necessary as a result of this review shall be resubmitted for review by the Engineer within five (5) days.
 - E. No progress payments will be made prior to submission and acceptance of the CPM Preliminary Schedule by the Engineer.
 - F. The Preliminary Progress Schedule shall be updated as required by Engineer until the Baseline Schedule, specified hereinafter, has been accepted.

3.5 BASELINE SCHEDULE SUBMITTAL

- A. The Contractor shall submit an acceptable Critical Path Method (CPM) Baseline Schedule to the Engineer within fifteen (15) days after the receipt of Engineer's comments on the Preliminary Progress Schedule. Subsequent revisions to Baseline Schedule shall be submitted as set forth hereinafter.
- B. The Contractor shall produce and provide four (4) complete set each of time-scaled network logic diagrams and bar charts in color on 22-inch by 34-inch sheets and one electronic copy on a USB Flash Drive with data in P6 format. The network logic diagram

shall be clear and legible. Critical activities shall be indicated in red color on both schedules.

- C. The Contractor shall include with the Baseline Schedule Submittal a signed statement from each Subcontractor listed on the Contractor's Bid Form Section 00434 – List of Subcontractors, which confirms they have evaluated the Contractor's Baseline Schedule and agree that the Baseline Schedule accurately depicts the quantity, logic and durations for all activities assigned to their company.
- D. The Engineer shall review the schedule and provide any comments, its favorable review of the schedule, or request a meeting to review the schedule with the Contractor within fifteen (15) days of receipt of the schedule. If requested, the Contractor shall participate in a review and evaluation of the proposed network diagrams and analysis by the Engineer. Any revisions necessary as a result of this review shall be resubmitted for review by the Engineer within ten (10) days. When completed, the favorably reviewed schedule shall then be the schedule to be used by the Contractor for planning, organizing, and directing the work, and for reporting progress. If the Contractor thereafter desires to make significant changes in its method of operating and scheduling, the Contractor shall notify the Engineer in writing stating the reasons for the change.
- E. No more than two (2) progress payments will be made prior to submission and acceptance of the CPM Baseline Schedule by the Engineer.
- F. Failure to include an activity required for execution of the Work does not excuse Contractor from completing the Work and portions thereof within specified contract times and contract price. Failure of Contractor to include required schedule constraints, sequences or milestones in schedule shall not relieve Contractor of obligation to conform to requirements of Contract. Acceptance of schedule shall not waive Contract requirements. In event of conflict between accepted schedule and Contract requirements, terms of Contract shall govern at all times, unless requirements are waived in writing by the Owner.
- G. Contractor shall not unilaterally change the accepted Baseline Schedule without the prior written notification to and acceptance and consent of the Engineer, excepting only the reporting of Actual Start, Actual Finish, and Activity Progress. The accepted Baseline Schedule shall be used for comparison with the current updated schedule, and possible revised schedules, during the Contract.

3.6 BASELINE SCHEDULE REQUIREMENTS

- A. The Contractor's proposed CPM Baseline Schedule and all updates or revisions thereto, shall meet the following requirements:
 - 1. Schedule and Project Completion: The Baseline Schedule and all updates or revisions shall show completion of the project within the required contract times and constraints on the Work. Failure to do so may result in the Owner terminating for cause under Section 00700, Article 15 – Suspension of Work and Termination.

2. If the Contractor's schedule is based on less time than the maximum time allowed for milestone(s) or Contract completion no compensation for extended overhead expenses will be considered until the expiration of the entire time periods provided for in the Contract as adjusted by any time extensions granted other than compensable time extensions. In such case refer to Section 00700.- General Conditions, for further provisions on the reimbursement of overhead expenses.
 3. Acceptance of the Contractor's Base CPM Schedule, monthly updates or revised schedule, when based on less time than the maximum time allowed for milestone(s) or Contract completion does not serve to change any Contract duration, nor serve as a waiver of the Contractor's nor the Owner's right to utilize the full amount of time specified in the Contract, unless so modified in a Contract Change Order.
- B. Schedule Logic: Schedule shall be assembled to show order in which Contractor proposes to carry out Work, indicate restrictions of access, availability of Work areas, and availability and use of manpower, materials and equipment. The Contractor shall indicate all dependencies and logic between activities so that it may be established what effect the progress of any one activity has on the schedule. The following criteria shall form basis for assembly of schedule logic.
1. Which activities must be completed before subsequent activities can be started?
 2. Which activities can be performed concurrently?
 3. Which activities must be started immediately following completed activities?
 4. What major facility, equipment or manpower restrictions are required for sequencing these activities?
- C. Resource Loading: Contractor shall input manpower and equipment data on each schedule activity. Manpower data shall consist of the manhours estimated to perform each task, categorized by trade. Equipment data shall consist of equipment hours estimated to perform each task, categorized by piece of equipment. Resource loading shall reflect a reasonable plan for accomplishing Work. Individual activities may be sequenced within limits of available float. Critical or near critical paths resulting from use of manpower or equipment restraints shall be kept to a minimum. Near critical path identified as path with five (5) or less working days of float. The Engineer will not review the resources as these shall be deemed to be within the Contractor's means and methods of work. The Contractor shall determine and allocate the proper resources to complete the Project by the specified Contract completion date.
- D. After the Baseline Schedule is accepted by the Engineer, Contractor is to submit a schedule histogram depicting total craft manpower for Contractor's own labor forces and those of each subcontractor. This manpower schedule shall be submitted electronically on a USB Flash Drive with one paper copy.
- E. Network Activities: The selection and number of detailed network activities shall be subject to favorable review by the Engineer and shall meet the following requirements:

1. All Work activities should be of sufficient detail to ensure adequate planning and execution of the Work and such that schedules provide an appropriate basis for monitoring and evaluating the progress of the Work. A work activity is defined as a single task that requires time and resources (manpower, equipment and/or material) to complete in a continuous operation, excluding submittal activities, review/acceptance activities, and fabrication/procurement activities. Durations for on-site work activities shall be in working days and shall not exceed ten (10) workdays. Passive on-site activities such as curing and testing periods can be in calendar days if desired by Contractor. All such passive on-site activities shall be included in the Contractor's schedule and durations should be as specified in the Contract Documents.
 2. The submittal and approval of samples and equipment, fabrication of special material and equipment and their installation and testing. Should the Contractor expect multiple submittals and deliveries for materials or equipment from the same supplier, the Contractor shall show each planned submittal and delivery and the logic to the respective on-site Work activity(s).
 3. The critical path shall be shown on all reports and on the graphic network logic diagram. The activities which constitute the critical path shall be identified.
 4. Progress milestone events or other significant stages of completion, as defined in Section 00800 – Supplementary Conditions, and Section 01020 – Work Constraints and Sequence of Construction. System shutdown and tie-in dates must be specifically and conspicuously identified and included on the schedule.
 5. The lead time required for testing, inspection and other procedures required prior to acceptance of the work. All witnessed factory tests shall be shown as individual activities.
 6. The activity numbers shall be grouped by responsibility, phases, milestones, work area, trade and subcontractor to provide logical summary activities.
 7. All activities of the Owner and the Engineer that affect progress along with required contract dates for completion of all parts of the work.
 8. All activities of utilities, regulatory agencies and permitting agencies.
 9. All mobilization and demobilization activities, including temporary controls.
 10. Schedule shall show all hydraulic testing of structures, pipe testing, field testing, training and demonstration periods as required. Field testing and training activities should be broken down to reflect all individual system and equipment components.
 11. Float shall not be an activity unless approved by the Engineer.
- F. Network Logic Diagram: The graphic network diagram shall include for each activity, the description, activity number, the estimated duration in workdays, and all activity relationship lines. The network diagram shall be drawn for the early start and early finish of all activities. The diagrams shall show elements of the project in detail and an entire project summary. Diagrams shall show the order and interdependence of all activities and sequence in which the work is to be accomplished as planned by the Contractor and its

subcontractors. The basic concept of a network analysis diagram shall be followed to show how the start of a given activity is dependent on the completion of preceding activities and its completion restricts the start of following activities. The Primavera layout of the network logic diagrams shall be time-scaled and show the following as a minimum:

1. Activity numbers and description
2. Activity duration and total float
3. Critical path, highlighted in red color
4. Relationships between activities and lag times, if any
5. Start, completion and milestone dates

G. Primavera Bar Chart: The Primavera layout of the bar chart shall show the following as a minimum:

1. Activity description
2. Early-start-early-finish, duration and total float time of activities
3. Critical path, highlighted in red color
4. Percent complete on bar, highlighted in blue color
5. Relationships between activities and lag times, if any
6. Start, completion and milestone dates

H. The layout of the columns, printed on left hand side of bar chart, shall include the following as a minimum:

1. Activity ID Number
2. Activity Description
3. Original Duration
4. Remaining Duration
5. Early Start, Early Finish, Late Start and Late Finish dates
6. Percent Complete
7. Current Total Float
8. Change in Float since Original Baseline
9. Change in Float since previous update.

I. Float – “Total Float” or “Float” shall be defined as the difference between the early finish and late finish dates for an activity. On the CPM Schedule delineate the specified Contract duration and identify the planned completion of the Work as the final finish milestone. The time period between these two dates, if any, shall be considered float. Float in any activity,

milestone completion date or Contract completion date shall be considered a resource available to both the Owner and the Contractor. Neither the Owner nor the Contractor has ownership of the float.

- J. The parties agree that float, as properly shown on the baseline schedule and all updates thereto, is not for the exclusive benefit of either party. Consequently, either party may, without liability to the other for actual or liquidated damages for delay, delay a schedule activity provided that such delay shall not cause the float of the affected activity to become negative. If the float of the activity is already negative, as shown on the most recent schedule update, either party may delay such activity, without liability to the other for actual or liquidated damages for delay, provided that such delay shall not cause the negative float of the delayed activity to exceed the negative float of all other schedule activities. If the project has interim milestones with separate liquidated damages, only delays by the Owner to the Project Critical Path shall potentially entitle the Contractor to extended overhead costs and only subject to the limitations of Section 00700 – General Conditions.
- K. Pursuant to these float sharing requirements, use of float suppression techniques such as preferential sequencing or logic, special lead or lag logic restraints, extended activity duration's or imposed dates shall be cause for rejection of any schedule submittal.
- L. Owner-furnished Equipment or Materials (If Applicable): Immediately after Award of Contract, Contractor shall obtain from Engineer anticipated delivery dates of Owner-furnished equipment or materials if they are not already specified in the Contract Documents. These dates shall be shown on Baseline Construction Schedule in same manner indicated by Engineer.
- M. Baseline Tabular Report: The Baseline Schedule submission should include a tabular report of all activities grouped by Area, Phases (as may be applicable), and sorted by early start, then total float, then early finish. For each activity, the following information shall be provided: 1) Activity ID and Description; 2) Original Duration; 3) Total Float; 4) Early/Late Starts and Finishes; and 5) Responsibility. This report should also include a project calendar indicating all non-working periods and an Activity Code dictionary which identifies all code values and code titles used.

3.7 WEATHER CONDITIONS AND WEATHER DAY ALLOWANCE

- A. Seasonal weather conditions shall be considered in the planning and scheduling of work activity durations influenced by high or low ambient temperatures or precipitation to ensure the completion of the Work within the Contract Time. No time extensions will be granted for the Contractor's failure to take into account such weather conditions for the location of the Work and for the period of time in which the Work is to be accomplished.
- B. The expected loss of working days specified in the Supplementary General Conditions, Weather Days, shall be included in a separate identifiable critical activity labeled "Weather Days Allowance" to be included as the last critical activity of the project schedule. When

weather days are experienced, and are approved as such by the Engineer, the Contractor shall either:

- C. Increase the duration of the current critical activity(ies) by the number of weather days experienced, or
- D. Add a critical activity to the schedule to reflect the occurrence of the weather day(s).
- E. The duration of the weather day allowance activity shall be reduced as weather days are experienced and included in the schedule. Any remaining weather days in the weather day allowance activity at the completion of the project shall be considered as float and shall not be for the exclusive use or benefit of either the Owner or Contractor.

3.8 UPDATING THE BASELINE SCHEDULE

- A. Contractor shall update the Baseline Schedule on a monthly basis (or at shorter intervals if deemed necessary by Engineer to identify corrections necessary, such as work activities fifteen (15) days or more behind schedule) for the purpose of recording and monitoring the progress of the work. The Updated Baseline Schedule shall incorporate changes mutually agreed upon by Contractor and Engineer during preceding periodic reviews and changes resulting from approved Change Orders and Field Orders.
- B. The Contractor shall produce and provide four (4) complete sets each of time-scaled network logic diagrams and bar charts in color on 22-inch by 34-inch sheets and one electronic copy on a USB Flash Drive with data in P6 format. The network logic diagram shall be clear and legible. Critical activities shall be indicated in red color on both schedules.
- C. Tabular Reports: Each Updated and Revised Schedule shall include a separate report that provides a comparative analysis between updated or revised schedule and previously accepted schedule submitted to Engineer. This report shall be provided electronically on a USB Flash Drive in Microsoft Word and also one paper copy and shall include the following information:
 - 1. List of all Activities deleted since last schedule update.
 - 2. List of all Activities added since last schedule update.
 - 3. List of all Activities with any changes in original duration since last schedule update.
 - 4. List of all changes in percent completes for each activity since last schedule update.
 - 5. List of all Activities who should have begun since last schedule update and did not.
 - 6. List of all Activities that should have completed since last schedule update and did not.
 - 7. List of all changes in activity Total Floats since last schedule update.

8. List of all changes in activity Free Floats since last schedule update.
 9. List of any activity description or number changes since last schedule update.
 10. List of all activity relationship changes, additions or deletions since last schedule update.
 11. List of all changes to any schedule constraints since last schedule update.
- D. This report shall also include a narrative explaining any significant updates or revisions inputted in the schedule since last schedule update, current or anticipated problems affecting the progress of Work, impact of these problems and the measures taken to mitigate impact.
- E. The Owner will not make monthly progress payments to the Contractor until the Engineer has received and accepted all schedule updates and reports as herein specified. The Contractor should submit schedule updates and reports to Engineer at least five (5) days before Contractor's submission of its request for progress payment for same monthly period.

3.9 SCHEDULE REVISIONS

The conditions under which the Engineer may require revisions of the Construction Schedule include the following:

- A. When delay in completion of any work item or sequence of work items results in an estimated extension of project completion by either fifteen (15) working days or by five percent (5%) of the remaining duration of time to complete the Contract, whichever is less. This slippage duration may be reduced further for any contract time that is a critical fixed completion date which must be met.
- B. When delays in submittals or deliveries make re-planning or re-scheduling of the work necessary.
- C. When the schedule does not represent actual prosecution and progress of the work.
- D. When any change to the sequence of activities, the completion date for major portions of the work, or changes occur which affect the critical path.
- E. When Contract modification necessitates schedule revision.

3.10 WEEKLY SCHEDULE

- A. Submit to Engineer, on the last working day of every week, a progress schedule showing the activities completed during the previous week and the Contractor's schedule of activities for the following three (3) weeks.

- B. The Weekly Schedule may be a CPM schedule or a bar chart but shall utilize the logic and conform to the status of the current progress schedule. In the event that the Weekly Schedule no longer conforms to the current schedule Contractor may be required to revise the schedule in accordance with Article, "Revisions to Schedule".
- C. The activity designations used in the Weekly Schedule shall be consistent with those used in the Baseline Schedule and the monthly Schedule Updates.
- D. The format of the Weekly Schedule shall be as agreed upon between the Contractor and the Engineer.

3.11 TIME IMPACT ANALYSIS

- A. When change orders are initiated, delays are experienced, or the Contractor desires to revise the schedule logic, the Contractor shall submit to the Engineer a written Time Impact Analysis illustrating the influence of each change, delay, or Contractor request on the current contract schedule completion date. Each Time Impact Analysis shall include an analysis demonstrating how the Contractor proposes to incorporate the change order, delay, or Contractor request into the Schedule. The analysis shall demonstrate the time impact based on the date of occurrence of the change, delay or revision; the status of construction at that point in time; and the impact of all affected activities.
- B. Activity time delays will not automatically mean that an extension of Contract Time is warranted or due the Contractor.
- C. It is possible that a strike or contract modification will not affect existing critical activities or cause non-critical activities to become critical, i.e., a strike or modification may result in only absorbing a part of the available total float that may exist within an activity chain of the network, thereby not causing any effect on the Contract completion date or time.
- D. The Contractor acknowledges and agrees that mitigation for delays due to changes, differing site conditions, and other causes will require revision of preferential sequences of the Work before proposing an updated schedule which supports a delay to the Project as a whole. When a delay to the Project as a whole can be avoided by revising preferential sequencing, and the Contractor chooses not to implement the revisions, the Contractor will be entitled to a time extension but is not entitled to compensation for extended overhead.
- E. Float or slack shall not be for the exclusive use or benefit of the Owner or the Contractor. Extensions of time for performance will be granted only to the extent that the equitable time adjustments for the activity or activities affected exceeds the total float along the activity chain involved at the time the change was ordered or the delay occurred.
- F. Time Impact Analyses shall be submitted in triplicate and within fifteen (15) days after a delay occurs or with the Contractor's cost proposal in response to a notice of change from the Engineer. In cases where the Contractor does not submit a Time Impact Analysis for a

specific change order, delay, or Contractor request within the specified period of time, then it is mutually agreed that the particular change order, delay, or Contractor request has no time impact on the Contract completion date and no time extension is required.

- G. Approval or rejection of Time Impact Analyses by the Engineer and the Owner will be made within fifteen (15) days after receipt of the Time Impact Analysis unless subsequent meetings and negotiations are necessary.
- H. Upon approval, a copy of the Time Impact Analysis signed by the Engineer and Owner will be returned to the Contractor.
- I. Upon mutual agreement by both parties, schedule revisions illustrating the influence of change orders, delays, and/or Contractor requests will be incorporated into the next schedule update.

3.12 RESPONSIBILITY FOR COMPLETION

Contractor agrees that at the sole judgment of Engineer, whenever it becomes apparent from the current monthly Updated Contract Baseline Schedule that the contract completion date and/or any milestone dates will not be met, Contractor will take the appropriate following actions, acceptable to Engineer, at no additional cost to Owner:

- A. Increase construction labor in such quantities and crafts as will substantially eliminate, in the judgment of Engineer, the backlog of work.
- B. Increase the number of working hours per shift, shifts per working day, working days per week, or the amount of construction equipment, or any combination of the foregoing, sufficiently to substantially eliminate, in the judgment of Engineer, the backlog of work. This paragraph shall not be construed to allow work outside the allowable hours and days specified in the Contract Documents.
- C. Reschedule activities to achieve maximum practical concurrence of completion of activities.

3.13 FINAL SCHEDULE SUBMITTAL

- A. As a condition precedent to the release of retainage the final Schedule Update shall be identified by the Contractor as the As-Built Schedule.
- B. The As-Built Schedule shall reflect the exact manner in which the project was constructed by reflecting actual start and completion dates for all activities accomplished on the project.

- C. The As-Built Schedule shall be signed and certified by the Contractor's Project Manager and Responsible Scheduler as being an accurate record of the way in which the project was actually constructed.

3.14 CONTRACTOR'S DAILY REPORTS

The Contractor shall maintain daily job reports recording all significant activity on the project, including number of workers on site, active construction equipment used, notable deliveries, work activities, delays, interruptions or any problems encountered. The Contractor shall use the daily reports to record this information and submit this form to the Engineer no later than the following morning for the previous work day. If there is no work performed on any given day, the Contractor shall note the reasons for no work and submit a daily report to the Engineer on those days also. Failure to stay current with daily reporting will be just cause for the Owner not processing a progress payment until reports are submitted.

END OF SECTION

SECTION 01320

SCHEDULE OF VALUES

PART 1 GENERAL

1.1 SUMMARY

This section includes the requirements for the preparation, format, and submittal of Schedule of Values. The Schedule of Values cost breakdown will be subject to the approval of the Engineer, and upon request, the Contractor shall substantiate the price for any or all items and provide additional level of detail, including quantities of work. The cost breakdown shall be sufficiently detailed to permit its use by the Engineer as one of the bases for evaluating requests for payments (unless otherwise approved by the Engineer, no single line item shall be greater than \$50,000, with the exception of major equipment procurement). The Engineer shall be the sole judge of the adequacy of the cost breakdown.

The Schedule of Values shall be solely used to determine progress payments. The cost breakdown shall not be considered in determining payment or credit for additional or deleted work.

The cost breakdown shall be generally in the same format as the Contract specifications divisions and subdivisions, with major items of work listed individually. The cost breakdown shall be by structure, civil, landscaping, or other logical division of work. The cost breakdown for architectural, structural, mechanical, and electrical work shall include separate items for identifiable portions of the structures. The cost breakdown shall include separate costs for any testing, startup and training required. Measurable approximate quantities of work performed by the Contractor or its subcontractors shall be provided. For quantities that are the sum total of several individual quantities, backup summaries shall be provided which list the individual descriptions and quantities. These summaries then will be used to determine the quantities of work in place in subsequent progress payment requests.

The above is a statement of the intent of the Contract Documents to provide a high level of detail, acceptable to the Engineer to allow a fair and reasonable estimate to be made of the value of work installed. The detail of the cost breakdown must be sufficient to provide timely processing of the monthly progress payment request.

1.2 PREPARATION

- A. Prepare Schedule of Values identifying costs of major items of Work and other costs shown in example form at end of this Section. It is anticipated that the Bid form will be reflected and expanded upon for a complete Schedule of Values.

- B. Divide the Work into the following major (not necessarily complete list) of items of Work:
1. Mobilization (Not to exceed two percent (2%) of the Total Base Bid Amount). See further Mobilization description below.
 2. Demobilization (Not to be less than one percent (1%) of the Total Base Bid Amount). See further Demobilization description below.
 3. Submittals, Bonds and Insurance
 4. Sheeting, Shoring, and Bracing
 5. Survey Control and Construction Staking
 6. Excavation Dewatering
 7. SWPPP Compliance
 8. Hydroseed
 9. Traffic Control
 10. Geotechnical Report and Final City WWTP Design
 11. HDPE DR 11 Force Main
 12. HDPE DR 13.5 Force Main
 13. Force Main Fittings and Valves (Elbows, Air Valves, Blow Off Valves, Isolation Valves)
 14. Backfill and Paving
 15. Highway 156 Crossing (through existing 42-inch casing)
 16. Prescott Road Canal Pipe Crossing
 17. San Juan Highway Canal Pip Crossing and Seismic Flexibility
 18. Manhole Removal and Restoration in Rancho Vista Development
 19. Hollister WWTP Manhole Restoration and Tie In
 20. SJB WWTP Pig Launching Station
 21. San Justo Road/Lucy Brown Road Remote Pig Launching & Receiving Station
 22. Freitas Road Remote Pig Launching & Receiving Station
 23. Hollister WWTP Pig Receiving Station
 24. Conduit, Pull Boxes, and Backfill (future fiber)
 25. 3" AC Overlay
 26. 3" Pavement/Subgrade Grind

27. Striping
28. Primary Pump Station
29. Primary Pumps
30. Davit Crane
31. Storage Pump Station
32. Storage Pumps
33. ESB 1 Sump Pump Station
34. Headworks Screen
35. Chemical Feed System
36. Throttling Valve and Appurtenances
37. Temporary Bypass Piping
38. SJB WWTP Yard Piping & Fittings
39. SJB WWTP EQ Tank Piping
40. SJB WWTP Site Work (grading and paving, etc.)
41. Clearing and Grubbing
42. Foundation
43. Sludge Removal from SJB ponds
44. Demolition of Existing Facilities
45. Standby Generator
46. Main Switchboard
47. Electrical and Instrumentation
48. PLC and Telemetry
49. Removal and Disposal of Materials (Concrete and AC)
50. Disposal of Unusable Materials
51. Miscellaneous

C. Mobilization: Limit amounts included under Mobilization to the following items:

1. Moving on the site any equipment required for first month operations.
2. Installing temporary construction power and wiring.
3. Establishing fire protection system.

4. Developing construction water supply.
5. Providing field office trailers complete with all specified furnishings and utility services including telephones.
6. Providing on-site sanitary facilities and potable water facilities as specified.
7. Arranging for and erection of Contractor's work and storage yard.
8. Subcontractor insurance and bonds.
9. Obtaining all required permits, licenses, and fees.
10. Developing construction schedule.
11. Contractor bonds and insurance.
12. Provide and erect project sign.

Furnish data and documentation to substantiate the amounts claimed under mobilization.

Amount paid for mobilization shall not exceed two percent (2%) of the Contract Price.

D. Demobilization

The lump sum bid for demobilization shall not be less than one percent (1%) of the total bid price. Demobilization shall include site cleaning and restoration of surfaces within the job site, post-construction meeting, removal of all temporary facilities and equipment from the work area, disconnection of the temporary construction utilities and turnover of project to the Owner.

Contractor may apply for payment of demobilization after the overall project substantial completion is achieved and the project begins to demobilize.

- E. Assign prices to major items of Work that aggregate the Contract Price. Base prices on costs associated with scheduled activities based on the Project Schedule for each major item of Work.
- F. Include in the schedule a value for over excavation of structures in case poor soils are found at the foundation elevations.

1.3 SUBMITTALS

- A. Submit preliminary Schedule of Values for all the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during the performance of Work. Such prices shall include an appropriate amount of overhead and profit applicable to each item of Work. Preliminary Schedule of Values shall be submitted within ten days after receipt of Notice to Proceed.

- B. Submit corrected schedule of values within 10 days upon receipt of reviewed Schedule of Values, but no later than 10 days prior to anticipated submittal of first Application for Payment.
- C. Upon request, support prices with data that will substantiate their correctness.
- D. If activities are added or removed from the Construction Schedule revise the Schedule of Values and resubmit.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

3.1 EXAMPLE SCHEDULE OF VALUES

The following is a partial example of an acceptable form for the Schedule of Values using Construction Standards Institute (CSI) Divisions. Contractor shall expend table to provide detailed information on each division for full documentation of total costs of each major work item:

Schedule of Values					
Item	Description of Item	Qty	Unit	Unit Cost	Total Cost

- a. Division 01 - General Requirements
- b. Division 02 - Sitework
 - i. Excavation
 - ii. AB placement
 - iii. Backfill, native
 - iv. Dewatering
 - v. Sheeting and shoring
 - vi. Compaction
- c. Division 03 – Concrete

- i. Forming
- ii. Rebar
- iii. Slab placement
- iv. Wall placement
- v. Sack testing

- d. Division 04 – Masonry
- e. Division 05 – Metals
- f. Division 06 – Wood and Plastics
- g. Division 07 – Thermal & Moist. Protect.
- h. Division 08 – Doors & Windows
- i. Division 09 – Finishes
- j. Division 10 - Specialties
- k. Division 11 - Equipment
- l. Division 12 – Furnishings
- m. Division 13 – Special Construction
- n. Division 14 – Conveying Systems
- o. Division 15 - Mechanical
- p. Division 16 - Electrical
- q. Division 17 - Instrumentation

TOTAL FOR THIS ITEM

END OF SECTION

SECTION 01330

SAFETY PLAN

PART 1 GENERAL

1.1 SUMMARY

- A. The Contractor shall be solely and completely responsible for conditions of the jobsite, including safety of all persons and property during performance of the Work. This requirement shall apply continuously and not be limited to normal working hours. Safety provisions shall conform to U.S. Department of Labor (OSHA), the California Occupational Safety and Health Act (CalOSHA), and all other applicable Federal, State, County, and local laws, ordinances, codes, including but not limited to the requirements set forth below, and any regulations that may be detailed in other parts of these Contract Documents. In the event of conflicting requirements, the most stringent requirement as it pertains to the Contractor's safety responsibility shall be followed by the Contractor.
- B. No provision of the Contract Documents shall act to make the Owner, the Construction Manager, Engineer or any other party than the Contractor responsible for safety. The Contractor agrees that for purposes of California Labor Code Section 6400 and related provisions of law the Contractor, the Contractor's privities and any other entities acting pursuant to this contract will be "employers" responsible for furnishing employment and a place of employment that is safe and healthful for the employees, if any, of such entities acting pursuant to this contract and that neither the Owner nor the Construction Manager, Engineer or their respective officers, officials, employees, agents or volunteers or other authorized representatives will be responsible for having hazards corrected and /or removed at the location(s) where the work is to be performed. The Contractor agrees that neither the Owner nor the Construction Manager, Engineer or their respective officers, officials, employees, agents or volunteers or other authorized representatives will be responsible for taking steps to protect the Contractor's employees from such hazards, or for instructing the Contractor's employees to recognize such hazards or to avoid the associated dangers. The Contractor agrees that with respect to the work to be performed under this contract and the location(s) where such work is to be performed, the Contractor will be responsible for not creating hazards, and for having hazards corrected and/or removed. The Contractor agrees that through the safety obligations contained in this contract and the Contractor's own inspection of the site(s) where the contract work is to be performed, the Contractor is aware and has been notified of the hazards to which the Contractor's employees may be exposed in the performance of contract work. The Contractor has taken and/or will take appropriate, feasible steps to protect the Contractor's employees from such hazards, and has instructed and/or will instruct its employees to recognize such hazards and how to avoid the associated dangers. The Contractor agrees that neither the Owner nor the Construction Ma

nager, Engineer or their respective officers, officials, employees, agents or volunteers or other authorized representatives will be “employers” pursuant to California Labor Code Section 6400 and related provisions of law with respect to the Contractor, the Contractor's privities or other entities acting pursuant to this contract.

- C. The Contractor shall indemnify, defend and hold Owner and Construction Manager, Engineer and their respective officers, officials, employees, agents and volunteers or other authorized representatives harmless to the full extent permitted by law concerning liability related to the Contractor’s safety obligations.
- D. If death or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone or messenger to both the Construction Manager and the Owner. In addition, the Contractor shall furnish the Construction Manager with a copy of the Employer's Report of Injury immediately following any incident requiring the filing of said report during the prosecution of the Work under this Contract. The Contractor shall also furnish the Construction Manager with a copy of the Employer's Report of Injury involving any subcontractors on this Project. The Contractor shall make all reports as are, or may be, required by any authority having jurisdiction, and permit all safety inspections of the Work being performed under this Contract.
- E. If a claim is made by anyone against the Contractor or any subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Construction Manager, giving full details of the claim.

1.2 SAFETY STANDARDS

The Contractor shall comply with all applicable provisions of the Safety and Health Regulations of Construction, promulgated by the Secretary of Labor under Section 107 of the Contract Work Hours and Safety Standards Act (40 USC 327 et. seq.) as set forth in Title 29, C.F.R., CAL/OSHA, and the regulations issued thereunder. Compliance shall be the Contractor's sole responsibility, and neither the Owner, the Construction Manager nor the Engineer shall have any liability for non-compliance for additional safety requirements.

1.3 SAFETY PROGRAM

The Contractor shall establish, implement, and maintain a written injury prevention program as required by Labor Code Section 6401.7. Before beginning the Work, the Contractor shall file with the Construction Manager a written Contractor Safety Program that provides for the implementation of all of the Contractor's safety responsibilities in connection with the Work at the Project site and the coordination of that program and its associated procedures and precautions with safety programs, precautions and procedures of each of its subcontractors and other Contractors performing work at the Project site. The Contractor shall be solely responsible for initiating, maintaining, monitoring, coordinating, and supervising all safety programs, precautions, and procedures in connection with the Work and for coordinating its programs, precautions, and procedures of the other contractors and subcontractors performing the Work at the Project site. The Safety Program should contain all the necessary elements for the Contractor

to administer its program on the Project site. At a minimum, this written Safety Program shall address the elements required by Labor Code Section 6401.7.

The Contractor's compliance with requirements for safety and/or the Construction Manager's acceptance for filing of the Contractor's Safety Program shall not relieve or decrease the liability of the Contractor for safety. The Construction Manager's review of the Contractor's Safety Program is only to determine if the above listed elements are included in the program.

1.4 SAFETY PLAN

- A. Detail the Methods and Procedures to comply with California, Federal, and Local Health and Safety Laws, Rules and Requirements for the duration of the Contract Times. Include the following:
 - 1. Identification of the Certified or Licensed Safety Consultant who will prepare, initiate, maintain and supervise safety programs, and procedures.
 - 2. Procedures for providing workers with an awareness of safety and health hazards expected to be encountered in the course of construction.
 - 3. Safety equipment appropriate to the safety and health hazards expected to be encountered during construction. Include warning devices, barricades, safety equipment in public right-of-way and protected areas, and safety equipment used in multi-level structures.
 - 4. Methods for minimizing employees' exposure to safety and health hazards expected during construction.
 - 5. Procedures for reporting safety or health hazards.
 - 6. Procedures to follow to correct a recognized safety and health hazard.
 - 7. Procedures for investigation of accidents, injuries, illnesses and unusual events that have occurred at the construction site.
 - 8. Periodic and scheduled inspections of general work areas and specific work stations.
 - 9. Training for employees and workers at the jobsite.
 - 10. Methods of communication of safe working conditions, work practices and required personal protection equipment.
- B. Assume responsibility for every aspect of Health and Safety on the jobsite, including the health and safety of Subcontractors, suppliers, and other persons on the jobsite.
 - 1. Forward available information and reports to the Safety Consultant who shall make the necessary recommendations concerning worker health and safety at the jobsite.
 - 2. Employ additional health and safety measures specified by the Safety Consultant, as necessary, for workers in accordance with OSHA guidelines.
- C. Transmit to Owner and Engineer copies of reports and other documents related to accidents or injuries encountered during construction.

- D. A copy of the Project Specific Safety Plan shall be delivered to the Owner within 30 days of the Notice to Proceed. Plan shall include, but is not limited to, biological hazards associated with wastewater, hazardous atmospheres, chemicals, fuels, and compressed gases, and/or physical hazards in the form of operating machinery, high voltage electrical systems and moving and stored water.
- E. A copy of the Project Specific Safety Plan shall be maintained on site and available for review.

1.5 SAFETY SUPERVISOR

- A. The Contractor shall appoint an employee as safety supervisor who is qualified and authorized to supervise and enforce compliance with the Safety Program. The Contractor shall notify the Construction Manager in writing prior to the commencement of work of the name of the person who will act as the Contractor's safety supervisor and furnish the safety supervisor's resume to the Construction Manager.
- B. The Contractor will, through and with its Safety Supervisor, ensure that all of its employees and its subcontractors of any tier, fully comply with the Project Safety Policies. The Safety Supervisor shall be a full-time employee of the Contractor whose responsibility shall be for supervising compliance with applicable safety requirements on the Project site and for developing and implementing safety training classes for all job personnel. The Owner shall have the authority to require removal of the Contractor's Safety Supervisor if the representative is judged to be improperly or inadequately performing the duties; however, this authority shall not in any way affect the Contractor's sole responsibility for performing this work safely, nor shall it impose any obligation upon the Owner to ensure the Contractor performs its work safely.

1.6 SAFETY AND PROTECTION

- A. The Contractor shall take all necessary precautions to prevent damage, injury, and loss to:
 - 1. All employees on the Project, employees of all subcontractors, and other persons and organizations who may be affected thereby;
 - 2. All the Work and materials and equipment to be incorporated therein, whether in storage on or off the site; and
 - 3. Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, wetlands, pavements, roadways, structures, utilities, and underground facilities not designated for removal, relocation, or replacement in the course of construction.
- B. The Contractor shall comply with all applicable laws and regulations of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss and shall erect and maintain all necessary safeguards for such safety and protection. The Contractor shall notify owners of adjacent property and of underground

facilities and utility districts when prosecution of the Work may affect them and shall cooperate with them in the protection, removal, relocation, and replacement of their property. All injury or loss to any property caused, directly or indirectly, in whole or in part, by the Contractor, any subcontractor, supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, shall be remedied by the Contractor.

C. General Safety Requirements

1. No smoking shall be allowed inside wastewater treatment plant boundary or in any area designated No Smoking or Flammable Storage, unless specifically authorized by Owner.
2. All acts or conditions believed to be unsafe shall be promptly reported to the nearest employee of the Owner
3. All acts or conditions believed to be unsafe shall be promptly reported to the nearest employee of the Owner, to the Owner's Project Manager, and provide to the Owner (before the end of the workday the unsafe condition or act was observed) a completed Contractor's Report of Unsafe Condition/Act Form (see Appendix A of this specification).
4. Contractors are responsible for providing their employees with the required safety equipment such as, but not limited to, gas detection meters, rescue equipment, and personal protective equipment.
5. Contractor shall not move or relocate the Owner's first-aid equipment, blankets, stretchers, emergency eyewash/shower units, or any other safety equipment, without the permission of the Owner.
Contractors who damage equipment or pipes, or drop objects into tanks, shall report the incident immediately to the nearest employee of the Owner and complete the Contractor's Report of Damage to Owner's Equipment or Property Form (see Appendix A of this specification).

1.7 EXCAVATION SAFETY

- A. In accordance with the provisions of Section 6705 of the Labor Code, the Contractor shall submit, in advance of excavation of any trench or trenches five feet or more in depth, a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trench or trenches. If such plans vary from the shoring system standards set forth in the Construction Safety Orders of the Division of Industrial Safety in Title 8, Subchapter 4, Article 6, California Code of Regulations, the plans shall be prepared and signed by a registered civil or structural engineer employed by the Contractor, and all costs therefore shall be included in the price named in the Contract for completion of the work as set forth in the Contract Documents. Nothing in this Section shall be deemed to allow the use of a shoring, bracing, sloping, or other protective system less effective than that required by the Construction Safety Orders. Nothing in this Section shall be construed to impose a tort liability on the Owner, the Engineer, the Construction Manager, nor any of their officers, officials, employees, agents, consultants or volunteers. The Owner's review of the Contractor's excavation plan is only for general conformance to the Construction Safety Orders.

- B. If there is a potential atmospheric hazard such as oxygen deficiency or toxic gases, the atmospheres in the excavation shall be tested before employees enter any excavation.
- C. Contractor shall have a competent person on-site who will make daily inspections of excavations, adjacent areas, and protective systems. The competent person will be responsible for ensuring that the protective system is based upon soil classifications, and that it provides the required protection in accordance with CCR, Title 8, Section 1541.1.
- D. Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered civil engineer. Design specifications shall be submitted to the Owner upon request.
- E. Prior to commencing any excavation, the Contractor shall designate in writing to the Construction Manager the "competent person(s)" with the authority and responsibilities designated in the Construction Safety Orders.

1.8 SAFETY EMERGENCIES

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Project site or adjacent thereto, the Contractor, without special instruction or authorization from the Construction Manager, is obligated to act to prevent threatened damage, injury or loss. The Contractor shall give the Construction Manager prompt written notice if the Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby.
- B. All accidents involving lost work time or damaged Owner's property shall be reported to the Owner or designee on the same workday the incident occurred. A copy of the Contractor's Injury/Fatality Incident Report and/or the Contractor's Report of Damage to Owner's Equipment/Property shall be provided to Owner or its representative within 24 hours of the incident. See Appendix A of this specification for forms.
- C. Should a serious accident or emergency occur, or if an emergency requires off-site emergency responders (police, fire, medical, etc.), Contractor shall immediately notify, including nights, weekends, and holidays, the Owner using contact information provided in the Emergency Contact Information Form (see Appendix A of this specification).
- D. Should a serious accident or emergency occur, Owner reserves the right to conduct an accident investigation of the incident, either in conjunction with, or separate of, the Contractor. The Contractor shall provide complete access to the Owner's representative(s) and shall allow the Owner's representative(s) to take photos and witness statements.
- E. If a claim is made by anyone against the Contractor or any subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Owner, giving full details of the claim.

F. Emergency Action Plan

1. Contractor shall have a written Emergency Action Plan that is applicable to the work site and work activities being performed.
2. Contractor is responsible for ensuring the availability of emergency medical services for its employees. Contractor employees who will render basic first aid are to be trained and immediately available. Contractor shall also provide its own first aid kit(s) that contain the minimum first-aid supplies as determined by a licensed physician or in accordance with CCR, Title 8, Section 1512.
3. Contractor shall be apprised of the Owner's site-specific Emergency Action Plan procedures that are applicable to the worksite and Contractor's work activities, including the Owner's emergency alarm system(s).
4. To facilitate prompt emergency services, Contractor shall:
 - a. Determine who is responsible for making emergency calls and;
 - b. Conspicuously post a list of emergency phone numbers, a map of the closest hospital, known and potential safety hazards, and other information to be transmitted.

1.9 SAFETY VIOLATIONS

Should the Contractor fail to correct an unsafe condition, the Owner shall have the right to notify the Contractor through the Construction Manager that an unsafe condition may exist and must be corrected or the work in question can be stopped until the condition is corrected to the satisfaction of the Owner. No extension of time or additional compensation will be granted as a result of any stop order so issued. The notification and suspension of such work or the failure to provide such notification and suspension by the Owner shall not relieve the Contractor of its sole responsibility and liability for safety and the correction of any unsafe conditions.

The Owner shall have the authority to require the removal from the project of any worker and the foreman and/or superintendent in responsible charge of the work where safety violations occur.

1.10 EQUIPMENT SAFETY PROVISIONS

The completed Work shall include all necessary permanent safety devices, such as machinery guards and similar safety items, required by the State and Federal (OSHA) industrial authorities and applicable local and national codes. Further, any features of the Work, including Owner-selected equipment, subject to such safety regulations shall be fabricated, furnished, and installed in compliance with these requirements. All equipment furnished shall be grounded and provided guards and protection as required by safety codes. Where vapor-tight or explosion-proof electrical installation is required by safety codes, this shall be provided. Contractors and manufacturers of equipment shall be held responsible for compliance with the requirements included herein. The Contractor shall notify all equipment suppliers and subcontractors of the provisions of this paragraph.

1.11 CONFINED SPACES

- A. The Project requires work in confined spaces and requires compliance with CAL/OSHA and Federal OSHA requirements. Confined spaces for the purposes of this Section shall be as defined by the Division of Industrial Safety. Work within confined spaces of this project is subject to the definitions and applicable provisions of Section 5156 et. seq., Title 8, Division 1, Chapter 4, Subchapter 7, Group 16, Article 108 of California Code of Regulations, and Title 29 Part 1926 of the Code of Federal Regulations.
- B. In addition the Owner classifies the following existing facilities as confined space: the interior of pipelines, vaults, manholes, reservoirs and any other such structure or space which is similarly surrounded by confining surfaces as to permit the accumulation of dangerous gases or vapors. The confined spaces are “permit” confined spaces as defined by OSHA and Cal/OSHA and therefore entry is allowed only through compliance with a confined space entry permit program by the contractor that meets the requirements of 8 C.C.R. Section 5157. While the above mentioned locations have been identified as permit confined spaces, other permit confined spaces may exist. It shall be the responsibility of the Contractor to identify and classify these confined spaces.
- C. It is anticipated that the Contractor may encounter hazardous conditions within these permit confined spaces which include, but are not limited to the following:
1. Exposure to hydrogen sulfide, methane, carbon dioxide and other gases and vapors commonly found in municipal sewers which could have or has the potential of having Immediate Danger to Life or Health Conditions (IDLH).
 2. Exposure to atmosphere containing insufficient oxygen to support human life.
 3. Exposure to combustible, flammable and/or explosive atmosphere.
 4. Exposure to sewage which may contain bacteriological, chemical and other constituents harmful to humans.
 5. Work in conditions where engulfment or entrapment may occur.
 6. Work in environments which may be slippery and/or have uneven work surfaces.
 7. Work in structures where workers may trip, slip and/or fall several feet.
 8. Exposure to an oxygen enriched environment.
- D. No entry into a confined space shall be permitted until written permission from the Owner has been granted.
- E. Whenever Contractor and Owner’s personnel are working simultaneously in a confined space, the activities will be coordinated prior to entry so that employees of one employer do not endanger the employees of any other employer. Coordination of entry procedures must include procedures for emergency evacuation.
- F. The Contractor shall debrief Owner at the conclusion of the entry operations regarding any hazards confronted or created in permit-required confined spaces during entry operations.

1.12 HAZARD COMMUNICATION

- A. No hazardous chemical in quantities greater than 5-gallons or 10-lbs shall be brought onto the Owner's premises without first gaining approval from the Owner using the Request to Use/Store Hazardous Substances on Owner's Property Form (see Appendix A of this specification).
- B. MSDS's for all hazardous chemicals brought onto Owner's premises shall be kept on the OWNER'S premises and made available to Owner's employees and their representative upon request.
- C. Contractors who bring hazardous substances to the work site must take the appropriate safety precautions to protect the Contractor's and Owner's employees from harmful exposure.
- D. All hazardous substances not used in the work by the end of the project shall be removed from the work site by the Contractor.

1.13 LOCKOUT/TAGOUT

- A. Work involving systems shutdown or startup (e.g. tie-ins, connections, equipment shutdowns, etc.) shall be coordinated with, and approved by, the Engineer and Owner, as required in Specification Section 01020 of the Contract Documents.
- B. The Contractor and its representatives are not permitted to take any equipment off line, to open or close valves or turn circuits or control switches off or on. These tasks are to be performed only by Operations & Maintenance personnel designated by the Owner. Under no circumstances shall Contractor initiate shutdown procedures of any work, processes or equipment. The Contractor shall follow the Owner's lockout/tagout procedures.
- C. Whenever work is to be performed on any equipment or systems that may result in hazardous energy exposures to workers or other affected personnel, all sources of energy (primary and secondary) shall be de-energized and locked out or blocked first by the Owner's authorized representative and followed by the Contractor.
- D. Lockout procedures shall comply with the most stringent applicable standard, (e.g. CCR Title 8, CFR Parts 1910 and 1926, NEC) and shall include the following:
 - 1. Lockout procedures shall be coordinated between the Contractor and Owner's designated representative.
 - 2. All locks shall be individually keyed. Group or crew locks are not allowed.
 - 3. All equipment or systems that have been locked out shall have a current accident prevention tag noting the reason for placing the tag, name of the individual placing the tag, how that person may be contacted, and the date the tag was placed.

4. No employee shall remove another employee's lock(s) or tag(s). Any exceptions shall be coordinated between the Contractor and the Owner's designated representative.
- E. If equipment or systems cannot be locked out or blocked, suitable tagout procedures shall be implemented. Only the person whose signature is on the accident prevention tag may remove it. Any exceptions to this shall be coordinated between the Contractor and Owner's designated representative.
- F. Upon completion of the work, energizing equipment is prohibited until all tags and locks have been removed. The person removing the last tag is responsible for re-installation of guards and for warning all affected personnel.

1.14 PUBLIC SAFETY AND CONVENIENCE

The Contractor shall conduct his work so as to ensure the least possible obstruction to traffic and inconvenience to the general public and the residents in the vicinity of the Work and to ensure the protection of persons and property. No road or street shall be closed to the public except with the permission of the Construction Manager and the written approval by the proper governmental authority. Fire hydrants on or adjacent to the Work shall be accessible to fire fighting equipment. Temporary provisions shall be made by the Contractor to ensure the continued use of sidewalks, private and public driveways and proper functioning of gutters, sewer inlets, drainage ditches and culverts, irrigation ditches and natural water courses. The Contractor shall provide public protection by installing and maintaining the appropriate barricades, fences, guardrails, overhead protection, or any other necessary form of protection. Pedestrian or vehicle barriers shall be used around all open pits, manholes, or excavation openings when left unattended.

In accordance with California Business and Professions Code Section 7058, no person or entity shall set up or remove roadway construction zones, lane closures, flagging, or traffic diversions on any roadway unless that person or entity holds a valid and current C31 specialty license from the California Contractors State License Board. (C31 - A construction zone traffic control contractor prepares or removes lane closures, flagging, or traffic diversions, utilizing portable devices such as cones, delineators, barricades, sign stands, flashing beacons, flashing arrow trailers, and changeable message signs, on roadways, including but not limited to public streets, highways, or any public conveyance.)

1.15 CRANE OPERATION

All Contractors shall only permit operators who have a valid certificate of competency (certificate) issued in accordance with CCR Title 8 Section 5006.1 by an Accredited Certifying Entity for the type of crane to be used, to operate mobile cranes regulated under Section 5006.1. Further, the same certification requirements as those identified in the CCR, for the type of crane to be used shall also apply to operators of cranes having a boom length of less than 25 feet or a maximum rated load capacity of less than 15,000 pounds.

1.16 ASBESTOS RELATED WORK

All work involving asbestos containing material must be performed in accordance with California Labor Code, Sections 6501.5 through 6510, inclusive, and California Administrative Code, Title 8, Section 5208 and all other pertinent laws, rules, regulations, codes, ordinances, decrees and orders.

1.17 PROVISIONS FOR HANDLING EMERGENCIES

- A. It is possible that emergencies may arise during the progress of the Work, which may require special treatment or make advisable extra shifts of labor forces to continue the Work for twenty-four (24) hours per day. These emergencies may be caused by damage or possible damage to nearby existing structures or property by reason of the work under construction, or by storm, accidents, or leakage. The Contractor shall be prepared in case of such emergencies to make all necessary repairs and shall promptly execute such work when required.

- B. Upon start of the Work, Contractor shall provide means for immediate emergency notification of Contractor's designated representative and designated emergency alternates.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

Not used.

APPENDIX A

CONTRACTOR'S REPORT OF UNSAFE CONDITION/ACT FORM

CONTRACTOR INSTRUCTIONS:

Contractor employee observing hazardous condition or near-miss incident completes and gives to their Supervisor. Contractor representative reviews and gives to Owner's Project Manager.

HAZARDOUS CONDITION/NEAR-MISS INCIDENT: (completed by reporting employee)

Employee Name (*optional*): _____ Date of This Report: _____

Date Unsafe Condition or Event Witnessed: _____ Location of Unsafe Condition or Event: _____

Describe Unsafe Condition or Event: _____

Do You Have Suggestions to Remedy the Situation or Prevent Recurrence: _____

Type of Hazard: Imminent Serious General Regulatory

REVIEWED BY: _____ SUBMITTED TO: _____ DATE: _____
Contractor's Rep. *Owner's Rep*

OWNER'S PROJECT MANAGER: A completed copy of this form is to be given to the Contractor representative and the original given to the Owner's Safety Officer for filing.

CONTRACTOR'S REPORT OF DAMAGE TO OWNER'S EQUIPMENT/PROPERTY FORM

1. Contractor (Name of Company): _____ Contact Number: _____

2. Name/Title of person completing this report: _____ Phone number: _____

3. Date of accident: _____ Time: _____ am/pm Day of the Week: _____

4. Whether Conditions: _____ Temperature: _____F

5. Roadway or Surface Conditions: Wet Dry Icy N/A
 Other: _____

6. Location where accident occurred: _____
 (Include specific areas, equipment, processes, etc.)

7. Owner's Equipment Involved (Description and Serial Nos.): _____

8. Any Personal Injuries? Yes No
 Estimated Value of damages: _____
 Owner's Property: _____ Third party damages: _____

For vehicle accidents only:
 Contractor's vehicle involved: _____

	Year	make	body style
Vehicle License No.			
Driver (Name): _____		Drivers' License No. _____	
Driver's address: _____		Phone No. _____	

 Vehicle damages (describe): _____

Passengers (Names): _____

Other Vehicle(s) involved: _____

	Year	make	body style
Driver (Name): _____		Drivers' License No. _____	
Driver's address: _____		Phone No. _____	
Insurance Company Name: _____			

 Vehicle damages (describe): _____

Passengers (Names): _____

9. Witness (es) to the Accident:

Name: _____	Name: _____
Address: _____	Address: _____
Phone No. _____	Phone No. _____

Supervisor's Signature: _____ Date this report completed: _____

REQUEST TO USE/STORE HAZARDOUS SUBSTANCES ON OWNER'S PROPERTY FORM

OWNER'S STAFF INSTRUCTIONS:

- Owner's Project Manager or designee provides this form to Contractors who plan to bring hazardous substances in quantities greater than 5-gallons or 10-lbs onto Owners properties, or whose work activities may expose Owner's employees to hazardous substances.
- Owner's Project Manager or designee reviews for completion and ensures a complete MSDS has been attached.
- Owner's Project Manager or designee ensures the MSDS is copied to the affected management personnel before the hazardous substance is opened or used on Owner's property.

CONTRACTOR INSTRUCTIONS:
Make a copy of this form and complete for each chemical/hazardous substance exceeding the Owner's threshold amounts that will be stored or used on Owner's property. Attach the respective MSDS(s) to each completed form. An MSDS *must* be provided for all hazardous substances exceeding the Owner's threshold amounts that will be used or stored on Owner's property.

PERSON SUBMITTING INFORMATION: _____ **POSITION:** _____

COMPANY NAME: _____
TELEPHONE NUMBER: _____ **EMAIL:** _____

CHEMICAL NAME: _____

QUANTITY TO BE BROUGHT ONTO OWNER PROPERTIES:

____ # Drums X ____ Drum Vol. (gal) = ____ Total Gallons

____ # Tanks X ____ Tank Vol. (gal) = ____ Total Gallons

OTHER: Total lbs or gallons = _____

CHEMICAL TO BE USED AND/OR STORED ON OWNER'S PROPERTY BY:

Prime Contractor Subcontractor Other: _____

WHAT WILL CHEMICAL BE USED FOR? _____

APPROXIMATELY HOW LONG WILL THE CHEMICAL BE USED/STORED ON OWNER'S PROPERTY?

NFPA or HMIS Rating

HEALTH ____ FLAMMABILITY ____ REACTIVITY ____ SPECIFIC HAZARD/PPE _____

WHERE WILL CHEMICAL BE STORED? _____

WILL CHEMICAL BE STORED USING SECONDARY CONTAINMENT? YES NO

CONTRACTOR'S INJURY/FATALITY INCIDENT REPORT FORM

1. Contractor (Name of Company): _____ Contact Number: _____
2. Name/Title of person completing this report: _____ Phone# _____
3. Date of accident: _____ Time: _____ am/pm: Day of the week: _____
4. Location where accident occurred: _____
(Include specific areas, equipment, _____
processes, etc.)
5. Injury type: __Lost time injury __Serious injury __Recordable Injury __Fatality
6. Name of the injured party: _____ Employment date of hire: _____
7. Occupation of injured party: _____ Male Female__
8. Job activities being performed when the accident occurred: _____

9. Primary Cause of the Accident: _____
10. Secondary or other contributing factors such as:
 Defective/unsafe equipment Safeguards missing Environmental conditions
 Lack of training Not following safety rules Lightning
 Not wearing protective equip. Working at unsafe speed Ventilation
 Horse-play Improper use of tools Poor housekeeping
 Lack of safety rules Lack of proper warning Slippery/uneven surfaces
 Physical limitation Improper storage
 Other: _____
11. Type of injury and body part(s) affected: _____
12. __On-site first aid __Off-site medical care __Required an ambulance or other emergency medical responder
13. Was the incident a fatality or an injury that required hospitalization for more than 24 hours for more than observation? __Yes
__No
14. Was CalOSHA notified: __Yes __No Date/Time notification was made: _____
15. Contractor's Workers' Compensation Insurance Notified? __Yes __No
Date/Time notification made: _____
16. Agencies who were called and/or responded to the accident:
 Fire Police Insurance Representative CalOSHA Other: _____
17. Was the accident investigated? __Yes __No By whom? _____ Report Available? _____
18. Supervisor's Correction Action taken: _____

- Supervisor's Signature: _____ Date this report completed: _____

OWNER'S EMERGENCY CONTACT INFORMATION FORM

OWNER'S EMERGENCY CONTACTS (To be filled out by the Owner's Project Manager for each project.)

PLEASE NOTE: It is the Contractor's responsibility to notify any appropriate regulatory authorities or outside emergency responders. This list is only meant to identify the Owner's staff that must be notified under the following events, in addition to any other appropriate emergency notifications.

In Case Of...	Immediately Contact:	If Unavailable, Contact:	How To Report:
Employee Injury			1. Phone or In Person AND 2. Complete Contractor's Injury/Fatality Incident Report
Damage to Owner's Property			1. Phone or In Person AND 2. Contractor's Report of Damage to Owner's Equipment or Property
Emergency Requiring Outside Assistance (e.g. fire, violence, chemical spill, etc.)			1. Phone or In Person
Harassment			1. Phone or In Person
Need Process Shut Down/Return to Service (e.g. lockout/tagout)			1. Phone or In Person AND 2. Fill out Plant/Process Shutdown Request-Return to Service Forms
Need to Bring Hazardous Substances Onto OWNER'S Property in Amounts Exceeding the Owner's Threshold Amounts Listed in Request to Use/Store Hazardous Substances on Owner's Property			1. Phone or In Person AND 2. Complete Request to Use/Store Hazardous Substances on Owner's Property Form

BIOLOGICAL HAZARDS IN WASTEWATER FACT SHEET

Wastewater contains bacteria, fungi, parasites, and viruses that can cause intestinal, lung, and other infections. Proper equipment, work practices, and personal protective equipment (PPE) can help protect you from these agents.

Some Biological Hazards That May Be in Wastewater

Bacteria may cause diarrhea, fever, cramps, and sometimes vomiting, headache, weakness, or loss of appetite.

Fungi

- Aspergillus can lead to allergic symptoms (such as runny nose) and sometimes can lead to lung infection or make asthma worse. If you have other health problems, you may be more likely to get sick from aspergillus.

Parasites

- Cryptosporidium and giardia lamblia may cause diarrhea, nausea and stomach cramps.
- Roundworm (ascariasis). Most people have no symptoms. With a lot of roundworms, you may cough and have trouble breathing or you may have pain in your belly and blocked intestines.

Viruses

- Hepatitis A causes liver disease. You may feel tired, have stomach cramps, nausea, jaundice (yellow skin) or diarrhea or not be hungry. The Center for Disease Control says sewage workers are not at more risk of hepatitis A infection than other workers.

Bloodborne viruses are a hazard mainly to workers in health care facilities. Hepatitis B and HIV are bloodborne.

- Hepatitis B causes liver disease. You may feel tired, have jaundice (yellow skin), have stomach cramps, nausea, or not be hungry. The disease has not been linked to exposure to sewage in the U.S.
- Human immunodeficiency virus (HIV) causes AIDS. There are no known cases of wastewater workers getting HIV from their jobs in the U.S.

Protecting the Worker

For work around wastewater, engineering controls and work practices are the best ways to protect workers from exposures to disease. When engineering controls are not possible, use personal protective equipment (PPE).

OSHA says the employer should give the worker:

- Training and education about the hazards of wastewater
- A place onsite with clean water for washing your hands
- A place to wash and clean up after work
- The right PPE, such as gloves, goggles, a face shield, water-resistant suit, or respirator – depending on the job
- Clean areas set aside for eating and smoking
- Cleaning facilities or services for clothing and equipment. (If clothing is badly soiled, change out of it. Keep equipment clean to limit your exposures to the disease-causing agents.)

What you can do:

- Most important: **Wash your hands well with clean water and soap before you eat or smoke and after work.**
- **Do not touch your nose, mouth, eyes, or ears with your hands, unless you have just washed.**
- Keep your fingernails short; use a stiff soapy brush to clean under your nails.
- Wear waterproof gloves when you handle wastewater, sludge, or grit.
- Always wear gloves when your hands are chapped or burned or you have a rash or a cut.
- Do not keep your soiled work clothes with your other clothes.
- Report any injury or illness you think you got from work right away.
- DO NOT wear shorts or open-toed shoes when working around sewage.
- **If you do get sick, be sure to tell your doctor you've worked in a sewage or wastewater treatment plant.** That information will help the doctor.

Vaccinations

You should have current shots for tetanus and diphtheria. If you want to know about shots to prevent hepatitis A, ask a nurse or doctor.

For more information, call the Center to Protect Workers' Rights (CPWR) (202-962-8490 or www.cpwr.com), the National Center for Infectious Diseases (www.cdc.gov/ncidod), National Institute for Occupational Safety and Health (NIOSH) (1-800-35-NIOSH or www.cdc.gov/niosh), or OSHA (1-800-321-OSHA or www.osha.gov)

END OF SECTION

SECTION 01340

REQUESTS FOR INFORMATION AND CLARIFICATIONS

PART 1 GENERAL

1.1 DESCRIPTION

- A. Should the Contractor discover conflicts, omissions, or errors in the Contract Documents, or have any questions concerning interpretation or clarification of the Contract Documents, or if it appears to the contractor that work to be done or any matter relative thereto are not sufficiently detailed or explained in the Contract Documents, then, before proceeding with the work affected, the Contractor shall immediately notify the Engineer in writing and request interpretation, clarification, or additional detailed instructions concerning the work. The Contractor shall ask for any clarification or request for information immediately upon discovery, but no less than fifteen (15) days prior to the start date of the activities related to the clarification, based on the latest updated and accepted construction schedule. Contractor shall be responsible for its costs to implement and administer RFI's throughout the Contract duration. Regardless of the number of RFI's submitted, Contractor will not be entitled to additional compensation.
- B. A RFI is not to be used for request for materials/equipment substitutions or value engineering/cost reduction incentive proposals.

1.2 RFI PROCEDURES

- A. Contractor review and submittal:
 - 1. Contractor's review: Before submitting each RFI, the Contractor shall carefully review the following for relevant information:
 - a. All field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto.
 - b. All materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work.
 - c. All information relative to means, methods, techniques, sequences, and procedures of construction and safety precautions and programs incident thereto.

- d. The coordination of each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.
 - e. The Contract Documents.
 - f. The Project correspondence and documentation.
2. Submittal requests
- a. The Contractor shall submit all requests for clarification and/or additional information in writing through the Engineer to the Engineer using a request for information (RFI) form. Contractor shall provide a detailed written statement that indicates the specific Drawings or Specifications in need of clarification and the nature of the clarification requested.
 - b. Contractor shall furnish six (6) copies of each RFI. Each RFI shall be dated and bear a signed certification that Contractor has performed the review defined above. No consideration for review by Engineer of any RFI will be made for any item which has not been certified by the Contractor. All non-certified RFI's will be returned to Contractor without action taken by Engineer, and any delays caused thereby shall be the total responsibility of Contractor.
 - c. Each RFI shall be limited to one subject.
- B. RFI numbering system: The initial RFI shall be numbered as RFI 001 and all subsequent questions shall be numbered consecutively with the date of issue, except for re-issuance of a respective RFI in which the subscript A, B, C, etc., will be added until the RFI is resolved. If Contractor believes the RFI reviewer's response is incomplete, Contractor shall issue another RFI (with the same RFI number with the letter "A" indicating if it is a follow-up RFI) to Engineer clarifying original RFI. Additionally, Engineer may return RFI requesting additional information should original RFI be inadequate in describing condition.
- C. Owner's RFI review and response time:
1. Except as may otherwise be provided herein, the Engineer will return one copy of each RFI form to Contractor, with its comments noted thereon or on a separate comment sheet, within a reasonable amount of time, but no more than fifteen (15) calendar days following their receipt from Contractor, or if it is necessary to extend this period, the Engineer shall notify the Contractor in writing as to when a decision will be provided.
 2. Engineer's review will be only to provide clarification and interpretation of the Contract Documents. Engineer's review shall not relieve Contractor for the responsibility for compliance with the Contract Documents.
 3. Engineer's review will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto.

4. The Engineer may furnish additional detailed written instructions to further explain the work, and such instructions shall be a part of the contract documents. Clarifications will be issued using the above RFI system. Should additional detailed instructions in the opinion of the Contractor constitute work in excess of the scope of the contract, the Contractor shall submit notification immediately and written notification thereof to the Engineer no more than seven (7) days following receipt of such instruction, and in any event prior to the commencement of work thereon. If the Engineer considers it justified, the instructions of the Engineer will be revised or a proposed change order will be issued for the Owner's consideration. The Contractor shall have no claim for additional compensation or extension of the schedule because of any such additional instructions unless the Contractor provides the Engineer written notice thereof within the time frame specified above. In addition, the Contractor shall within fifteen (15) days from the date of notification provide detailed justification and analysis as well as complete pricing and schedule CPM fragmentary network to support any request for time extension.
5. Should the Contractor proceed with the work affected before receipt of a response from the Engineer, any portion of the work which is not done in accordance with the Owner's interpretation, clarifications, instructions, or decisions subject to removal or replacement and the Contractor shall be responsible for all losses.
6. RFI's will not be recognized or accepted, if in the opinion of the Engineer or Engineer, that one of the following conditions exists:
 - a. The Contractor submits an RFI as a submittal.
 - b. The Contractor submits the RFI under the pretense of a contract documents discrepancy or omission without thoroughly reviewing the documents. In this case, the Contractor shall be responsible for both the Engineer's and Engineer's administrative costs to process the RFI. Such costs will be deducted from Contractor's progress payments.
 - c. The Contractor submits the RFI in a manner that suggests that specific portions of the contract documents are assumed to be excluded, or be taken as an isolated portion of the contract documents in part rather than whole.
 - d. The Contractor submits an RFI in an untimely manner without proper coordination and scheduling of work or related trades.
7. The Engineer's review shall not relieve Contractor from the entire responsibility for any variation from the requirements of the Contract Documents unless Contractor has in writing called attention to each such variation at the time of each RFI submittal and Engineer has given written approval of each such variation by specific written notation thereof incorporated in the RFI review; nor will any review by Engineer relieve Contractor from responsibility for compliance with the requirements for careful review above.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

Not used

END OF SECTION

SECTION 01350

CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section provides supplementary procedures for the administration of changes to the Contract as specified in Section 00700 – General Conditions. Whenever corrections, alterations, or modifications of the work under this Contract are ordered by the Engineer and approved by the Owner which increases the amount of work to be done, such added work shall be known as extra work; and when such corrections, alterations, or modifications decrease the amount of work to be done, such subtracted work shall be known as omitted work.
- B. Any change in scope of Work or deviation from Contract Documents including, without limitation, extra Work, or alterations or additions to or deductions from the original Work, shall not invalidate the original Contract, and shall be performed under the terms of the Contract Documents. The difference in cost of the work affected by such change will be added to or deducted from the amount of said Contract price, as the case may be, by a fair and reasonable valuation, as outlined in this Section.
- C. The prices agreed upon and any agreed upon adjustment in Contract Time shall be incorporated in the written order issued by the Owner, which shall be written so as to indicate an acceptance on the part of the Contractor as evidenced by its signature. By signature of the Change Order, the Contractor acknowledges that the adjustments to cost and time contained in the Change Order are in full satisfaction and accord, payment in full, and so waives any right to claim any further cost and time impacts at any time during and after completion of the Contract for the changes encompassed by the Change Order.
- D. Only the Owner or Contractor may initiate changes in scope of Work or deviation from Contract Documents.
- E. See Paragraphs 1.3.A.6 and 1.3.A.8.d of this Section for submittal of labor and equipment rates.

1.2 CONTRACT MODIFICATION PROCEDURES

A. Request for Proposal (RFP):

1. A request for a proposal made to the Contractor by the Owner to add, delete or change the Work. RFP's shall not be deemed to be directions to proceed with any addition, deletion or change to the Work.
2. All Cost Proposals in response to an RFP must contain a complete breakdown of costs of credits, deducts, and extras; and itemizing materials, labor, equipment, special services, taxes, overhead and profit. All Subcontractor Work shall be so indicated. Individual entries on the Cost Proposal shall follow the cost items defined in Cost Determination in this Section. The Contractor shall provide all required information requested in the RFP no later than fourteen (14) days after receiving the RFP.
3. Upon receipt of a Cost Proposal with a detailed breakdown as prescribed herein this Section, the Engineer will act promptly thereon. If Engineer accepts a Cost Proposal, Engineer will prepare Change Order for Owner and Contractor signatures. If Cost Proposal is not acceptable to Engineer because it does not agree with cost and/or time included in Cost Proposal, Engineer will submit in a response what it believes to be a reasonable cost and/or adjustment, if any. Except as otherwise provided in this Section, Contractor shall have seven (7) days in which to respond to Engineer with a revised Cost Proposal.
4. If the parties do not agree on the price or time for an RFP, Owner may either issue a unilateral Change Order pursuant to Section 00700 - General Conditions or a Work Change Directive (WCD) as defined below. Contractor shall perform the changed Work notwithstanding any claims or disagreements of any nature.
5. When necessity to proceed with a change does not allow the Engineer sufficient time to conduct a proper check of a Cost Proposal (or revised Cost Proposal), Engineer may order Contractor to proceed on basis to be determined at earliest practical date. In this event, value of change, with corresponding equitable adjustment to Contract, shall not be more than increase or less than decrease proposed.

B. Work Change Directive (WCD) resulting from RFI's or submittals:

1. The Contractor may be issued a Work Change Directive (WCD) resulting from an RFI.
2. If Contractor is satisfied with the WCD and does not request change in Contract Sum or Contract Time, then the WCD shall be executed without a Change Order.
3. If Contractor believes the WCD results in a change in Contract Sum or Contract Time, then Contractor must notify the Engineer with seven (7) days following receipt of WCD and before proceeding with this Work. If the Engineer considers it justified, the instructions of the WCD will be revised or proposed Change Order will be issued for the Owner's consideration. The Contractor shall have no claim for additional compensation or extension of the schedule because of any such additional instructions unless the Contractor provides the Engineer written notice thereof within the time frame specified above. In addition, the Contractor shall within fifteen (15) days from the date of notification provide detailed justification and analysis as well

as complete pricing and schedule CPM fragmentary network to support any request for time extension.

4. Should the Contractor proceed with the work affected before receipt of a response from the Engineer, any portion of the work which is not done in accordance with the Owner's interpretation, clarifications, instructions, or decisions subject to removal or replacement and the Contractor shall be responsible for all losses.
5. If the parties still do not agree on the a WCD's impact to the Contract Sum or Contract Time, then Contractor will be directed again in writing to make the changes covered in the WCD and Contractor shall do so notwithstanding any claims or disagreements of any nature. Contractor may file a Claim in accordance with Section 00800.

C. Work Change Directive (WCD):

1. A WCD is a written order prepared by the Engineer and signed by the Owner, directing a change in the Work and stating a proposed basis for adjustment, if any, in the Contract Price or Contract Time.
2. If at any time Owner believes in good faith that a timely Change Order will not be agreed upon using the foregoing procedures, Owner may issue a WCD with its recommended cost and/or time adjustment. Upon receipt of WCD, Contractor shall promptly proceed with the change of Work involved and concurrently respond to Owner's WCD within ten (10) calendar days.
3. Contractor's response must be any one of following:
 - a. Return WCD signed, thereby accepting Owner's response, time, and cost.
 - b. Submit a (revised if applicable) Cost Proposal with supporting documentation (if applicable, reference original Cost Proposal number followed by letter A, B, etc. for each revision), if Owner so requests.
 - c. Give notice of intent to submit a Claim as described in Section 00800 within thirty (30) days.
4. If the WCD provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:
 - a. Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation.
 - b. Unit prices stated in the Contract Documents or subsequently agreed upon.
 - c. Cost to be determined in a manner agreed by the Owner and Contractor.
5. A WCD signed by Contractor indicates the agreement of Contractor therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

6. If Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the method and the adjustment shall be determined by Engineer on the basis of reasonable expenditures and savings of those performing the Work attributable to the change including, in case of an increase in the Contract Sum, an allowance for overhead and profit in accordance with the mark up allowances in this Section. If the parties still do not agree on the price for a WCD, Contractor may file a Claim in accordance with Section 00800. Contractor shall keep and present, in such form as Engineer may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this paragraph shall be limited to those provided in the Cost Determination article this Section.
7. Pending final determination of cost to Owner, amounts not in dispute may be included in Applications for Payment.

D. Field Order - force account work:

1. If either the amount of work or payment for a Change Order cannot be determined or agreed upon beforehand, the Owner may direct by written Change Order or Field Order that the work be done on a force account basis. The term "force account" shall be understood to mean that payment for the work will be done on a time and expense basis, that is, on an accounting of the Contractor's forces, materials, equipment, and other items of cost as required and used to do the work. For the work performed, payment will be made for the documented actual cost of the work as described in the Cost Determination article is this Section.
2. Prior to the commencement of force account work, the Contractor shall notify the Engineer of its intent to begin work. Labor, equipment and materials furnished on force account work shall be recorded daily by the Contractor on a Daily Extra Work Report form approved by the Engineer. The reports, if found to be correct, shall be signed by both the Contractor and Engineer, or inspector, and a copy of which shall be furnished to the Engineer no later than the working day following the performance of said work. The Daily Extra Work Report form shall thereafter be considered the true record of force account work provided. If the Engineer, or inspector, do not agree with the labor, equipment and/or materials listed on the Contractor's daily force account report, the Contractor and Engineer, or inspector, shall sign-off on the items on which they are in agreement. The Engineer shall then review the items of disagreement and will advise the Contractor, in writing, of its determination. If the Contractor disagrees with this determination, it shall have the right to file a Claim notice as provided in Section 00800.
3. The Contractor shall maintain its records in such a manner as to provide a clear distinction between the direct costs of work paid for on a force account basis and the costs of other operations.
4. To receive partial payments and final payment for force account work, the Contractor shall submit, in a manner approved by the Engineer, detailed and complete documented verification of the Contractor's and any of its subcontractor's actual costs involved in the force account pursuant to the pertinent Change Order or Field Order. Such costs shall be submitted within thirty (30) days after said work has been

performed. No payments will be made for work billed and submitted to the Engineer after the thirty (30) day period has expired.

5. The force account invoice shall itemize the materials used and shall cover the direct costs of labor and the charges for equipment rental, whether furnished by the Contractor, subcontractor, or other forces. The invoice shall be in a form acceptable to the Engineer and shall provide names or identifications and classifications of workers, the hourly rate of pay and hours worked, and also the size, type, and identification number of equipment and hours operated. Material charges shall be substantiated by vendor's invoices acceptable to the Engineer.

- E. Differing Site Conditions: Contractor shall submit Notices of Differing Site Conditions to resolve problems regarding differing Site conditions encountered in the execution of the Work pursuant to Section 00700 – General Conditions, which shall govern. If Owner determines that a change in Contract Sum or Contract Time is justified, Owner will issue an RFP, WCD or Field Order.

- F. Hazardous Waste Conditions: Contractor shall submit Notices of Hazardous Waste Conditions to resolve problems regarding hazardous materials encountered in the execution of the Work pursuant to Section 00700 – General Conditions, which shall govern. If Owner determines that a change in Contract Sum or Contract Time is justified, Owner will issue RFP, WCD or Field Order.

- G. Contractor Cost Reduction Proposals: See article below for procedures on Cost Reduction Proposals, also known as Value Engineering Proposals.

- H. All changes:
 1. Upon request of the Engineer, the Contractor shall provide the following information to support the request for change in cost:
 - a. Copy of original quotations, purchase order or invoices to verify costs included in original bid.
 - b. Copy of all quotations, purchase order or actual invoices to support new costs submitted.
 - c. Copy of all subcontracts.
 - d. Copy of all employee time records and wage rates paid.
 - e. Copy of all insurance and bond costs resulting from change.
 - f. Copy of all quantity takeoff sheets for materials, labor and equipment.
 - g. Certified payroll records.
 - h. Certified composite wage rate statements including employees base rate and Contractor's contributions for fringe benefits, subsistence and travel.

- i. A list of equipment with manufacturer's name and model number and the alphanumeric designation used in the Equipment Rental Rates prepared by the California Department of Transportation.
 - j. Invoices for all rental equipment.
 - k. Other information, as required, to document the labor, equipment and materials used.
2. Article 1.4 below provides expanded Contractor requirements regarding providing access to cost pricing data and related change records.
3. Correlation of Other Items:
 - a. Contractor shall revise Schedule of Values and Application for Payment forms to record each authorized Change Order, WCD or Field Order as a separate line item and adjust the Contract Sum as shown thereon prior to the next monthly pay period.
 - b. Contractor shall revise the Progress Schedules prior to the next monthly pay period to reflect the effects of all authorized Change Order, WCD or Field Order.
 - c. Contractor shall enter changes in Project Record Documents prior to the next monthly pay period.

1.3 COST DETERMINATION

A. Direct Cost Categories:

1. The categories described below are defined to be direct costs. No other type of costs will be allowable as a direct cost. Direct costs shall not include any labor costs or indirect costs pertaining to the Contractor's and subcontractor's managers or superintendents, their office and engineering staffs, the cost of their offices, facilities, vehicles, or anyone not directly employed on such work, nor small tools and supplies. All such items are considered indirect costs which form a part of the Contractor's and subcontractors' overhead expenses.
2. The Owner reserves the right to furnish such labor, materials and equipment as it deems expedient, and the Contractor shall have no claim for profit or added fees on the cost of such items.
3. Direct Field Labor: The cost of labor for workers (including forepersons when authorized by the Engineer) used in actual and direct performance of the work by the Contractor will be the sum of the following:
 - a. The actual wages paid plus any employer payments to, or on behalf of workers for fringe benefits including health and welfare, pension, vacation and similar purposes.
 - b. All payments imposed by State and Federal Laws including, but not limited to, workers' compensation insurance, and social security payments. The rates used

for workers' compensation insurance shall be actual rates paid by the Contractor for each specific craft and broken down by wage rate if applicable to that craft.

- c. Liability insurance burden applied to Contractor's payroll. Contractor shall provide adequate backup information to Engineer to verify this burden rate is indicative of the actual rates paid by the Contractor as a percent of labor.
4. Except as otherwise may be agreed to in writing by the Engineer, the actual wages and benefits paid for manual classifications of Contractor's on-site workers will not, in the aggregate, be more than the current applicable wage for each classification as established by the State of California Director of Industrial Relations.
5. Specifically prohibited from the labor costs are other payroll burden factors such as small tools, bonuses of any kind and safety incentives. Contractor shall include the actual travel and/or subsistence costs, if any, as a separate line item under the labor cost category. Except as otherwise may be agreed to in writing by the Engineer, the actual travel and/or subsistence costs will not be more than established in an applicable Master Labor Agreement or the State of California Director of Industrial Relations.
6. Within twenty (20) business days following Notice to Proceed date, the Contractor shall submit to Engineer for approval a breakdown of labor costs as allowed herein for each expected craft used in the Work showing straight time and overtime rates. These rates would be good during defined period for each craft until wages are changed by the either Union Master Labor Agreements, if Contractor is signatory, or the Department of Industrial Relations.
7. Materials:
 - a. The cost of all materials, including all factory testing, freight and delivery costs of materials, accepted by the Owner and used in performing the work will be the cost to the Contractor from the supplier thereof. All discounts for early payment shall accrue to the Contractor unless the Owner's payment to Contractor is paid to Contractor before discount payment is due in which case discount savings will be fully credited to Owner on next progress billing. All rebates and all returns from the sale of surplus materials shall be credited to the Cost of the Work.
 - b. For materials used in construction of the Project which may have additional uses on other projects for the Contractor's benefit, such as dimensional lumber, beams and plywood to form concrete or temporary diversion pipes, the Contractor shall submit a material unit cost to cover use of these types of materials for the approval of the Owner prior to delivery to the Work Site. This unit cost shall take into account the use of such materials on other past and future projects.
8. Construction Equipment:
 - a. The cost of construction machinery and equipment for changes shall be based on fair rental cost or equivalent rental cost of owned equipment. Such costs will be allowed for only those days or hours during which the equipment is in actual use. Payment shall be based on actual rental and transportation invoices but

shall not exceed the rental rates listed for such equipment in the State of California Department of Transportation publication entitled "Labor Surcharge and Equipment Rental Rates" which is in effect on the date upon which the work is performed.

- b. Owner-operated equipment rates shall not exceed the rates in the aforesaid Rental Rate publication plus the labor costs as provided under Direct Field labor in this Section. The rental cost allowed for equipment will, in all cases, be understood to cover all fuel, supplies, repairs, ownership, and incidental costs and no further allowances will be made for those items, unless specific written agreement to that effect is made. Compensation for idle time of equipment through delays caused by the Owner will be made consistent with Section 8-1.09, Right of Way Delays, of the Caltrans Standard Specifications.
 - c. Individual items of construction equipment or small tools which have a replacement value of \$500 or less shall not be charged to the Change Order work unless it can be demonstrated that the particular item is needed solely for the completion of the Change Order work.
 - d. Within twenty (20) business days following Notice to Proceed date, the Contractor shall submit to Engineer for approval a list of hourly rates for equipment owned by the Contractor and expected to be used in the Work.
9. Special Services: When the Engineer and the Contractor, by agreement, determine that special service or item of extra Work cannot be performed by forces of the Contractor or those of any Subcontractors, service or extra Work item may be performed by a specialist. These types of services will be paid based on an agreed upon current market rate.
- B. Mark-Up Allowances: The Contractor and subcontractors shall be entitled to compensation for indirect field and home office overhead costs, and profit for Change Order work. This compensation shall be in the form of markup percentages applied to the direct cost of the Change Order work, as further described below. The maximum markup which will be allowed for the Contractor's combined overhead and profit will be:
- 1. For work by its own organization, the Contractor may add up to the following percentages:
 - a. Direct Field Labor: 20 percent
 - b. Materials: 10 percent
 - c. Equipment (owned or rented): 15 percent
 - d. Special Services 5 percent
 - 2. For all such work performed by subcontractors, such subcontractor may add the same percentages as the Contractor as listed in Paragraph B.1 above to its actual net increase in costs for combined overhead and profit. The Contractor may add up to five percent (5%) of the subcontractor's total for its combined overhead and profit. No further compensation will be allowed for the Contractor's administration of the work performed by the subcontractor.

3. For all such work done by sub-tier-subcontractors, such sub-subcontractors may add the same percentages as the Contractor as listed above to its actual net increase in costs for combined overhead and profit. The subcontractor may then add up to five percent (5%) of the sub-subcontractor's total for its combined overhead and profit. The Contractor may add up to five percent (5%) of the subcontractor's total for its combined overhead and profit. No further compensation will be allowed for the subcontractors' and Contractor's administration of the work performed by the sub-tier-subcontractor. No additional mark-ups will be allowed for further tier-ed subcontracts.
4. When both additional and deleted work are involved in any one change, the markup allowances of this section shall be applied to the net extra cost of the work, if any, after subtraction of the costs for the omitted work from the extra work. For Change Order work which results in a net decrease in cost a minimum of five percent (5%) markup shall be added to the sum of the direct labor, materials and equipment as a deduction for profit, costs, and reduction in bond and insurance. The Contractor shall not be entitled to nor claim for anticipated profits on work that may be omitted.
5. To the total of the actual costs and fees allowed herein under, not more than two and one half percent (2.5%) shall be added for additional bond and insurance. The compensable percentage for additional bonds and insurance shall be based on the Contractor's actual costs, as substantiated through documentation submitted to the Engineer.
6. The added fixed fees shall be considered to be full compensation, covering the cost of general supervision, overhead, profit, small tools, incidentals and any other general expenses. The above fixed fees represent the maximum limits which will be allowed, and they include but are not limited to the Contractor's and all subcontractors' indirect field and home office expenses and all other costs for cost proposal preparation, schedule analysis and preparation, operation and maintenance manual documentation, and record documents and change order administration.

C. Increased or decreased quantities:

1. Increases or decreases in the quantity of a Contract unit price bid item of work will be determined by comparing the total pay quantity of such item of work with the Bid Schedule quantity.
2. If the total pay quantity of any item of work required under the Contract varies from the Bid Schedule quantity by twenty-five percent (25%) or less, payment will be made for the quantity of work of said item performed at the Contract unit prices therefore, unless eligible for adjustment pursuant to the article on Changes in Character of Work in this Section.
3. If the total pay quantity of any item of work required under the Contract varies from the Bid Schedule quantity by more than twenty-five percent (25%), in the absence of an executed Contract change order specifying the compensation to be paid, the compensation payable to the Contractor will be determined in accordance with Paragraphs 1.3.D, 1.3.E and 1.3.F, as the case may be.

D. Increases of more than 25 Percent:

1. Should the total pay quantity of any item of work required under the Contract exceed the Bid Schedule quantity by more than twenty-five percent (25%), the work in excess of 125 percent of the Bid Schedule quantity will be paid for by adjusting the Contract unit price, as hereinafter provided. At the option of the Engineer, payment for the work involved in such excess will be made on the basis of force account as provided in this Section under Force Account Payment.
2. Such adjustment of the Contract unit price will be the difference between the Contract unit prices and the actual unit costs, which will be determined as hereinafter provided, of the total pay quantity of the item. If the costs applicable to such item of work include fixed costs, such fixed costs will be deemed to have been recovered by the Contractor by the payments made for 125 percent of the Bid Schedule quantity for such item, and in computing the actual unit cost, such fixed costs will be excluded. Subject to the above provisions, such actual unit cost will be determined by the Engineer in the same manner as if the work were to be paid for on a force account basis as provided in this Section under Force Account payment or such adjustment will be as agreed to by the Contractor and the Engineer.
3. When the compensation payable for the number of units of an item of work performed in excess of 125 percent of the Bid Schedule quantity is less than \$5,000 at the applicable Contract unit price, the Engineer reserves the right to make no adjustment in said price if it so elects, except that an adjustment will be further considered if requested in writing by the Contractor.

E. Decreases of more than 25 Percent:

1. Should the total pay quantity of any item of work required under the Contract be less than seventy-five percent (75%) of the Bid Schedule quantity, an adjustment in compensation pursuant to this Section will not be made unless the Contractor so requests in writing. If the Contractor so requests, the revised quantity will be paid for by adjusting the Contract unit price as hereinafter provided. At the option of the Engineer, payment for the quantity of the work of such item performed will be made on the basis of force account as provided in this Section under Force Account Payment. However, in no case shall the payment for such work be less than that which would be made at the Contract unit price.
2. Such adjustment of the Contract unit price will be the difference between the Contract unit price and the actual unit cost of the total pay quantity of the item, including fixed costs. Such actual unit cost will be determined by the Engineer in the same manner as if the work were to be paid for on a force account basis as provided in this Section under Force Account Payment; or such adjustment will be as agreed to by the Contractor and the Engineer.
3. The payment for the total pay quantity of such item of work will in no case exceed the payment which would have been made for the performance of seventy-five percent (75%) of the Bid Schedule of the quantity for such item at the original Contract unit price.

F. Eliminated items:

1. In the event that a part of the Work is to be eliminated in its entirety and such Work is covered by unit price(s) contained in the Bid and/or Contract Documents, the price of the eliminated Work item shall be based on the applicable unit price(s). The Contractor shall be paid five percent (5%) of the total extended amount (bid price times quantity) for the eliminated Work item in consideration of the applicable Contractor's overhead costs.
2. Should any Contract item of the Work be eliminated in its entirety, in the absence of an executed Contract change order covering such elimination, payment will be made to the Contractor for actual costs incurred in connection with such eliminated Contract item if incurred prior to the date of notification in writing by the Engineer of such elimination.
3. If acceptable material is ordered by the Contractor for the eliminated item prior to the date of notification of such elimination by the Engineer, and if orders for such material cannot be canceled, it will be paid for at the actual cost. In such case, the material paid for shall become the property of the Owner and the actual cost of any further handling will be paid for. If the material is returnable to the vendor and if the Engineer so directs, the material shall be returned and the Contractor will be paid for the actual costs of charges made by the vendor for returning the material. The actual cost of handling returned material will be paid for by the Owner.

G. Changes in character of work:

1. If an ordered change in the plans and specifications materially changes the character of work of a Contract unit price bid item from that on which the Contractor based its Bid price, and if the change increases or decreases the actual unit cost of such changed item as compared to the actual or estimated actual unit cost of performing the work of said item in accordance with the plans and specifications originally applicable thereto, in the absence of an executed Contract change order specifying the compensation payable, an adjustment in compensation therefore will be made in accordance with the following:
2. The basis of such adjustment in compensation will be the difference between the actual unit cost to perform the work of said item or portion thereof involved in the change as originally planned and the actual unit cost of performing the work of said item or portion thereof involved in the change, as changed. Actual unit costs will be determined by the Engineer in the same manner as if the work were to be paid for on a force account basis as provided in this Section under Force Account Payment; or such adjustment will be agreed to by the Contractor and the Engineer. Any such adjustment will apply only to the portion of the work of said item actually changed in character. At the option of the Engineer, the work of said item or portion of item which is changed in character will be paid for by force account as provided in this Section under Force Account Payment.
3. If the compensation for an item of work is adjusted under this Section, the costs recognized in determining such adjustment shall be excluded from consideration in

making an adjustment for such item of work under the provisions in this Section under Increases of More Than 25 Percent and Decreases of More Than 25 Percent.

1.4 COST PRICING DATA AND ACCESS TO RECORDS

- A. All cost and pricing data submitted by the Contractor with respect to any change, prospective or executed, or any claim for extra compensation shall be a true, complete, accurate and current representation of actual cost and pricing of the work. The Engineer may require a formal certification as to cost and pricing data submitted by the Contractor.
- B. The Engineer shall have access, upon reasonable notice during normal business hours, to any books, documents, accounting records, papers, project correspondence, project files, scheduling information and other relevant records of the Contractor and all subcontractors directly or indirectly pertinent to the work, original as well as changes and claimed extra work, and the Contract for the purpose of making audit, examination, excerpts and transcriptions and in order to verify or evaluate any change, prospective or executed, or any claim for which compensation has been requested or notice of potential claim has been tendered.
- C. Such books, documents, and other records mentioned above shall include, but are not limited to all those reasonably necessary to determine the accurate amount of direct and indirect costs, job site, and delay and impact costs, however characterized, and shall include the original Bid and all documents related to the Bid and its preparation, as well as the as-planned construction schedule and all related documents.
- D. Such access shall include the right to examine and audit such records and make excerpts, transcriptions, and photocopies at the Owner's cost.

1.5 TIME EXTENSIONS FOR CHANGE ORDERS

If the Contractor requests a time extension for the extra work necessitated by a proposed Change Order, the request must comply with the applicable requirements of Section 01310 – Progress Schedules and Reports.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 01610

SEISMIC DESIGN CRITERIA

PART 1 GENERAL

1.1 SUMMARY

Section includes: Seismic design criteria for the following:

- A. Contractor or vendor provided design for support systems and anchorage of mechanical equipment, electrical equipment and distributed systems (i.e. piping, conduit, ducting, other), shall be, in accordance with section 1.3, and as called for below:
 - 1. Where the mechanical or electrical equipment has a weight of four hundred pounds (400 lbs) or more.
 - 2. Where the mechanical or electrical equipment has a weight of less than four hundred pounds (400 lbs) and a center of mass located four feet (4'-0") or more above the adjacent floor level.
 - 3. Where mechanical or electrical equipment has a weight of twenty pounds (20 lbs) or less or, in the case of a distributed system that has a weight of five pounds per feet (5 lbs/ft) or less, seismic anchorage need not be considered. Where multiple distributed systems are supported off of the same system their combined weight must be used in determining if design is required for the support system.
 - 4. Typical Details may have been provided for supporting mechanical equipment, electrical equipment and distributed systems (i.e. piping, conduit, ducting, other) as well as for stairs, ladders, and other miscellaneous items in the construction documents. These Typical Details are to be used for a minimum standard for style, size, and materials and shall be used as a guide for the contractor in designing the specific item or system utilized on the project Design for these systems shall be provided in the submittal. The design shall include details and calculations stamped and signed by a Civil or Structural engineer registered in the State of California.
- B. Contractor or vender to provide seismic design of tanks and anchorage of tanks.
- C. Other Contractor or vender provided structures or items as specified or indicated on the Drawings.

- D. In addition to the requirements of parts A-C above, provide seismic design for support systems, internal connections and packaged components as called for below:
1. Seismic design of Premanufactured Modular Mechanical and Electrical Systems (i.e. Electrical Switch Boards, Motor Control Centers, Standby Generators and Skid Mounter Systems with an Enclosure), where the Premanufactured Mechanical and Electrical Modules are six feet (6'-0") or taller and that contain or support mechanical and electrical components shall be designed in accordance with ASCE 7-16 Chapter 15 'Nonbuilding Structures Similar to Buildings'. Nonstructural components contained or supported within the modular systems shall be designed in accordance with ASCE 7-16 Chapter 13. Provide design that includes details and calculations stamped and signed by a Civil or Structural engineer registered in the State of California.
 2. If Premanufactured Modular Mechanical and Electrical Systems (i.e. Electrical Switch Boards, Motor Control Centers, Standby Generators and Skid Mounter Systems with an Enclosure) is 'Prequalified' in accordance with ASCE 7-16 Chapter 13 section 13.2.2, it is exempt from the requirements of Section 4.a above. Manufacturer shall provide seismic qualification based on a nationally recognized testing standard procedure, such as ICC-ES AC 156. Seismic qualification by experience data based on nationally recognized procedures is also acceptable. Seismic pre-approval from OSHPD will also satisfy this requirement. Certification must be provided for either listed option. Certification must show seismic capacities are equal to or exceed the seismic demands that are project specific.
 3. Section 1.1.D shall not apply to Skid-Mounted Equipment without an enclosure (i.e. pumps), and single large components, such as air handlers, cooling towers, chillers and boilers.
- E. In accordance with the Building Code, internal elements in a water bearing structures, such as equipment and accessories that are attached to the structure, shall be designed for the lateral loads due to sloshing liquid in addition to the inertial forces.
- F. All design calculations shall be per the 2019 CBC and the 2019 CBC Chapter 16 load combinations.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section 01300: Submittals.

Appendix A: Geotechnical Report, San Juan Bautista to Hollister Sanitary Force Main Project, San Benito County, California (Crawford & Associates, Inc., September 2022)

1.3 REFERENCES

- A. International Code Council (ICC).
- B. 2019 California Building Code (CBC).

- C. American Society of Civil Engineers
 - 1. 7-16 Minimum Design Loads for Buildings and Other Structures (ASCE 7)
- D. American Concrete Institute
 - 1. Anchoring to Concrete of 318-14 Building Code Requirements for Structural Concrete (ACI 318-14)
 - a. Chapter 17 -Anchoring to Concrete
- E. California Office of Statewide Health Planning and Development's (OSHPD) Seismic Preapproval.

1.4 SYSTEM DESCRIPTION

Design Requirements: Design in accordance with the requirements of the 2019 CBC and ASCE 7.

- A. Risk Category, III
- B. Site Class, D
- C. Spectral Acceleration Parameter, S_s : 1.987g
- D. Spectral Acceleration Parameter, S_1 : 0.82g
- E. Design Spectral Acceleration at short period, S_{DS} : 1.59g
- F. Design Spectral Acceleration at 1-Second Period, S_{D1} : 1.367g
- G. Component Amplification Factor, a_p : In accordance with ASCE 7-16, Tables 13.5-1 and 13.6-1.
- H. Component Response Modification Factor, R_p : In accordance with ASCE 7-16, Tables 13.5-1 and 13.6-1.
- I. Overstrength Coefficients, Ω_o : In accordance with ASCE 7-16, Tables 13.5-1 and 13.6-1
- J. Component Importance Factor, I_p : In accordance with ASCE 7-16, Section 13.1.3 but not less than 1.25
- K. Component Response Modification Factor, R : In accordance with ASCE 7-16, Tables 15.4-1 and 15.4-2
- L. Overstrength Coefficients, Ω_o : In accordance with ASCE 7-16, Tables 15.4-1 and 15.4-2

- M. Deflection Amplification Factor, Cd: In accordance with ASCE 7-16, Tables 15.4-1 and 15.4-2
- N. Importance Factor, Ie: In accordance with ASCE 7-16, Section 15.4.1.1 but no less than 1.25.
- O. Do not use friction to resist sliding due to seismic forces.
- P. Do not use more than 60 percent of the weight of the mechanical and electrical equipment for designing anchors for resisting overturning due to seismic forces.
- Q. Do not use more than 60 percent of the weight of the tank for resisting overturning due to seismic forces.
- R. Anchor design capacity is to be independent of reinforcing steel in the concrete providing ductility.
- S. Use anchor bolts, bolts, or welded studs for anchors for resisting seismic forces. Anchor bolts used to resist seismic forces shall have a standard hex bolt head. Do not use anchor bolts fabricated from rod stock with an L or J shape.
 - 1. Do not use concrete anchors, flush shells, adhesive anchors, powder actuated fasteners, or other types of anchors unless indicated on the Drawings or accepted in writing by the Engineer.
 - 2. Seismic forces must be resisted by direct bearing on the fasteners used to resist seismic forces. Do not use connections which use friction to resist seismic forces.
- T. Where adhesive anchors are allowed, personnel used for installation shall be certified by an applicable certification program per ACI 318-14 section 17.8.2.2.

1.5 SUBMITTALS

- A. Shop Drawings and Calculations: Submit shop drawings and seismic calculations in accordance with Section 01300. Calculations to be attached to the approved equipment/piping/tank submittal (to coordinate appropriate dimensions, weights and pertinent information).
- B. Calculations shall be signed and stamped by a Civil or Structural Professional Engineer licensed to practice in the state where the project is located. All calculations shall be provided in English units.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 01615

WIND DESIGN CRITERIA

PART 1 GENERAL

1.1 SUMMARY

Section includes: Wind design criteria for the following:

- A. Section Includes: Wind design criteria for the following:
 - 1. Design of equipment, light poles, flag poles, antenna poles, freestanding walls, solid signs, tanks, facilities, buildings and all other structures as indicated in ASCE 7.
 - 2. Wind design shall be considered for all cases listed, unless equipment is 'housed' in an enclosed structure or when it can be demonstrated that Wind design does not govern.
 - 3. The minimum Wind loading for other elements that are not defined in ASCE 7 shall be sixteen pounds per square foot (16 lbs/ft²) multiplied by its area.
- B. Design of anchorage for the Item A, listed above.
- C. Other structures or items as specified or indicated on the Contract Drawings and as required by the latest California Building Code.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section 01300: Submittals

1.3 REFERENCES

- A. International Code Council (ICC).
- B. 2019 California Building Code (CBC).
- C. American Society of Civil Engineers.
 - 1. ASCE 7-16 Minimum Design Loads for Buildings and Other Structures (ASCE 7).

1.4 SYSTEM DESCRIPTION

Design Requirements: Design in accordance with the requirements of the 2019 CBC and ASCE 7.

- A. Risk Category: III
- B. Basic Wind Speed (3 second gust):
 - 1. Ultimate design wind speed, $V_{ULT} = 115$ mph
 - 2. Nominal design wind speed, $V_{ASD} = 90$ mph
- C. Exposure Category: D
- D. Topographic Factor, K_{tz} = shall be in accordance with ASCE 7-16 Standard.
- E. Use anchor bolts, bolts, or welded studs for anchors for resisting wind forces. Anchor bolts used to resist wind forces shall have a standard hex bolt head. Do not use anchor bolts fabricated from rod stock with an L or J shape.
 - 1. Do not use concrete anchors, flush shells, adhesive anchors, powder actuated fasteners, or other types of anchor unless indicated on the Drawings or accepted in writing by the Engineer.
 - 2. Wind forces must be resisted by direct bearing on the anchors used to resist wind forces. Do not use connections which use friction to resist wind forces.
- F. Where adhesive anchors are allowed, personnel used for installation shall be certified by an applicable certification program per ACI 318-14 section 17.8.2.2.
- G. Anchor design capacity is to be independent of reinforcing steel in the concrete providing ductility.

1.5 SUBMITTALS

- A. Shop Drawings and Calculations: Submit complete shop drawings and wind calculations in accordance with Section 01300.
- B. Calculations shall be signed and stamped by a Civil or Structural Professional Engineer licensed to practice in the state where the project is located. All calculations shall be done in English units.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 01620

QUALITY CONTROL AND INSPECTION

PART 1 GENERAL

1.1 CONTRACTOR'S QUALITY CONTROL

- A. General: The Contractor is to ensure that products, services, workmanship and Site conditions comply with the requirements of the Contract Documents by coordinating, supervising, testing and inspecting its Work. The Contractor shall utilize only suitably qualified, skilled and trained personnel experienced in the tasks required to complete the Work in accordance with the quality requirements of the Contract Documents. Should there be no quality basis specifically prescribed for any portion of the Work, the quality and testing procedures shall be in accordance with the best-accepted practices of the construction industry for the locale of the Project, for projects of this type, or standards set by engineering or technical societies (e.g. ASTM or ASHRAE), whichever is more stringent.

- B. Quality of Work: The Contractor's quality of Work shall include, but not be limited to, the following requirements:
 - 1. Quality of Products: Unless otherwise indicated or specified, all products shall be new, free of defects, and fit for the intended use. Materials manufactured over one year, prior to shipment to the Project site, shall not be allowed on the Project (as identified by manufacturer's serial numbers/labels/stamps).
 - 2. Quality of installation: All Work shall be produced plumb, level, square and true, or true to indicated angle, and with proper alignment and relationship between the various elements, as shown on or required by Contract Documents.
 - 3. Protection of Completed Work: Take all measures necessary to preserve completed Work free from damage, deterioration, soiling, and staining, until acceptance by Owner.
 - 4. Standards and Code Compliance and Manufacturer's Instructions and Recommendations: Unless more stringent requirements are indicated or specified, comply with manufacturer's instructions and recommendations, reference standards and building code research report requirements in preparing, fabricating, erecting, installing, applying, connecting, and finishing Work.
 - 5. Deviations from Standards and Code Compliance and Manufacturer's instructions and Recommendations: Secure Owner's advanced written consent. Document and explain all deviations from reference standards and building code research report

requirements and manufacturer's product installation instructions and recommendations, including acknowledgement by the manufacturer that such deviations are acceptable and appropriate for the Project.

6. Verification of Quality: Work shall be subject to verification of quality by Owner in accordance with provisions of the Contract Documents.
- C. Defective Work: Defective Work shall be modified, replaced, repaired or redone by the Contractor at no change in Contract Sum or Contract Time. Acceptance of Defective Work, without specific written acknowledgement and approval of Owner, shall not relieve the Contractor of the obligation to correct such Work. Should Owner determine that it is not feasible or in Owner's interest to require Defective Work to be repaired or replaced, an equitable reduction in Contract Sum shall be made by agreement between Owner and Contractor. If equitable amount cannot be agreed upon, a Construction Change Directive will be issued and the amount in dispute resolved in accordance with the Contract Documents. Owner and Owner's consultants disclaim any and all responsibility for Work produced not in conformance with the Drawings and Specifications. Contractor shall have full responsibility for all consequences resulting from Defective Work, including without limitation all delays, disruptions, extra inspection and correction costs by Contractor and Owner and re-Work, and extra time and costs of all types. Contractor waives excuses for defective work relating to Owner's prior review of Submittals and/or prior failure to notice Defective Work in place on inspection.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

3.1 INSPECTION AND TESTING

A. General:

1. Where the Contract Documents require work to be field tested or approved, it shall be tested in the presence of the Construction Manager or its authorized representative. The Construction Manager shall have the right to witness all on-site tests performed by the Contractor and any shop tests. The results of any tests performed by the Contractor shall be made available for the information of the Construction Manager. Inspections, tests or favorable reviews by the Construction Manager or others shall not relieve the Contractor from its obligation to perform the work in accordance with the requirements of the Contract Documents or for its sole responsibility for the quality of workmanship and materials.
2. Except as specifically required under the technical specifications for testing and inspection, all tests for materials furnished by the Contractor will be done in accordance with commonly recognized standards of national organizations. Where

tests are to be performed by the Construction Manager or by an independent laboratory or agency, the Contractor shall furnish such samples of all materials as required by the Construction Manager without charge. The sample or samples of materials to be tested shall be selected by such laboratory or agency, or the Construction Manager, and not by the Contractor. No material for which the Contract Documents require the submittal and approval of tests, certificates of compliance or other documentation shall be incorporated in the Work until such submittal has been made and approved. The Contractor shall provide safe access, including plants where materials or equipment are manufactured or fabricated, for the Construction Manager and inspectors to adequately inspect the quality of work and the conformance with the Contract Documents. The Contractor shall furnish the Construction Manager the necessary labor and facilities for such things as excavation in the compacted fill to the depths required to take samples. The Contractor shall provide adequate lighting, ventilation, ladders and other protective facilities as may be necessary for the safe performance of inspections.

3. Upon completion of the Work the Construction Manager will conduct a final inspection as provided in Section 00700 – General Conditions. Records shall be available at all reasonable hours for inspection by other local or State agencies to ascertain compliance with laws and regulations.
4. Neither the employment of independent testing and inspection agency nor observations or tests by Owner and Owner’s consultants shall in any manner relieve the Contractor of obligation to perform Work in full conformance to all requirements of the Contract Documents. The Owner reserves the right to reject all Work not in conformance to the requirements of the Contract Documents, or otherwise Defective.

B. Notice:

1. The Contractor shall notify the Construction Manager in writing at least twenty-four (24) hours before any field testing or special inspections are required to be performed by the Construction Manager or independent laboratory furnished by the Owner. The Contractor shall notify the Construction Manager at least two hours before any inspection is required to be performed or to witness the Contractor’s on-site field testing.
2. Whenever the Contractor varies the period during which work is carried on each day, the Contractor shall give due notice to the Construction Manager so that proper inspection may be provided. Any work done in the absence of the Construction Manager shall be considered to be rejected. It will be the responsibility of the Contractor to demonstrate to the satisfaction the Construction Manager that the work meets all conditions of the specification and if such conditions are not met to remove the work.
3. The Contractor shall give the Construction Manager written notification at least thirty (30) days prior to the shipment of materials and equipment to be tested and/or inspected at the point of origin. Satisfactory tests and inspections at the point of origin shall not be construed as a final acceptance of the materials and equipment nor shall such tests and inspections preclude retesting or reinspection at the site of the Work.

C. Costs of Testing:

1. The Contractor shall be responsible for, and shall pay for, all quality control and off-site tests of materials required including all source and mix design tests for the approval of soil and concrete materials. The Owner will perform the soils and concrete confirmation tests detailed in the Technical Specifications during the performance of the Work. Owner will retain and pay a qualified testing agency to perform soil compaction testing and work identified as requiring special inspections and testing as defined by CBC section 1701. All other testing required by the technical specifications shall be the responsibility of the Contractor.
2. The Contractor shall be responsible for, and shall pay for, all source quality control and all on-site tests of materials required, except those tests specifically noted to be performed and paid for by the Owner.
3. The Construction Manager shall have the authority to require additional tests or inspections due to the manner in which the Contractor executes its work. Examples of such additional tests and inspections include; tests of materials substituted for previously accepted materials, or substituted for specified materials, or retests made necessary by failure of material to comply with the requirements of the Specifications. Where such tests and inspections are required by Contract to be performed by the Owner, the Owner will pay for the additional tests and inspections but will issue an unilateral Change Order to deduct these costs from the Contract price.

D. Work Covered Prior to Inspection and/or Testing: Work requiring inspection and/or testing shall not be concealed or buried prior to the acceptance of such inspection or testing. Work covered without the favorable review or consent of the Construction Manager shall, if required by the Construction Manager, be uncovered for inspection and/or testing at the Contractor's expense.

E. Work Covered With Prior Inspection and/or Testing: If the Construction Manager considers it necessary or advisable that covered work which was favorably inspected and tested be uncovered for reinspection and/or retesting, the Contractor, at the Construction Manager's request, will uncover, expose or otherwise make available for observation, inspection or testing as the Construction Manager may require, that portion of the work in question, furnishing all necessary labor, materials, tools, and equipment. If it is found that such work is defective, the Contractor will bear all expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction. If, however, such work is not found to be defective the Contractor will be allowed an increase in the Contract price or an extension of the Contract time, or both, directly attributable to such uncovering, exposure, observation, testing and reconstruction, and a Change Order shall be issued for such additional work.

F. Coordination of County, City Building and Other Inspections: The Contractor is completely responsible for scheduling all County, City and any other agency inspections in accordance with the County, City and agency requirements. The Contractor shall notify the Construction Manager of all building and other work component inspection notices and

schedules. Failure of the Contractor to properly coordinate and schedule these inspections shall not be cause for time extensions.

- G. **Special Tests and Inspections:** As provided for in the Contract Documents, laws and regulations, specialized tests and inspections shall be performed by special inspectors certified by the International Code Council (ICC). Unless otherwise stated in the Contract Documents, each of these tests will be performed and paid for by the Owner.
- H. **Inspections and Tests by Serving Utilities:** Unless otherwise indicated in the Contract Documents, the Contractor shall cause, schedule and conduct inspections and tests by serving Utilities required for the Work under this Contract.
- I. **Inspections and Tests by Serving Manufacturers:** Unless otherwise indicated in the Contract Documents, the Contractor shall cause all required tests and inspections to be conducted by materials, equipment or systems manufacturers. Additionally, all tests and inspections required by materials, equipment or systems manufacturers as conditions of warranty or certification of Work shall be made, the cost of which shall be included in the Contractor's bid.

3.2 TEST WATER

- A. The Owner will furnish non-potable water for testing to the Contractor, free of charge, as is available from the Owner's water system. The conveyance of water shall be the responsibility of the Contractor and shall be at the Contractor's expense. Use of the reclaimed water by the Contractor must be approved by the Central Coast Regional Water Quality Control Board Executive Officer.
- B. The Contractor shall submit a written request of water needs for testing including a description, volume, location and duration of use to the Construction Manager for approval. The Construction Manager will designate the type of water, locations where connections may be made and the backflow protection, if required. The Contractor is responsible for providing, installing and testing the backflow prevention device at the Contractor's expense. The Construction Manager may also require a meter on the connection depending on the volume of water requested.
- C. There may be short periods of time when water is not available from the Owner's system.

END OF SECTION

SECTION 01640

PRODUCT HANDLING

PART 1 GENERAL

1.1 DESCRIPTION

Work Included: Protect products scheduled for use in the work by means including, but not necessarily limited to, those described in this Section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Documents affecting work of this Section include, but are not necessarily limited to:

- A. Section 00700: General Conditions
- B. Section 00800: Supplementary Conditions
- C. Section 01010: General Construction Information and Requirements

Additional procedures also may be prescribed in other sections of these Specifications, including specific handling instructions recommended in the Manufacturer's literature.

1.3 QUALITY ASSURANCE

Include within the Contractor's quality assurance program such procedures as are required to assure full protection of work and materials.

1.4 MANUFACTURERS' RECOMMENDATIONS

Except as otherwise approved by the Engineer, determine and comply with manufacturer's recommendations on product handling, storage, and protection. Rotating equipment storage shall include recommended manual rotation frequency with a log prepared by the Contractor to demonstrate specification compliance. The Contractor shall contact the Engineer prior to performing the scheduled rotation. An Inspector may accompany the Contractor's workmen during the required rotation.

1.5 PACKAGING AND DELIVERY

- A. Deliver products to the job site in manufacturer's packaging material with seals unbroken and labels intact until time of use. Promptly remove damaged material and unsuitable items from the job site, and promptly replace with material meeting the specified requirements, at no additional cost to the Owner.
- B. The Engineer may reject as non-complying such material and products that do not bear identification satisfactory to the Engineer as to manufacturer, grade, quality, and other pertinent information.
- C. Copies of all equipment delivery tags shall be provided to the Engineer on a daily basis with delivery tag indicating equipment number, item description, model number, and serial number.
- D. Packing and Marking:
 - 1. All equipment shall be adequately and effectively protected against damage from moisture, dust, handling or other cause during transport from manufacturer's or supplier's premises to site.
 - 2. Each item or package shall be clearly marked with a fitting or distinguishing mark which shall be shown on the packing lists. Copies of packing lists shall be delivered to the Engineer.
 - 3. Stiffeners shall be used where necessary to maintain shapes and to give rigidity. Parts of equipment shall be delivered in assembled or sub-assembled units where possible.
- E. Identification of Equipment: Each item of equipment shall have firmly affixed to it a label or tag with its equipment number or other discrete identifying mark.
- F. Delivery of Equipment: The Owner's personnel will not accept materials or equipment deliveries for the Contractor.

1.6 PROTECTION

- A. Protect finished surfaces, including jambs and soffits of openings used as passageways, through which equipment and materials are handled.
- B. Provide protection for finished floor surfaces in traffic areas prior to allowing equipment or materials to be moved over such surfaces.
- C. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by the Owner.

- D. Protect materials and equipment from the effects of weather, sunlight, extreme temperatures, etc., when exposure of the materials or equipment to the elements would cause degradation of, or damage to, the material, equipment or coating system. Progress payments for materials and equipment stored on-site will only be made when the materials or equipment are suitably stored.
- E. Storage of Equipment: During the interval between the delivery of equipment to the site and installation, all equipment shall be safely stored in a manner acceptable to the Engineer. Equipment shall be stored in an enclosed space affording protection from vandalism, weather, dust and mechanical damage and providing favorable temperature, humidity and ventilation conditions to ensure against equipment deterioration. Rotating equipment shall be turned or exercised as recommended by the Manufacturer.
- F. Protection of Equipment after Installation: After installation, all equipment shall be protected as specified by the manufacture. During concrete operations, including finishing, all equipment that may be affected by cement dust must be completely covered. During painting operations, all grease fittings and similar openings shall be covered to prevent the entry of paint. Electrical switchgear, unit substation and motor load centers shall not be installed until after all concrete work and sandblasting in those areas have been completed and accepted.
- G. Exercise installed equipment and provide maintenance per manufacturer's recommendations until the project is accepted by the Owner.

1.7 REPAIRS AND REPLACEMENTS

- A. In event of damage, promptly make replacements and repairs to the approval of the Engineer and at no additional cost to the Owner.
- B. Additional time required to secure replacements and to make repairs will not be considered by the Engineer to justify an extension in the Contract Time of Completion.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 01656

DISINFECTION OF WATER LINES

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of the disinfection of all portions of the new utility water system by the Contractor, including valves and stops and any portion of the existing connecting system that might have become contaminated during construction activities. Disinfection of water lines shall be done in accordance with AWWA C651 and this section.

1.2 SUBMITTALS

- A. Submit plan for conveying water and protecting the existing utility water system used to supply disinfection water.
- B. Submit plan for disposal of chlorinated water.
- C. Submit test plan indicating fill location, bleed location(s), test locations(s) and other pertinent information.

PART 2 MATERIALS

2.1 CALCIUM HYPOCHLORITE

- A. HTH, by Olin Chemicals, Olin Corporation, 120 Long Ridge Road, Stamford, CN 06904, or similar commercial product having approximately 70 percent available chlorine.
- B. Mixture: A 5-percent solution shall be made by mixing 5 percent of powder with 95 percent water, by weight, first into a paste, then thinning to slurry by the addition of water.

2.2 SODIUM HYPOCHLORITE

Liquid sodium hypochlorite with a 12% minimum concentration.

PART 3 EXECUTION

3.1 METHOD

The method of chlorination shall be “continuous-feed method” in accordance with AWWA C651. Notify Engineer, in writing, at least 48 hours prior to all disinfection procedures and testing.

3.2 FLUSHING

Prior to commencing the disinfection process, flush the water system to remove all dirt and debris. Fill the system at a rate not to exceed 1 foot per second. Once filled, open valves and appurtenances as necessary to achieve flushing velocities on the order of 3 feet per second. Continue flushing until the receiving water is free of visible dirt and impurities. Commence disinfection operations only after the successful completion of flushing and pressure testing operations in accordance with Section 01666. Operation of all valves shall be performed by the Owner unless the Contractor is otherwise directed in writing.

3.3 DOSAGE

Place enough disinfecting material in the system to insure a chlorine dosage of 50 parts per million. This is equivalent to 10 ounces of commercial hypochlorite powder to each 1,000 gallons of water.

3.4 FILLING SYSTEM

Fill entire system with the chlorine solution at a rate not to exceed 1 foot per second. Open all taps and valves and leave open until a strong odor of chlorine is noticeable in the water coming from the outlets, after which close the taps and valves.

3.5 TEST PERIOD

Allow chlorinated water to remain in the system a minimum of 24 hours, and then thoroughly flush the system. During retention period, operate all valves, stops, and other appurtenances to assist the disinfection. Testing shall be done in strict accordance with AWWA C651 disinfection standards.

3.6 DISPOSAL OF CHLORINATED WATER

Dispose of chlorinated water so that no water having a chlorine residual reaches a surface stream.

On completion of disinfecting, the mains and appurtenances shall be thoroughly flushed until the chlorine concentration in the water leaving the main is no higher than that generally prevailing in the system (less than 2 mg/l). Waste chlorinated water shall cause no damage to the environment.

A neutralizing chemical shall be applied to the water to thoroughly neutralize any residual chlorine. Disposal of chlorinated water shall only be done in full compliance with all applicable Federal, State and local laws, regulations and ordinances. Chlorinated water shall not be discharged without first being neutralized and authorized by the Engineer.

3.7 BACTERIOLOGICAL EXAMINATION

Contractor shall install suitable sampling taps. After the system has been thoroughly flushed, the Owner will take samples from representative points in the system, in sterile bottles, and submit to proper authorities as directed by the Engineer for bacteriological examination. If the report is unsatisfactory, the Contractor shall repeat the disinfection procedure until satisfactory results are obtained. Retesting shall be performed at no additional cost to the Owner. Re-testing fees include lab work, sample collection, and applicable inspection fees.

END OF SECTION

SECTION 01666

TESTING OF PIPELINES, GRAVITY SEWER LINES, AND MANHOLES

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section consists of leak testing all pipelines, gravity sewer lines, manholes, and related valves and fittings. Repaired work shall be retested and if still rejected shall be repaired or replaced to the satisfaction of the Engineer at no additional cost to the Owner.
- B. Testing Methods:
 - 1. Pipelines - water test,
 - 2. Gravity Sewer Lines - air test,
 - 3. Manholes - vacuum test,
 - 4. SDR 26&35 – additional mandrel testing.

1.2 QUALITY ASSURANCE

- A. Flow meters shall record the actual volume plus or minus 2 percent.
- B. Air test gauges shall be ANSI/ASME B40.1, Grade 3A (plus or minus 0.25 percent of full scale accuracy), 15 psi dial range.
- C. Water test gauges shall be ANSI/ASME B40.1, Grade 2A (plus or minus 0.5 percent of full scale accuracy), dial range approximately twice the required test pressure.

1.3 SUBMITTALS:

- A. In accordance with Section 01300.
- B. Accuracy certification by approved independent testing labs for flow meters and test gauges. Certifications shall be dated no more than 90 days prior to actual system testing.

- C. Prior to testing, provide the following information:
 - 1. All Tests: Describe precautions that will be taken to protect system equipment that might be damaged under test pressures, and the proposed method for rerouting sewer flows where the system must remain in service. Provide pipe test acceptance form, example provided in Appendix A of this Section.
 - 2. High or Low Pressure Water Test: Describe the proposed method for disposal of water used in line testing, coordinate with requirements of specification Section 01656.
 - 3. Test Bulkheads: Submit test bulkhead locations and design calculations, pipe attachment details, and methods to prevent excessive pipe wall stresses.
 - 4. Air Test: Describe safety devices on air test equipment, and personnel safety precautions during air test.

1.4 PROJECT CONDITIONS

- A. Testing shall not be performed until each system has been flushed or thoroughly cleaned in accordance with procedures in the section that describes sewer line installation.
- B. Water for flushing and testing is available as noted in Section 01010.

1.5 TEST RECORDS

Provide records of each piping installation during the testing. These records shall include:

- A. Date of Test.
- B. Identification of pipeline, or pipeline section, tested or retested.
- C. Identification of pipeline material.
- D. Identification of pipe specification.
- E. Test fluid.
- F. Test pressure.
- G. Remarks: Leaks identified (type and location), types of repairs, or corrections made.
- H. Certification by Contractor that the leakage rate measured conformed to the specifications.

PART 2 MATERIALS

2.1 MANUAL AIR-RELEASE VALVES FOR BURIED PIPING

Provide temporary manual air-release valves for pipeline test. Construct the pipe outlet in the same manner as for a permanent air valve and after use, seal with a blind flange, pipe cap, or plug and coat the same as adjacent pipe.

2.2 TEST BULKHEADS

Design and fabricate test bulkheads per section VIII of the ASME Boiler and Pressure Vessel Code. Materials shall comply with Part UCS of said code. Design pressure shall be at least 2.0 times the specified test pressure for the section of pipe containing the bulkhead. Limit stresses to 70% of yield strength of the bulkhead material at the bulkhead design pressure. Include air-release and water drainage connections.

2.3 TESTING FACILITIES

Provide all necessary temporary facilities required to accommodate specified testing.

PART 3 EXECUTION

3.1 GENERAL

- A. Perform testing in the Engineer's presence after backfill and proper compaction of trenches. Where lines are installed under roadways, parking areas, concrete, or structures, perform tests before and after completion of final subgrade preparation and prior to application of surface courses. Notify Engineer in writing at least 48 hours prior to testing. Notification shall be by the Contractor submitting a test form which shall indicate test date, pipeline to be tested, test requirements and requirements of the Owner.
- B. Prepare each section for testing, using adequate bracing; protect system equipment susceptible to damage by test pressures; make provision for installation of Owner's pressure gauge in parallel with Contractor's gauge, if so requested; and maintain services where required.
- C. Testing requirements are stipulated in Laws and Regulations; are specified in the specifications covering the various types of piping; and are specified herein. Requirements in Laws and Regulations supersede other requirements of Contract Documents, except where requirements of Contract Documents are more stringent, including higher test pressures, longer test times, and lower leakage allowances.

3.2 PIPELINE TEST PROCEDURE

- A. After completion of the installations, Contractor shall test all piping and pipework as herein specified. The Contractor shall furnish all material, equipment, and labor for testing the piping systems.
- B. Each system may be tested as a unit or in sections as directed by the Engineer, but each complete system shall successfully meet the requirements specified herein before acceptance by the Engineer.
- C. Clean piping before pressure or leak tests.
- D. For water testing, the test shall be made by closing valves or providing bulkheads or plugs and filling the pipe lines with water, with provisions made for the release of all air in the lines. Lines shall be filled with water 24 hours prior to testing for leakage to allow for absorption of water by pipe or joint material.
- E. Specified pressures or heads of water shall be maintained for the periods of time tabulated herein, except where indicated to be air or vacuum, and the leakage determined. Leakage shall not exceed the tabulated values.
- F. Test pressures shall be as indicated herein and in Section 15010. The pressure shall be maintained at all times during the test by restoring it whenever it falls an amount of 5 psi for test pressures above 20 psi and 2 psi for test pressures below 20 psi.
- G. If leakage is more than allowable, the Contractor shall repair or replace the pipeline and retest it. Do not use paints, asphalts, tars, or other type of pipe compounds to eliminate leaks.
- H. The Contractor shall take all necessary precautions to prevent any joints from drawing while the pipelines and their appurtenances are being tested and he shall, at his own expense, repair any damage to the pipes and their appurtenances, or to any other structures, resulting from or caused by these tests.
- I. Where any section of the piping contains concrete thrust blocks or encasement, wait at least 10 days after the pour to begin testing.
- J. After a satisfactory test, remove the testing fluid, remove test bulkheads and other test facilities, and restore the pipe coatings.

Testing Requirements

Type of Pipe	Test Medium	Minimum Test Period	Maximum Allowable Leakage
Sanitary Drain	(a)	(a)	(a)
Liquid-Containing Lines	Water	2 hours	(b)

(a) Per applicable plumbing code

(b) Exposed pipe shall have no visible leaks. Otherwise, allowable leakage shall be determined by the following formula:

$$L = \frac{SD (P)^{\frac{1}{2}}}{133,200}$$

Where:

L = allowable leakage, in gallons per hour

S = length of pipe tested, in feet

D = nominal diameter of the pipe, in inches

P = average test pressure during the leakage test, in pounds per square inch (gauge), where test pressure shall be the higher of 2x working pressure, or minimum of 150 psi.

(c) Water or air testing allowed above groundwater. For water testing, leakage rate is for piping installed above groundwater level. If pipe is installed below groundwater, use air test. For air, see subsection 3.3, testing of gravity sewer piping.

3.3 GRAVITY SEWER SYSTEMS TEST PROCEDURE

A. Air Test: Test lines less than or equal to 30 inches in diameter between manholes with low pressure air. Safety requires regulator or relief valve on pressurizing equipment, set at 8 psig. No one will be allowed in manholes while there is air pressure against test plugs.

Lines greater than 30-inches in diameter shall include individual joint testing as specified.

B. Plug all pipe outlets to resist test pressure. Give special attention to laterals. Plug all other pipes in both upstream and downstream manholes.

C. Supply air into the line until the test pressure of 3.5 psi in excess of the ground water pressure is attained or 8 psi, whichever is greater. Allow at least 5 minutes for air temperature in the test section to stabilize.

D. Reestablish the test pressure, and start a stop watch. Determine the time required for pressure to drop 1.0 psig.

E. For 6-inch and smaller pipe only, if the pressure does not drop during the stabilization period, and no additional air has been added, the section undergoing test will have passed without further testing.

- F. The pipe section will also have passed if the time observed for the pressure to drop 1.0 psig is greater than that determined by using Table 1.

Determine the test time from the table below (minimum time 60 seconds).

Minimum Test Time for Various Pipe Sizes

Size	Time per 100-feet	Size	Time per 100-feet	Size	Time per 100-feet
4-inch	0.3-min.	12-inch	1.8-min.	24-inch	3.6-min
6-inch	0.7-min.	15-inch	2.1-min.	27-inch	4.2-min.
8-inch	1.2-min.	18-inch	2.4-min.	30-inch	4.8-min.
10-inch	1.5-min.	21-inch	3.0-min.		

- G. When a combination of more than one pipe size is under test, the calculated time for the larger pipe shall apply.
- H. For larger sewer pipes, refer to the material specification for testing requirements.
- I. Any portions which fail the test shall be repaired and retested until they meet the requirements in the attached table of this section.

3.4 VISUAL TEST FOR PIPELINES

Interior visual inspection shall be conducted by the Owner and/or CCTV inspection may be performed by the Owner. The Owner’s Inspector shall visibly inspect the line and record findings. Preliminary inspections may be performed by outside contractors, but shall not be accepted by Engineer as an official record.

The sewer system shall be completely cleaned by an approved method prior to visual inspection. The sewer system shall be rejected if any of these conditions exist:

- A. Standing water or sags greater than ½-inch in depth.
- B. Standing water in services.
- C. Offset joints.
- D. Cracked pipe.
- E. Infiltration.

3.5 TELEVISION TEST FOR PIPELINES

Any portion of the new piping system may be TV'd by the Owner. Any construction deficiencies discovered during TV'ing shall be corrected by the Contractor and the line TV'd again. There will be no cost to the Contractor for the initial TV test. All re-inspection costs including soil density testing, quality assurance observation, and re-testing inspection, shall be paid for by the Contractor.

3.6 DEFLECTION TESTING OF FLEXIBLE PIPE

All flexible PVC pipe shall be tested for over-deflection as specified below.

3.7 LEAKAGE TEST FOR MANHOLES

Sewer manholes shall pass a vacuum test consisting of the following criteria and procedures:

- A. The Contractor shall notify the Engineer at least 72-hours in advance to be present during testing without exception.
- B. The test shall be performed after assembly of the manhole, but prior to backfilling. The Contractor shall perform the test and supply all test equipment. A City Inspector shall witness the test results.
- C. Lift holes shall be filled with non-shrinking grout prior to testing.
- D. Pipe entering and existing the manhole shall be plugged. Securely brace the plugs to prevent them from being drawn into the manhole. Unused channels shall be permanently plugged with a plastic or clay stop and filled with grout.
- E. A vacuum of 10-inches of mercury shall be drawn to start the test. The amount of time required for the vacuum to drop to 9-inches shall be measured. The manhole will pass the test if the amount of elapsed time is greater than 60 seconds for a 48-inch manhole, 75 seconds for a 72-inch manhole, and 120 seconds for a 84-inch manhole. A liquid filled vacuum gauge shall be used for testing.
- F. If the manhole fails the initial test, necessary repairs shall be made with a non-shrink grout while the vacuum is still being drawn. Retesting shall proceed until the elapsed times are satisfactory.
- G. After passing the vacuum test, all joints shall then be mortared, inside and out. Outside mortared joints shall be allowed to dry before backfilling.

3.8 ADDITIONAL TESTING FOR PLASTIC PIPING AND FITTINGS

- A. Field Inspection for Plastic Pipe and Fittings: Installed pipe shall be tested to ensure that vertical deflections for plastic pipe do not exceed the maximum allowable deflection. All

SDR 26 and 35 PVC Sewer Pipe shall be mandrel tested by the Contractor as outlined below. All C905 PVC pipe may be measured by the Engineer for over-deflection above 3%. Maximum allowable deflections for SDR 26 and 35 pipe shall be governed by the mandrel requirements stated herein and shall nominally be the percentage listed of the maximum average ID.

Nominal Pipe Size	Percentage
Up to and including 12-inch	5.0
Over 12-inch to and including 30-inch	4.0
Over 30-inch	3.0

- B. The maximum average ID shall be equal to the average OD per applicable ASTM Standard minus two minimum wall thicknesses per applicable ASTM Standards. Manufacturing and other tolerances shall not be considered for determining maximum allowable deflections.
- C. Deflection tests shall be performed not sooner than 30 days after completion of placement and densification of backfill. The pipe shall be cleaned and inspected for offsets and obstructions prior to testing.
- D. For all pipes less than 24-inch ID, a rigid mandrel shall be pulled through the pipe by hand to ensure that maximum allowable deflections have not been exceeded. Prior to use, the mandrel shall be certified by the Engineer. Use of an uncertified mandrel or mandrel altered or modified after certification will invalidate the test. If the mandrel fails to pass, the pipe will be deemed to be overdeflected.
- E. Unless otherwise permitted by the Engineer any overdeflected pipe shall be uncovered and, if not damaged, reinstalled. Damaged pipe shall not be reinstalled, but shall be removed from the Work site. Any pipe subjected to any method or process other than removal, which attempts, even successfully, to reduce or cure any overdeflection, shall be uncovered, removed from the Work site and replaced with new pipe.
- F. The mandrel shall:
 1. Be rigid, non-adjustable, odd-numbering-leg (9 legs minimum) mandrel having an effective length not less than its nominal diameter.
 2. Have a minimum diameter at any point along the full length as follows:

Pipe Material	Nominal Size (inches)	Minimum Mandrel Diameter ^(a) (inches)
PVC-ASTM D 3033 (SDR 35)	6	5.619
	8	7.309
	10	9.137
	12	10.963
	15	13.849

PVC-ASTM F 679 (T-1 Wall)	18	16.924
	21	19.952
	24	22.446
	27	25.297
	30	28.502
	36	35.03

- (a) Mandrel diameters of SDR 26 pipe shall be based on 4% deflection of the average inside diameter.
3. Be fabricated of steel, be fitted with pulling rings at each end, be stamped or engraved on some segment other than a runner indicating the pipe material specification, nominal size and mandrel OD, (e.g., PVC D 3034-8'-7.524"); and be furnished in a suitable carrying case labeled with the same data as stamped or engraved on the mandrel.
 4. All costs incurred by the Contractor attributable to mandrel and deflection testing, including any delays, shall be borne by the Contractor at no cost to the Owner.

**APPENDIX A
PIPE TEST ACCEPTANCE FORM**

Project Name _____		
Project Location _____		
Contractor _____	Date of Test _____	
Pipe Section to Be Tested		
Process _____		
Starting Point _____		
Ending Point _____		
Pipe Material _____	Spec Section: _____	
Test Fluid Air <input type="checkbox"/>	Water <input type="checkbox"/>	+Mandrel <input type="checkbox"/>
Starting Pressure (gauge reading) _____	Ending Pressure (gauge reading) _____	
Test Start Time: _____	Test End Time: _____	
Initial Test <input type="checkbox"/>	Re-Test <input type="checkbox"/>	
Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	
Comments: (If this is a re-test, describe repairs made or actions taken. If test requires mandrel and deflection measurements, include here)		

END OF SECTION

SECTION 01670

EQUIPMENT AND SYSTEM TESTING AND STARTUP

PART 1 GENERAL

1.1 DESCRIPTION

This section contains requirements for Performance Testing, Facility Startup/Operational Testing, and the Demonstration Period for all the mechanical, electrical, and instrumentation, equipment and systems. In addition, this section contains requirements for the documentation of all testing work. This section supplements the specific testing requirements found in the individual sections of these Specifications.

1.2 RELATED WORK

- A. Section 01300: Submittals
- B. Section 01675: Training
- C. Section 01680: Operating and Maintenance Manuals
- D. Section 11010: General Mechanical Equipment Provisions

1.3 GENERAL SEQUENCE OF TESTING AND STARTUP

The general sequence of testing and startup will proceed as follows. Expanded information on each item is presented later in this Section:

- A. **SUBMITTALS:** All relevant submittals, operation and maintenance manuals and factory testing shall be completed and acceptable to the Engineer.
- B. **CALIBRATION:** All test equipment to be used during the testing shall be calibrated.
- C. **TESTING PREPARATION:** Preparation for actual testing will then take place (visual inspections, lubrication, etc.)

- D. **PERFORMANCE TESTING (8 HOURS):** Performance Testing shall be conducted on each piece of equipment to verify its operation prior to putting the entire system on-line. Performance Testing will be for a continuous 8-hour period for each piece of equipment. Additional information as required in specification Section 11010.
- E. **TRAINING:** Training of the Owner's personnel shall take place after the Contractor has verified that the individual pieces of equipment are in working order.
- F. **FACILITY STARTUP/OPERATIONAL TESTING (5-DAYS):** Facility Startup/Operational Testing will then follow. The Operational Testing is to verify that the facility as a whole is functioning properly. Operational Testing will be for a continuous 5-day period.
- G. **DEMONSTRATION PERIOD (30-DAYS):** The Demonstration Period will be used to demonstrate the longer term functionality of the facility. The Demonstration Period will be for a continuous 30-days.

1.4 CONTRACTOR'S TESTING MANAGER

The Contractor shall appoint a qualified professional as the Contractor's Testing Manager to manage, coordinate, and supervise the Testing Program. The qualified professional shall have at least (5) five years experience in managing the startup and operation of mechanical, electrical, instrumentation, HVAC, and piping systems.

1.5 SUBMITTALS

Submittals shall be provided in accordance with Section 01300 and shall include the following information:

- A. The Contractor shall designate in writing the appointed Testing Manager, including a resume demonstrating compliance with the requirements of this Section, to the Engineer prior to implementation of the Testing Program.
- B. Submit the credentials and certification of the testing laboratory proposed by the Contractor for calibration of all test equipment.
- C. A schedule for the Performance Testing, Facility Startup/Operational Testing, and Demonstration Period updated monthly (weekly when testing is taking place).
- D. An Equipment Testing Plan to be used during Performance Testing. An example 8-hour testing plan template is provided in an Appendix to this Specification.
- E. A Facility Startup/Operational Testing and Demonstration Plan. An example 5-day testing plan template is provided in an Appendix to this Specification.

- F. Calibration and Performance Test results, documented as required by the test program, of equipment or system prior to commencement of the Operational Test.
- G. The original and three copies of all records produced during the Testing Program.
- H. Completed Equipment Test Report forms for each piece of equipment.

PART 2 MATERIALS

2.1 EQUIPMENT TESTING PLANS

- A. The objective of the Equipment Testing Plan shall be to demonstrate, to the Engineer's complete satisfaction, that the structures, systems, and equipment meet all the performance requirements. In addition, the Equipment Testing Plan shall produce a record of baseline operating conditions for the Owner.
- B. The Contractor shall participate with the Engineer in the development of the Equipment Testing Plan which will be based on the detailed testing requirements as stated in the individual Specification sections. The Equipment Testing Plan shall be divided into the various process systems. The Equipment Testing Plan shall include tests and documentation procedures for the calibration of all analysis instruments and control sensors followed by step-by-step procedures for the Performance Testing, Facility Startup/Operational Testing, and Demonstration Testing for each individual item of mechanical, electrical, and instrumentation equipment, and for the facility as a whole as specified in the individual Sections. The Contractor shall be responsible for leading the development of the Equipment Testing Plan effort and the Equipment Testing Plan shall be reviewed and accepted by the Engineer prior to beginning any testing.
- C. The Contractor shall submit Equipment Test Report Forms for each item of equipment to be tested. The minimum information to be included shall be as follows:
 - 1. Project Name.
 - 2. Equipment or item tested (including tag numbers).
 - 3. Date and time of test.
 - 4. Type of test performed (Performance or Operational).
 - 5. Test conditions.
 - 6. Manufacturer's representatives present during testing (if applicable)
 - 7. Temporary systems required during the testing (if applicable)
 - 8. Test results.
 - 9. Calibration documentation for all test equipment (including test laboratory)

10. Signature space for Contractor and Engineer.
 11. Additional information as required in specification Section 11010 and Division 16.
- D. The Contractor shall prepare a testing schedule in bar graph form establishing the time period when the Contractor plans to proceed with the testing of the completed systems and each system element. The schedule shall include a description of the temporary systems and installations planned to allow testing to take place. The schedule shall detail the sequence, time and duration of Performance Testing, Facility Startup/Operational Testing, and the Demonstration Period. No testing or startup shall take place on dates and times other than those given in the testing schedule.

PART 3 EXECUTION

3.1 CONTRACTOR'S RESPONSIBILITIES

- A. The Contractor shall provide, at no expense to the Owner, all fuel, chemicals, compressed air supplies, all labor, temporary piping, valves, gauges, test equipment, heating, ventilating, air conditioning and all other items and work required to complete the tests. Temporary facilities shall be maintained until permanent systems are in service.
- B. The Contractor shall arrange for the manufacturer's representatives to revisit the Site as often as necessary to correct malfunctions to the Engineer's satisfaction.
- C. The Contractor shall provide at least one week notice to third-party SCADA programmer to allow for coordination on commissioning.

3.2 CONTRACTOR'S TESTING MANAGER

- A. The Contractor's Testing Manager shall organize qualified representatives of equipment suppliers, subcontractor's, the Contractor's independent testing laboratory, and others, as appropriate, to calibrate and test the equipment, systems, and the facility as a whole. Testing shall follow the procedures and sequences as described in the Equipment Testing Plan.
- B. Test results shall be documented on forms provided in the Equipment Testing Plan, including but not limited to the Equipment Test Report, as previously described.
- C. The Contractor's Testing Manager shall conduct at least weekly meetings with the test team and the Engineer beginning one week prior and continuing during equipment testing periods to discuss procedures and testing results.
- D. The Testing Manager shall be present during equipment testing, facility startup, and meetings and shall be available at all times during the Demonstration Period.

3.3 TEST EQUIPMENT CALIBRATION

- A. The Contractor shall conduct a calibration program for all instruments, gages, meters, monitors, and thermometers used for determining the performance of equipment and systems to be tested.
- B. All test equipment (gages, thermometers, meters, analysis instruments, and other equipment) used for calibrating or verifying the performance of equipment installed under this contract shall be calibrated to an accuracy at least as accurate as the tolerance specified for the item being tested with $\pm 2\%$ of actual value at full scale being the maximum allowable. Test equipment employed for individual test runs shall be selected so that expected values as indicated by the detailed performance specifications will fall between 60 and 85% of full scale.
- C. Pressure gages shall be calibrated in accordance with ANSI/ASME B40.1. Thermometers shall be calibrated in accordance with ASTM E77. Liquid flow meters, including all open channel flow meters and all meters installed in pipelines with diameters greater than 2" shall be calibrated in situ using either the total count or dye dilution methods. Ultrasonic level and magnetic type flow meters shall be calibrated per manufacturers' recommendations. For gas flow meters installed in piping systems with diameters greater than 6", factory calibration curves for the primary element shall be submitted and the transmitters shall be calibrated onsite per factory specifications.

3.4 TESTING PREPARATION

The following steps apply to each process system or facility as it is readied for startup and operation:

- A. **SUBMITTALS:** All submittals relevant to installation practices, equipment, piping, anchorage calculations, instrumentation, materials, and testing plans have been submitted to the Engineer and received "No Exceptions Taken" or "Make Corrections Noted" review status.
- B. **FACTORY TESTING:** Where required prior to the shipment of equipment to the site, complete factory testing. Such testing may be both unwitnessed and witnessed by the Engineer and/or Owner as specified and at their discretion.
- C. **OPERATIONS AND MAINTENANCE MANUALS:** Operations and maintenance manuals for equipment shall be submitted and receive "No Exceptions Taken" or "Make Corrections Noted" review status.
- D. **CONSTRUCTION COMPLETE:** Construction is substantially complete so that facility is ready to be used for its intended purposes and all signage is posted. All construction deficiencies shall be corrected prior to testing, unless agreed by Owner that testing can begin concurrent with correcting a construction deficiency.

- E. INSPECTION: Inspect and clean equipment, devices, connected piping, and structures to ensure they are free of foreign material.
- F. LUBRICATION: Lubricate equipment in accordance with manufacturer's instructions.
- G. REGULATORY AGENCY APPROVALS: Conduct inspections by and tests for regulatory agencies (Fire Marshal, Air Quality Control Board, etc.) and receive approvals needed to operate system. Provide written information required by regulatory agencies.

3.5 PERFORMANCE TESTS

- A. General:
 - 1. Each item and system of mechanical, electrical, and instrumentation equipment installed under this contract shall be tested for 8-hours continuously to demonstrate compliance with the performance requirements of the individual Specification sections, unless otherwise specified.
 - 2. Follow the approved Equipment Testing Plan and detailed procedures specified. Unless otherwise indicated, furnish all labor, materials, and supplies for conducting the test and taking all samples and performance measurements. Prepare Performance Test reports summarizing test methods and results as described in the Equipment Testing Plan.
 - 3. The Contractor is responsible for performance testing of all project equipment and systems in all modes of operation including remote PLC modes of operation.
 - 4. The Contractor shall test the utility, chemical feed, safety equipment and other support systems before testing the process system.
- B. Pressure and leakage tests: Pressure and leakage tests shall be conducted in accordance with applicable portions of Divisions 1, 2, 3, 10, 13, and 15 and shall be completed prior to any testing of connected mechanical equipment or valves. All tests shall be witnessed by the Engineer.
- C. Calibration: Calibration of analysis instruments, sensors, gages, and meters installed under this contract shall proceed on a system-by-system basis. No equipment or system Performance Tests shall be performed until instruments, gages, and meters to be installed in that particular system have been calibrated and the calibration work has been witnessed by the Engineer. Calibrate testing equipment in accordance with the manufacturer's instructions. The Contractor shall execute and submit completed Instrument Calibration Test Data Forms.
- D. Mechanical systems: Manufacturer's representatives shall confirm that all equipment and valves are properly installed before first operation and shall conduct/oversee the initial operation and testing. All mechanical systems shall be tested as specified in the individual equipment specification sections and as follows:

1. Ensure and demonstrate that equipment and valves operate properly and reliably. Open and close valves by hand and operate other devices to check for binding, interference, or improper functioning.
 2. Inspect hand and motorized valves for proper adjustment. Tighten packing glands to insure no leakage, but permit valve stems to rotate without galling. Verify valve seats are positioned for proper flow direction.
 3. Tighten leaking flanges or replace flange gasket. Inspect screwed joints for leakage.
 4. Equipment that is capable of automatic or remote operation shall be tested first in manual mode. Limit switches shall be set and adjusted on all valves so equipped. Setpoints on all pressure regulating, pressure relief, vacuum relief, and other valves with setpoints shall be confirmed and reset as directed by the Engineer.
 5. Remove rust preventatives and oils applied to protect equipment during construction.
 6. Flush lubrication systems and dispose of flushing oils. Recharge lubrication system with lubricant recommended by manufacturer.
 7. Flush fuel system and provide fuel for testing and start-up.
 8. Install and adjust packing, mechanical seals, O-rings, and other seals. Replace defective seals.
 9. Remove temporary supports, bracing, or other foreign objects installed to prevent damage during shipment, storage, and erection.
 10. Check rotating machinery for correct direction of rotation and for freedom of moving parts before connecting driver. Turn rotating equipment by hand when possible to confirm that equipment is not bound.
 11. Perform cold alignment and hot alignment to manufacturer's tolerances.
 12. Adjust V-belt tension and variable pitch sheaves.
 13. Startup tests of pumps, motors, and VFD's shall be performed to verify pump performance and operation over the full operating range from minimum head/flow up to maximum head/maximum capacity.
 14. Install gratings, safety chains, handrails, shaft guards, and sidewalks prior to Facility Startup/Operational Testing.
- E. Electrical systems: Testing shall be performed in three stages as specified in the individual equipment specification sections, Division 16 and as follows:
1. The first stage shall consist of electrical equipment testing prior to energization and operation of electrical equipment. Testing, calibration, and setting of electrical conductors, equipment, protective devices, grounding, and other components as specified in the electrical sections of the Specifications shall be conducted prior to equipment startup. This also includes bumping all motors to verify the direction of rotation. Unsatisfactory equipment test results shall require that the equipment be

- repaired and re-tested until acceptable results are obtained at no additional cost to the Owner.
2. The second stage of electrical testing shall occur after energization and start-up of equipment and shall consist of complete testing of all other equipment as specified in the Electrical Sections.
 3. The third stage of testing will take place during the Operational Testing and shall include all possible operating scenarios, alarm conditions, prohibitive interlocks, and indication functions.
 4. Contractor shall coordinate with third-party SCADA programmer, at least one week in advance of each process startup and commissioning date.
- F. Instrumentation: Conduct field calibration, loop acceptance, and end-to-end testing as specified in the individual Instrumentation Sections. Bench or field calibrate instruments and make required adjustments and control point settings. Energize transmitting and control signal systems, verify proper operation, ranges, and settings. Demonstrate proper operation of each instrument loop function including alarms, local and remote controls, instrumentation and other equipment functions. Generate signals with test equipment to simulate operating conditions in each control mode. Contractor shall coordinate with third-party SCADA programmer, at least one week in advance of each process startup and commissioning date.
- G. Permanent utilities: Conduct Performance Tests on utilities impacted, constructed, or modified by construction, as specified in the applicable Sections.
- H. HVAC systems: Balance HVAC systems, measuring airflow (cfm) static pressure, and component pressure losses. Furnish written report documenting results of balancing.
- I. Demonstration: Demonstrate proper rotation, alignment, speed, flow, pressure, vibration, sound level, adjustments, and calibration over the full operating range of equipment and systems. Perform initial checks in the presence of and with the assistance of the manufacturer's representative.
- J. Telecommunications system testing: Telecommunications testing shall be as specified in the applicable Section.

3.6 TEST RESULTS

- A. Test results shall be within the tolerances stated in the individual Specification sections. If no tolerances have been specified, test results shall conform to tolerances established by recognized industry practice. When, in Engineer's opinion, equipment meets performance requirements specified, such equipment will be accepted as conforming with Contract requirements.

- B. Should any doubt, dispute, or difference arise between the Engineer and the Contractor regarding the test results or the methods or equipment used in the performance of the testing, then the Engineer may order the test to be repeated. If the repeat test, using such methods or equipment as the Engineer requires, substantially confirms the previous test, then all costs in connection with the repeat test will be paid by the Owner, otherwise the costs shall be borne by the Contractor. All costs associated with repeat testing due to failed test results shall be borne by the Contractor, including the Engineers expenses.
- C. If any portion of the work should fail to fulfill the contract requirements and is adjusted, altered, renewed, or replaced, tests on that portion of the work together with all other affected portions of the work, shall, be repeated within reasonable time and in accordance with the specified requirements. The Contractor shall pay to the Owner all reasonable expenses incurred by the Owner, including the costs of the Engineer, as a result of repeating such tests.

3.7 POST TEST INSPECTION

Once Performance Testing has been completed, all machines shall be rechecked for proper alignment and realigned, as required. All equipment shall be checked for loose connections, unusual movement, or other indications of improper operating characteristics. Any deficiencies shall be corrected to the satisfaction of the Engineer. All machines or devices, which exhibit unusual or unacceptable operating characteristics, shall be disassembled and inspected. Any defects found during the course of the inspection shall be repaired or the specific part or entire equipment item shall be replaced to the complete satisfaction of the Engineer, at no cost to the Owner.

3.8 MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

- A. Upon completion of Performance Testing and prior to Facility Startup/Operational Testing, the Contractor shall submit the Manufacturer's Installation Certification Form certifying that the equipment:
 - 1. Has been properly installed, adjusted, aligned, and lubricated.
 - 2. Is free of any stresses imposed by connecting piping or anchor bolts.
 - 3. Is suitable for satisfactory full-time operation under full load conditions.
 - 4. Operates within the allowable limits for vibration.
 - 5. Controls, protective devices, instrumentation, and control panels furnished as part of the equipment package are properly installed, calibrated, and functioning.
 - 6. Control logic for start-up, shutdown, sequencing, interlocks, and emergency shutdown have been tested and are properly functioning.
- B. The Contractor shall also submit the Manufacturer's Installation Certification Form signed by the electrical and/or instrumentation Subcontractor certifying:

1. Control logic that resides in motor control centers, control panels, and circuit boards furnished by the electrical and/or instrumentation subcontractor has been calibrated and tested and is properly operating.
 2. Control logic for equipment start-up, shutdown, sequencing, interlocks and emergency shutdown has been tested and is properly operating.
- C. The Contractor shall co-sign the Manufacturer's Installation Certification Form along with the manufacturer's representative and Subcontractors and deliver the reports to the Engineer prior to Facility Startup/Operational Testing.

3.9 TRAINING

The Contractor shall conduct the training of the Owner's staff as specified for equipment and facility operation and maintenance before each associated system is placed into service. Refer to Section 01675 – Training for specific requirements.

3.10 FACILITY STARTUP AND OPERATIONAL TESTING

After completion of all Performance Testing and operator training the Contractor shall begin the Facility Startup and conduct Operational Tests of each system as described herein. Contractor shall conduct the Operational Test for a continuous 5-day period.

A. Facility Startup/Operational Plan:

1. Develop a plan in conjunction with Owner's operations personnel detailing step-by-step instructions for startup of each unit process and the complete facility.
2. Include a method of evaluation and overall performance reports for each unit process, utilizing the Startup and Performance Evaluation Forms. Startup and Performance Evaluation Forms will minimally include the following:
 - a. Description of unit process being started.
 - b. All equipment and devices included in the unit process.
 - c. Unit process startup procedures (i.e., valves to be open/closed, order of equipment startup, etc.).
 - d. Requirements for water, power, chemicals, etc. needed for startup.
 - e. Space for performance evaluation comments.

B. Owner's responsibilities:

1. Assist Contractor in developing a Facility Startup and Demonstration Plan detailing step-by-step instructions for startup of each unit process and the complete facility.
2. Provide water and power for testing and facility startup, unless otherwise indicated.

3. Operate process units and devices, with support of Contractor.
 4. Provide labor and materials as required for sampling and laboratory analyses.
- C. Facility startup/operational testing period:
1. Startup sequence of the unit processes shall be in accordance with the Facility Startup/Operation Plan developed by the Contractor and the Owner, and as approved by the Engineer.
 2. Startup of the entire facility or any portion thereof shall be considered complete when, in the opinion of the Engineer, the facility or designated portion has operated in manner intended for 5-continuous days, without interruption, unless otherwise specified. This period is in addition to training, or Performance Test periods specified elsewhere.
 3. Repeat the Operational Test when malfunctions or deficiencies cause shutdown or partial operation of the facility or results in performance that is less than specified, as determined by the Engineer. Any interruption will require the startup then in progress to be stopped and restarted for an additional 5-continuous days, after corrections are made.
- D. Facility performance evaluation:
1. During the Facility Startup/Operational Testing Period, conduct a performance evaluation to determine the full capabilities of the facility and performance of the computer system, until all unit processes are operable and under control of the computer system.
 2. Certify, on the Startup and Performance Evaluation Forms that each unit process is capable of performing its intended function(s), including fully automatic and computerized operation.

3.11 DEMONSTRATION PERIOD

- A. After successful completion of the Performance, Facility Startup/Operational Testing and when the Owner is ready to accept the system, the system shall be placed into full operational condition.
- B. The Contractor, Engineer, and the Owner's operations personnel shall first develop an outline of the steps for the startup and initial operation of each area under actual operating conditions of the equipment and systems. The document shall serve as guidance for the Demonstration Period.
- C. The Owner's certified operations personnel shall operate the facility under the direction and supervision of the Contractor for a 30-day period. The Contractor shall be available within 24-hours notice to provide repairs, assistance, or adjustments in case of failure of any portion of the system.

- D. During the Demonstration period, the Owner shall be responsible for all normal operational costs and the Contractor shall bear the costs of all necessary repairs or replacements, including labor and materials.
- E. Owner reserves the right to simulate operational variables, equipment failures, routine maintenance scenarios, etc., to verify the functional integrity of the system.
- F. The facility shall be fully operational, performing all functions for which it was designed. If, during the Demonstration Period the aggregate amount of time used for repairs, alterations, or unscheduled adjustments to any equipment or systems that renders the affected equipment or system inoperative exceeds 10-percent of the Demonstration Period, then the Demonstration Period will be deemed to have failed. In the event of failure, a new Demonstration Period will recommence after correction of the cause of failure. Any new Demonstration Periods shall have the same requirements and durations as the first period.
- G. Time of beginning and ending of the Demonstration Period shall be agreed upon by the Contractor Owner and the Engineer, in advance of initiating the Demonstration Period.
- H. At the end of the Demonstration Period and when all corrections required by the Engineer to assure a reliable and completely operational facility are complete and all test reports have been submitted and approved, the Engineer shall issue a Final Completion Certification, unless otherwise noted in the General Conditions.

APPENDIX A

EXAMPLE 8-HOUR PERFORMANCE TEST PLAN TEMPLATE

 (equipment) **8-Hr. Performance Test Plan**

Note: (Equipment) 8-Hr. Performance testing will be performed in conjunction with integral equipment “xyz1”, “xyz2” & “xyz3” 8-hr Performance testing.

Inspector Contractor

Int. ____ ____ **A.** **Verify visual inspection of (equipment).**

Comments: _____

Int. ____ ____ **B.** **Verify control and power wire loop checks complete. Provide documentation.**

Comments: _____

Int. ____ ____ **C.** **Verify SCADA programming completed.**

Comments: _____

Int. ____ ____ **D.** **Perform electrical testing as per attached template sheets. Confirm submittal acceptance of harmonics study and coordination/short circuit analysis prior to energizing any equipment (see 16011). Confirm megger test, VFD test, instrumentation testing, I/O testing, gauge calibration, and all other electrical testing have been complete. Provide filled in documentation based on the templates provided in specification section Div 16 and 17.**

Comments: _____

Int. ____ ____ **E.** **Verify vendor start up has been completed.** Provide vendor start up documentation.

Comments: _____

Int. ____ ____ **F.** **Set downstream process ____ (xyz) to Auto, and coordinate with plant operations for permission to discharge water.**

Comments: _____

Int. ____ ____ **G.** **Manually start equipment. Close ____ (valves, gates, xyz) and check alarm is activated in SCADA and equipment automatically shut down.** Note equipment warnings ____ (don't run dry, xyz) ____.

Comments: _____

Int. ____ ____ **H.** **Verify related equipment ____ "xyz1, xyz2, and xyz3" are sending flow to ____ (equipment) as per "xyz1", "xyz2", and "xyz3" 8-hour performance testing plans.**

Comments: _____

Int. ____ ____ **I.** **Set ____ (equipment) in "auto" and run them through SCADA, for 8-hrs each.** Check that all status items are read in SCADA, see attached P&IDs to confirm all I/O.

Comments: _____

Int. _____ **J.** **Verify (equipment) are working properly.** See attached process control narrative to ensure proper operation strategy (before, during and after equipment startup).

Comments: _____

Int. _____ **K.** **Open (equipment) associated equipment (SOV wash water, conveyor, automatic gates, xyz) are working properly.** Associated equipment should be run through SCADA and they should open for a pre-set amount of time when equipment is off

Comments: _____

APPENDIX B

EXAMPLE 5-DAY OPERATIONAL TEST PLAN TEMPLATE

 (xyZ process) **5-Day Operational Testing**

Inspector Contractor

Int. ____ ____ 1. Verify process upstream equipment (xyZ, xyZ, and xyZ) 8-Hr performance test is complete and is working properly. Ensure liquid is available for testing (sludge, chemical, gas, water, xyZ).

Comments: _____

Int. ____ ____ 2. Verify process downstream equipment (xyZ, xyZ, and xyZ) 8-Hr performance test is complete and is working properly. Ensure liquid is available for testing (sludge, chemical, gas, water, xyZ).

Comments: _____

Int. ____ ____ 3. Verify process associated equipment (xyZ, xyZ, and xyZ) 8-Hr performance test is complete and is working properly. Ensure liquid is available for testing (sludge, chemical, gas, water, xyZ).

Comments: _____

Int. ____ ____ 4. Place disconnect power in the “ON” position, and (process xyZ) systems in “AUTO”. Confirm they are picked up by SCADA.

Comments: _____

Int. ____ ____ **5. Start upstream equipment in Auto and run (equipment xyz) through SCADA.**

Comments: _____

Int. ____ ____ **6. Coordinate with Operational Staff and verify they are ready to receive discharge into their system.**

Comments: _____

Int. ____ ____ **7. Verify all necessary valves are in open position.**

Comments: _____

Int. ____ ____ **8. Start downstream equipment in Auto and run (equipment xyz) through SCADA.**

Comments: _____

Int. ____ ____ **9. Start process equipment in Auto and run (equipment xyz) through SCADA, all equipment should start and stop automatically.**

Comments: _____

Int. ____ ____ **10. Check process control narrative to ensure all equipment is running as designed (time delay, water level, position switch, etc).**

Comments: _____

Int. ____ ____ **11. Verify level indicators, flow meters, pressure gauges, etc. are working properly and signals are being picked by SCADA (see attached P&ID).**

Comments: _____

Int. ____ ____ **12. Close downstream (gates, valves, xyz) in system. This should send out an alarm and automatically shut down xyz, xyz2, and xyz3 systems.**

Comments: _____

Int. ____ ____ **13. Process fluids for 5-days. And verify every system is working properly.**

Comments: _____

END OF SECTION

SECTION 01675

TRAINING

PART 1 GENERAL

1.1 DESCRIPTION

This section contains requirements for training the Owner's personnel, by persons retained by the Contractor specifically for the purpose, in the proper operation and maintenance of the equipment and systems installed under this contract. All costs for training shall be the responsibility of the Contractor.

1.2 RELATED WORK

- A. Section 01300: Submittals
- B. Section 01670: Equipment and System Testing and Startup
- C. Section 01680: Operation and Maintenance Manuals

1.3 QUALITY ASSURANCE

- A. The Contractor shall provide on-the-job training of the Owner's personnel for all equipment identified in the technical specifications. The training sessions shall be conducted by qualified, competent, experienced (two years minimum), manufacturers' factory-trained representatives (not sales representatives) of the various equipment manufacturers. Representatives shall be thoroughly familiar with instructional methods in addition to the subject matter.
- B. If, in the opinion of the Owner, an appropriately knowledgeable person did not provide the scheduled training, such training shall be rescheduled and repeated with a suitable instructor at no additional cost to the Owner.
- C. Training shall include instruction of operating personnel in equipment operation in one session, and preventive maintenance and instruction of station mechanics, electricians, and electronics technicians in normal maintenance up to major repair in a separate session.

1.4 SUBMITTALS

- A. The Contractor shall submit a training plan to the Engineer for review, in accordance with the provisions of Section 01300 – Submittals. The submitted training plan shall include lesson materials in addition to a training schedule as follows:
1. A class agenda and lesson plans for each training session to be conducted by the manufacturer's representatives shall be submitted. In addition, training manuals, handouts, visual aids, and other reference materials shall be included.
 2. Date, time, and subject of each training session and identity the qualifications of individuals to be conducting the training.
 3. Provide a training schedule with a minimum of two sessions of each class to facilitate the attendance of the Owner's personnel. Concurrent classes will not be allowed.
- B. The Contractor shall submit a list of all equipment items or systems for which training will be provided in accordance with the specifications. The list shall include item number, specification section, description and required training in hours.

PART 2 MATERIALS

2.1 GENERAL

Where specified in Divisions 11, 13, 14, 15, and 16 the Contractor shall conduct training sessions for the Owner's operating personnel in one session to instruct the staff on the proper operation of the equipment, and maintenance and repair personnel in a separate session to instruct the staff on the proper care and maintenance of the equipment and systems installed under this contract. Training shall take place at the site of the work and under the conditions specified in the following paragraphs.

2.2 OPERATION AND MAINTENANCE MANUALS

If training is being conducted on equipment, systems, or products for which an operations and maintenance manual is required, this manual shall be complete, approved by the Engineer and used during the classroom instruction. Approved operating and maintenance manuals shall be available to Owner personnel at least 30-days prior to the date scheduled for the individual training session. Refer to Section 01680 – Operating and Maintenance Materials, for additional requirements.

2.3 LOCATION

Field training sessions shall take place at the site of the equipment. Classroom training facility will be provided by the Owner.

2.4 LESSON PLANS

- A. A class agenda shall be prepared and submitted to the Engineer as least 4 weeks in advance of the training sessions. Formal written lesson plans shall be prepared for each training session. Lesson plans shall contain an outline of the material to be presented along with a description of visual aids to be utilized during the session, and the training materials shall include a list of tasks which the Owner’s employees may perform with the equipment. Each plan shall contain a time allocation for each subject.
- B. One complete set of originals of the lesson plans, training manuals, handouts, visual aids, and reference material shall be the property of the Owner and shall be suitably bound for proper organization and easy reproduction. The Contractor shall furnish three copies of necessary training manuals, handouts, and reference materials and one copy of necessary visual aids at least two weeks prior to each training session. It is estimated that 5 to 10 persons will attend each training session. The Owner will determine the actual number of students and provide and estimated “headcount” one week prior to the class, so that the instructor can furnish the class room materials, samples, and handout for all those in attendance. Five additional copies of all classroom materials, samples, handouts, etc. shall be provided during the training session.

2.5 FORMAT AND CONTENT

For complex equipment and systems, the training for operation personnel and for maintenance personnel shall be provided as separate entities. The training for maintenance personnel shall be further subdivided into two trade groups: mechanical maintenance and electrical/instrumentation maintenance. Each training session shall be composed of time spent both in the classroom and at the specific location of the equipment or system. As a minimum, a training session shall cover the following topics for each item of equipment or system:

Topic	Operations Personnel	Maintenance and Repair Personnel
Familiarization	X	X
Safety	X	X
Operation (Start-up, Shut-down, Normal & Emergency)	X	X
Instrumentation	X	X
Electrical and Mechanical Troubleshooting		X
Preventive Maintenance	X	X
Lubrication of Equipment	X	X
Corrective Maintenance, Repair, and Overhaul		X
Lockout Procedures, Alarm, and Fail-Safe Operation	X	X
Parts (Including Inventory of Spare Parts)		X
Local Representatives		X
Operation and Maintenance Manuals	X	X

2.6 VIDEO RECORDING

The Contractor shall record, or retain the services of a commercial video taping service to record, each training session. The videotape shall be transferred onto DVD-R and two copies shall be provided to the Owner. The Contractor shall advise all manufacturers providing training sessions that the material will be video taped.

Video equipment shall include an adjustable focal-distance range from 6 inches to infinity, and produce a minimum resolution of 1280x720. Audio equipment shall be 16-bit minimum.

PART 3 EXECUTION

3.1 TRAINING

- A. Training shall be conducted after the Performance Testing and prior to the Facility Startup/Operational Testing. Refer to Section 01670 – Equipment and System Testing, Startup and Demonstration for additional information.
- B. Classes shall be scheduled such that classroom sessions are interspersed with field instruction in logical sequence. The Contractor shall consolidate short training sessions into combined sessions so that staff time is more efficiently used. The Contractor shall provide a minimum of two training sessions, each of the required length, on each system, piece of equipment, or "topic." Organize training sessions into maintenance versus operation topics and identify on schedule.
- C. No training sessions shall be scheduled for Mondays or Fridays, or legal holidays recognized by the Owner. The Contractor shall coordinate the scheduling of training sessions and the length of the classes with the Owner's Utilities Operations Superintendent.
- D. The following services shall be provided for each item of equipment or system as required in individual Specification sections. Additional services shall be provided, where specifically required in individual Specification sections.
 - 1. As a minimum, classroom equipment training for operations personnel shall include:
 - a. Using slides and drawings, discuss the equipment's specific location in the plant and an operational overview.
 - b. Purpose and plant function of the equipment.
 - c. A working knowledge of the operating theory of the equipment.
 - d. Start-up, shutdown, normal operation, and emergency operating procedures, including a discussion on system integration and electrical interlocks, if any.
 - e. Identify and discuss safety items and procedures.

- f. Routine preventative maintenance, including specific details on lubrication and maintenance of corrosion protection of the equipment and components.
 - g. Operator detection, without test instruments, of specific equipment trouble symptoms.
 - h. Required equipment exercise procedures and intervals.
 - i. Routine disassembly and assembly of equipment if applicable (as judged by the Owner on a case-by-case basis) for purposes such as operator inspection of equipment.
2. As a minimum, hands-on equipment training for operations personnel will include:
- a. Identify location of equipment and review the purpose.
 - b. Identifying piping and flow options.
 - c. Identifying valves and their purpose.
 - d. Identifying instrumentation:
 - 1) Location of primary element.
 - 2) Location of instrument readout.
 - 3) Discuss purpose, basic operation, and information interpretation.
 - e. Discuss, demonstrate, and perform standard operating procedures and round checks.
 - f. Discuss and perform the preventative maintenance activities.
 - g. Discuss and perform start-up and shutdown procedures.
 - h. Perform the required equipment exercise procedures.
 - i. Perform routine disassembly and assembly of equipment if applicable.
 - j. Identify and review safety items and perform safety procedures, if feasible
3. Classroom equipment training for the maintenance and repair personnel will include:
- a. Theory of operation.
 - b. Description and function of equipment.
 - c. Start-up and shutdown procedures.
 - d. Normal and major repair procedures.
 - e. Equipment inspection and troubleshooting procedures including the use of applicable test instruments and the "pass" and "no pass" test instrument readings.
 - f. Routine and long-term calibration procedures.
 - g. Safety procedures.

- h. Preventive maintenance such as lubrication; normal maintenance such as belt, seal, and bearing replacement; and up to major repairs such as replacement of major equipment part(s) with the use of special tools, bridge cranes, welding jigs, etc.
- 4. Hands-on equipment training for maintenance and repair personnel shall include:
 - a. Locate and identify equipment components.
 - b. Review the equipment function and theory of operation.
 - c. Review normal repair procedures.
 - d. Perform start-up and shutdown procedures.
 - e. Review and perform the safety procedures.
 - f. Perform Owner approved practice maintenance and repair job(s), including mechanical and electrical adjustments and calibration and troubleshooting equipment problems.
 - g. Review and use equipment manufacturers' manuals in the hands-on training.
- 5. Electrical System Training shall be provided for the electrical system. Specific emphasis shall be as follows:
 - a. Overview of the plant's electrical system.
 - b. Discussion of each item of power distribution equipment in the overall plant.
 - c. Loop system operation and possible sectionalizing arrangements.
 - d. System protection.
 - e. Automatic bus transfer to standby system.
 - f. System power monitoring/control.
 - g. Maintenance/Fault troubleshooting.
- E. Maintain a log of class room training including: Instructors, topics, dates, time, and attendance.
- F. The Contractor shall replace equipment that is damaged during the training exercises at no additional cost to the Owner.

END OF SECTION

SECTION 01680

OPERATING AND MAINTENANCE MANUALS

PART 1 GENERAL

1.1 DESCRIPTION

Operating and Maintenance information shall be provided in accordance with this section and as required in the technical sections of these Specifications. Operating and Maintenance information shall be provided for each maintainable piece of equipment, equipment assembly or subassembly, and material provided or modified under this contract. Operating and Maintenance manuals must be submitted and accepted before Performance Testing or on-site training may start.

1.2 RELATED WORK

- A. Section 01300: Submittals
- B. Section 01670: Equipment and System Testing and Startup
- C. Section 01675: Training

1.3 TRANSMITTAL PROCEDURE

- A. Unless otherwise specified, Operating and Maintenance information and data shall be transmitted in accordance with Section 01300 – Submittals. Only complete sets of Operating and Maintenance manuals will be reviewed for acceptance. The Contractor shall submit three (3) copies of the Preliminary Manuals for the Engineer’s review. After receiving the Engineer’s acceptance, five (5) copies of the final manuals shall be submitted (including 5 hard copies as detailed below and 5 PDF copies on USB flash drives. The USB flash drives shall be clearly labeled with text similar to the binder cover (including, project name, product numbers, client, and title.)
- B. If the manufacturers' standard brochures and manuals are used to describe Operating and Maintenance procedures, such brochures and manuals shall be modified to reflect only the model or series of equipment used on this project. Extraneous material shall be crossed out neatly or otherwise annotated or eliminated.

PART 2 MATERIALS

2.1 MANUAL FORMAT

One binder shall be provided for each piece of equipment (for example, sump pumps will have a separate binder from vertical turbine pumps) and the Operating and Maintenance information shall be submitted in the following manner.

- A. Size: 8-1/2 inches by 11 inches.
- B. Paper: 20-pound minimum, white for typed pages.
- C. Text: Manufacturer's printed data, or neatly typewritten.
- D. Arrange printing so that punched holes do not obliterate data and use hole reinforcements for bound in plan sheets.
- E. Provide fly-leaf for each separate product, or each piece of operating equipment, with typed description of product and major component parts of equipment and provide with heavy section dividers with numbered plastic index tabs.
- F. Provide each manual with title page, and typed table of contents with consecutive page numbers. Place contents of entire set, identified by volume number, in each binder.
- G. Cover and Spine: Identify each volume with typed or printed title "OPERATION AND MAINTENANCE MANUAL, VOLUME NO. __OF__", if applicable, and list:
 - 1. Project title.
 - 2. Designate the system or equipment for which it is intended.
 - 3. Identity of separate structure as applicable.
 - 4. Identity of general subject matter covered in manual.
 - 5. Identity of equipment number and Specification section.
- H. Assemble and bind material in same order as specified, as much as possible.
- I. Material shall be suitable for reproduction, with quality equal to original. Photocopying of material will be acceptable, except for material containing photographs.
- J. Binders:
 - 1. Preliminary Manuals: Heavy paper covers.

2. Final Manuals: Commercial quality, substantial, permanent, three-ring, D-ring, binders with durable, cleanable, plastic binders, plastic-coated section dividers, and plastic sheet lifters prior to first page and following last page.
- K. Table of contents neatly typewritten, arranged in a systematic order:
1. Contractor, name of responsible principal, address, and telephone number.
 2. List of each product required to be included, indexed to content of each volume.
 3. List with each product: Name, address, and telephone number of Subcontractor, Supplier, installer, and maintenance contractor, as appropriate.
 - a. Identify area of responsibility of each.
 - b. Provide local source of supply for parts and replacement.
 4. Identify each product by product name and other identifying numbers or symbols as set forth in Contract Documents.
- L. Product Data:
1. Include only those sheets that are pertinent to specific product and delete references to inapplicable information.
 2. Clearly annotate each sheet to identify specific product or part installed and identify data applicable to installation.
- M. Drawings: Supplement product data with Drawings as necessary to clearly illustrate:
1. Relations of component parts of equipment and systems.
 2. Control and flow diagrams.
 3. Coordinate drawings with Project record documents to assure correct illustration of completed installation.
 4. Do not use Project record documents as maintenance manual drawings.
 5. Provide reinforced punched binder tab, bind in with text.
 6. Reduced to 8-1/2 inches by 11 inches, or 11 inches by 17 inches folded to 8-1/2 inches by 11 inches.
 7. Where reduction is impractical, fold and place in 8-1/2-inch by 11-inch vinyl envelopes bound in text.
 8. Identify Specification section and product on Drawings and envelopes.
- N. Instructions and Procedures: Within text, as required to supplement product data:
1. Delivery, handling, storage, maintenance during storage, assembly, erection, installation, startup, adjusting, testing, operating, shutdown in emergency, troubleshooting, maintenance, interface, and as may otherwise be required.

2. Organize in a consistent format under separate heading for each different procedure.
 3. Provide a logical, sequence of instructions for each procedure. Provide information sheet for Owner's personnel, including:
 - a. Proper procedures in the event of failure.
 - b. Instances that might affect the validity of Warranties or Bonds.
- O. All manuals shall also be provided in an electronic format which includes all information included in the Operation and Maintenance Manuals. Provide the electronic files on USB flash drives. All text portions shall be provided in MS Word format, spreadsheets in Excel format, drawings in AutoCAD format, graphical portions shall in JPEG format, and all other documents including but not limited to brochures that need to be scanned shall be provided in a searchable PDF format. These files shall become the property of the Owner for use in training programs and other uses.

PART 3 EXECUTION

3.1 GENERAL

- A. Operating and Maintenance information shall be bound in sturdy, heavy-duty 3-ring binders. One binder shall be provided for each piece of equipment (for example, sump pumps will have a separate binder from vertical turbine pumps). The binders shall be clearly labeled on the front and spine identifying the equipment located in the Operating and Maintenance Manual. For ease of identification, each manufacturer's brochure and manual shall be appropriately labeled with the equipment name and equipment number as it appears in these Contract Documents. The information shall be organized in the binders in numerical order by the equipment numbers assigned in the Specifications. The binders shall be provided with a table of contents and tab sheets to permit easy location of desired information.
- B. Operating and Maintenance manuals shall contain the names, addresses, and telephone numbers of the manufacturer, the nearest representative of the manufacturer, and the nearest supplier of the manufacturer's equipment and parts.
- C. Provide identification of all parts of each component, assembly, subassembly, and accessory. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing shall show the index, reference, or key number which will cross-reference the illustrated part to the listed part. Parts shown in the listings shall be grouped by components, assemblies, and subassemblies. Include control and flow diagrams and panel wiring diagrams. Coordinate drawings to ensure correct illustration of completed installation.

- D. All manuals shall also be provided in an electronic format which includes all information included in the Operation and Maintenance Manuals. Provide the electronic files on USB flash drives. All text portions shall be provided in MS Word format, spreadsheets in Excel format, drawings in AutoCAD format, graphical portions shall in JPEG format, and all other documents including but not limited to brochures that need to be scanned shall be provided in a searchable PDF format. These files shall become the property of the Owner for use in training programs and other uses.

3.2 OPERATING INSTRUCTIONS

Specific instructions, procedures, and illustrations shall be provided for the following phases of operations in addition to those required in other sections of this Specification:

- A. Safety precautions: List personnel hazards for equipment and list safety precautions for all operating conditions.
- B. Operator pre-start: Provide requirements to set up and prepare each system for use.
- C. Startup, shutdown, and post shutdown procedures: Provide step-by-step procedures for start-up, break-in, shutdown, and post-shutdown operations. Include recommendations for installation, adjustment, calibration, troubleshooting, regulation, control, stopping, and shutdown operations. Summer and winter operating instructions shall be included as required.
- D. Normal operations: Provide control diagrams with data to explain operation and control of systems and specific equipment.
- E. Emergency operations: Provide emergency procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further damage to systems and equipment, as applicable. Include emergency shutdown instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance on emergency operations of all utility systems including valve locations and portions of systems controlled.
- F. Operator service requirements: Provide instructions for services to be performed by the operator such as lubrication, adjustments, and inspection.
- G. Environmental conditions: Provide a list of environmental conditions (temperature, humidity, and other relevant data) which are best suited for each product or piece of equipment and describe conditions under which equipment should not be allowed to run.

3.3 PREVENTATIVE MAINTENANCE

The following information shall be provided for preventive and scheduled maintenance to minimize corrective maintenance and repair:

- A. Lubrication data: Provide lubrication data in accordance with these Specifications and the manufacturer' requirements of the respective equipment. Lubrication Information shall include the required lubricants and lubrication schedules. For each required lubricant, provide a list of acceptable equivalents from at least one different major manufacturer whose products are locally available. Provide the following information:
 - 1. A table showing recommended lubricants for specific temperature ranges and applications;
 - 2. Charts with a schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants, and capacities; and
 - 3. A lubrication schedule showing service interval frequency.
- B. Preventive maintenance plan and schedule: Provide manufacturer's schedule for routine preventive maintenance, inspections, tests, and adjustments required to ensure proper and economical operation and to minimize corrective maintenance and repair. Provide manufacturer's projection of preventive maintenance man-hours on a daily, weekly, monthly, and annual basis. Include procedures for disassembly, repair, and assembly, alignment, adjusting, and checking. Supply a table showing the predicted life of parts subject to wear. Provide the Manufacturer's printed operating and maintenance instructions.

3.4 CORRECTIVE MAINTENANCE

- A. Manufacturer's recommendations shall be provided on procedures and instructions for correcting problems and making repairs.
 - 1. Troubleshooting guides and diagnostic techniques: Provide step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.
 - 2. Wiring diagrams and control diagrams: Wiring diagrams and control diagrams shall be point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job-specific wiring and control work. On diagrams, number electrical and electronic wiring and pneumatic control tubing and the terminals for each type identically to actual installation numbering.
 - 3. Maintenance and repair procedures: Provide instructions and list tools required to restore product or equipment to proper condition or operating standards.
 - 4. Removal and replacement instructions: Provide step-by-step procedures and list required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings, and adjustments required. Instructions shall include a combination of text and illustrations.

5. Spare parts and supply lists: Provide lists of spare parts and supplies required for maintenance and repair to ensure continued service or operation without unreasonably delays. Special consideration is required for facilities at remote locations. List spare parts and supplies that have a long lead-time to obtain. The spare parts list shall include the name, address, telephone number, and FAX number of authorized repair facilities, address of factory, and location of a local supplier where spare parts are to be obtained.
 6. Corrective maintenance man-hours: Provide manufacturer's projection of corrective maintenance man-hours including craft requirements by type of craft. Corrective maintenance that requires participation of the equipment manufacturer shall be identified and tabulated separately.
- B. Test results: Provide copies of factory test reports as specified in the applicable equipment section. After field testing is completed, insert field test reports as specified in the equipment section. Include performance curves and engineering data.

3.5 APPENDICES

The following information shall be provided; include information not specified in the preceding paragraphs but pertinent to the maintenance or operation of the product or equipment.

- A. Warranty information: List and explain all of the warranties, bonds and service agreements and include the servicing and technical precautions prescribed by the manufacturers or contract documents to keep the warranties in force. Include the proper procedures in event of failure.
- B. Personnel training requirements: Provide information available from the manufacturers to use in training designated personnel to operate and maintain the equipment and systems properly. Refer to Section 01675 – Training for additional training information.
- C. Testing equipment and special tool information: Provide information on test equipment required to perform specified tests and any special tools needed for the operation, maintenance, and repair of components.

3.6 FIELD CHANGES

Following the acceptable installation and operation of an equipment item, the item's instructions and procedures shall be modified and supplemented by the Contractor to reflect any field changes or information requiring field data.

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 DESCRIPTION

This section includes the contract closeout requirements including final cleanup, maintenance and guarantee requirements, preparation and submittal of closeout documents, and post-construction inspection.

1.2 RELATED WORK

- A. Section 01670: Equipment System Testing and Startup
- B. Section 01675: Training
- C. Section 01680: Operation and Maintenance Manuals

1.3 CLOSEOUT TIMETABLE

The Contractor shall establish dates for equipment testing, interim final inspections, and on-site instructional periods (as required under the Contract). These dates shall take into account the interim completion dates noted in the Special Provisions. Such dates shall be established not less than five working days prior to beginning any of the foregoing items, to allow the City of San Juan Bautista, the Engineer, and their authorized representatives sufficient time to schedule attendance at such activities. The testing requirements of Section 01670 shall be adhered to.

1.4 FINAL CLEANUP

The Contractor shall promptly remove from the vicinity of the completed work, all rubbish, unused materials, concrete forms, construction equipment, and temporary structures and facilities used during construction. Final acceptance of the work by the Owner will be withheld until the Contractor has satisfactorily complied with the foregoing requirements for final cleanup of the project site.

1.5 MAINTENANCE AND GUARANTEE

- A. The Contractor shall comply with the maintenance and guarantee requirements contained in the General Conditions and Supplementary Conditions.
- B. Replacement of earth fill or backfill, where it has settled below the required finish elevations, shall be considered required repair work, and any repair or resurfacing constructed by the Contractor which becomes necessary by reason of such settlement shall likewise be considered required repair work.
- C. The Contractor shall make all repairs and replacements promptly upon receipt of written order from the Owner. If the Contractor fails to make such repairs or replacements promptly, the Owner reserves the right to do the work and the Contractor and his surety shall be liable to the Owner for the cost thereof.

1.6 BOND

The Contractor shall provide a bond to guarantee performance of the provisions contained in Paragraph "Guaranty" above, and Section 6.01 of the General Conditions.

1.7 GUARANTY AND BONDS

The Contractor shall provide the Owner with an executed Guaranty Form and provide specified additional warranties, guarantees, and bonds from manufactures and suppliers.

PART 2 MATERIALS

2.1 CLEANING MATERIALS

As recommended by the manufacturer of surface to be cleaned.

2.2 REPAIR OR REPLACEMENT MATERIALS

Materials used in repairing or replacing surfacing shall be equivalent to the installed surface.

PART 3 EXECUTION

3.1 CLEANING

- A. Exterior Cleaning: Sweep paved surfaces; rake other surfaces or grounds.
- B. Final Cleaning: Remove all tools, equipment, surplus materials, and rubbish. Refinish surfaces of existing facilities that are marred, scratched, or damaged to match original

condition. Remove grease, dirt, stains, foreign materials, and labels from interior and exterior finished surfaces. Do any required waxing and polishing. At time of final inspection, project shall be thoroughly clean and ready for use.

3.2 TESTING AND STARTUP

Provide Owner with all documentation of equipment and system testing and startup in accordance with Section 01670 - Equipment and System Testing and Startup.

3.3 TRAINING

Provide Owner with all documentation of training in accordance with Section 01675 – Training.

3.4 OPERATION AND MAINTENANCE MANUALS

Provide Owner with the final operation and maintenance manuals in accordance with Section 01680 – Operation and Maintenance Manuals.

3.5 PROJECT RECORD DRAWINGS

- A. Using red colored pencil, make changes on a set of clean full size drawings. Show all changes and revisions to the original design that affect the permanent structures and will exist in the completed work. Reference underground utilities to semi-permanent or permanent physical objects. Reference water, sewer, telephone, and electric lines to corners of buildings. Show invert elevations at structures, grade changes, valves, and fittings for all pipelines 6-inches in diameter and larger. Include schematic diagrams for all electrical equipment with terminal numbers shown.
- B. Keep record drawings current. Inspection will be made monthly and will be required prior to the submittal of Progress Payments. Certification by Contractor of accuracy and completeness will be required on monthly submitted payment requisitions. Project record drawings are the property of the Owner and shall be delivered to the Engineer before closeout.

3.6 SUBSTANTIAL COMPLETION AND FINAL INSPECTION

- A. Submit written certification that the project, or a designated portion of the project, is substantially complete, and request, in writing, a final inspection. The Engineer will make an inspection within 10 days of receipt of the request.
- B. When the Engineer determines that the work is substantially complete, he will prepare a list of deficiencies that need to be corrected before final acceptance and issue a certificate of Substantial Completion with the deficiencies noted.

- C. If the Engineer determines that the work is not substantially complete, he will immediately notify Contractor, in writing, stating reasons. After completing work, the Contractor shall resubmit certification and request a new final inspection.

3.7 ACCEPTANCE OF THE WORK

- A. After all deficiencies have been corrected to the satisfaction of the Engineer; a Letter of Final Acceptance will be issued by the Engineer.
- B. Acceptance may be given before correction of deficiencies that do not prevent operation and use of the facility; however in such case, an amount equal to twice the Engineer's estimated value of each deficient item or item of remaining work will be withheld until the work is accomplished or the deficiency repaired to the Engineer's satisfaction.
- C. Until receipt of Letter of Final Acceptance, Contractor shall be responsible for the work of this Contract.

3.8 OPERATING INSTRUCTIONS

In accordance with Section 01675, after equipment and systems are complete and operating as defined in Section 01670, the Contractor or his suppliers shall, in cooperation with Engineer, instruct Owner personnel how to operate them.

3.9 START-UP/TRAINING

In accordance with Section 01675, The Contractor shall demonstrate systems and instruct Owner personnel in their correct operation. This instruction shall include familiarizing Owner personnel with locations of switches, junction boxes, and circuiting. The Contractor shall have completed all startup and training defined in each individual applicable specification before project closeout.

3.10 CLOSEOUT SUBMITTALS

- A. Submit before payment request.
- B. Project Record Drawings: As specified above.
- C. Written Guarantees and Bonds: As specified in individual sections.
- D. Spare Parts, Special Tools, and Materials: As specified in individual sections.
- E. Keys and Keying Schedule: Submit all keys including duplicates. Wire all keys for each lock securely together. Tag and plainly mark with lock number or equipment identification,

and indicate physical location, such as building and room name or number, or panel or switch number.

- F. Operating Handles and Special Tools: Clearly identify as to related equipment.

3.11 CLOSEOUT DOCUMENTS AND SPARE PARTS

Submit the following at least seven (7) days prior to final payment request:

- A. Testing and Startup Forms
- B. Training documentation
- C. Project Record Drawings
- D. Operation and Maintenance Manuals
- E. Written Guarantees and Bonds: As specified in individual sections.
- F. Spare Parts, Special Tools, and Materials: As specified in individual sections.
- G. Keys and Keying Schedule: Submit all keys including duplicates. Wire all keys for each lock securely together. Tag and plainly mark with lock number or equipment identification, and indicate physical location, such as building and room name or number, or panel or switch number.
- H. Evidence of Payment and Release of Liens and Stop Payment Notices.

3.12 POST-CONSTRUCTION INSPECTION

Before expiration of guaranty period, Engineer will inspect project and notify Contractor in writing of any deficiencies.

END OF SECTION

SECTION 01741

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 SUMMARY

This Section includes requirements for construction waste reduction, disposal, and recycling mandates, in accordance with the 2019 California Green Building Standards Code, CCR Title 24, Part 11. Including administrative and procedural requirements for the following:

- A. Recycling nonhazardous construction waste.
- B. Disposing of nonhazardous construction waste.
- C. Forms attached as scheduled in Appendix A.

1.2 RELATED DOCUMENTS AND SECTIONS

- A. All Contract Documents.
- B. 2019 California Green Building Standards Code
- C. Section 02100 – Demolition, Clearing, Grubbing, Stripping
- D. Section 02200 – Earthwork
- E. Section 02513 – Asphalt Concrete Paving

1.3 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

- B. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- C. Recycle: The process of collecting, sorting, cleansing, treating and reconstituting materials that would otherwise become solid waste, and returning them to the economic mainstream in the form of raw material for new, reused or reconstituted products which meet the quality standards necessary to be used in the marketplace. "Recycling" does not include transformation, as defined in Public Resources Code Section 40201.
- D. Re-Use: The use, in the same form as it was produced, of a material which might otherwise be discarded.
- E. Solid Waste: All putrescible and non-putrescible solid, semisolid and liquid wastes, including garbage, trash, refuse, paper, rubbish, ashes, industrial wastes, demolition and construction wastes, abandoned vehicles and parts thereof, discarded home and industrial appliances, dewatered, treated or chemically fixed sewage sludge which is not hazardous waste, manure, vegetable or animal solid and semisolid wastes, and other discarded solid and semisolid wastes.
- F. Salvage: Recovery of construction waste and subsequent sale or reuse in another facility.
- G. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

Contractor shall recycle and/or salvage for reuse a minimum of 50 percent of the non-hazardous construction and demolition debris, except excavated soil and land-clearing debris. Calculate the amount of materials diverted by weight or volume, but not by both. Contractor shall reuse or recycle 100 percent of all excavated soils and land clearing debris, including trees, stumps, rocks, and associated vegetation and soils resulting from land clearing.

1.5 SUBMITTALS

- A. Contractor shall submit a Waste Management Plan within 30 days of the Notice to Proceed.
- B. Contractor shall provide Waste Reduction Progress Reports with each Application for Payment. Use Form CWM-7, in Appendix A for construction waste. Include the following information:
 - 1. Material category.
 - 2. Generation point of waste.
 - 3. Total quantity of waste by volume or weight.

4. Quantity of waste salvaged, both estimated and actual, by volume or weight.
 5. Quantity of waste recycled, both estimated and actual, by volume or weight.
 6. Total quantity of waste recovered (salvaged plus recycled) by volume or weight.
 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- C. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.6 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of Projects with similar requirements, as waste management coordinator.
- B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Meetings." Review methods and procedures related to waste management including, but not limited to, the following:
1. Review and discuss waste management plan including responsibilities of waste management coordinator.
 2. Review requirements for documenting quantities of each type of waste and its disposition.
 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.

4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.
6. Review acceptable locations for waste diversion and disposal.

1.7 WASTE MANAGEMENT PLAN

- A. Contractor shall develop a waste management plan according to ASTM E 1609, 2019 California Green Building Standards Code, and requirements of this Section. Plan shall consist of waste identification and waste reduction work plan. Plan shall identify the materials to be diverted from disposal by efficient usage, recycling, reuse on the project or salvage for future use or sale. Plan shall determine if materials will be sorted on-site or mixed and identify diversion facilities where material collected will be taken. The plan shall indicate that the amount of materials diverted shall be calculated by weight or volume, but not both, and the same units of measure shall be used throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of site-clearing and construction waste generated by the Work. Use Form CWM-1 in Appendix A for construction waste. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 in Appendix A for construction waste. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
 - 1. Distribute waste management plan to everyone concerned within three days of submittal return.
 - 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.

3.2 RECYCLING CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.
- C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site.
 - a. Include list of acceptable and unacceptable materials at each container and bin.
 - b. Inspect containers and bins for contamination and remove contaminated materials if found.
 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 3. Stockpile materials away from construction area. Do not store within drip line of trees.
 4. Store components off the ground and protect from the weather.
 5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.3 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 2. Polystyrene Packaging: Separate and bag materials.
 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.
1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

3.4 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

3.5 ATTACHMENTS (APPENDIX A)

- A. Form CWM-1 for construction waste identification.
- B. Form CWM-3 for construction waste reduction work plan.
- C. Form CWM-7 for construction waste reduction progress report.

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APPENDIX A

CONSTRUCTION WASTE MANAGEMENT FORMS

Form CWM-1	Construction Waste Identification
Form CWM-3	Construction Waste Reduction Workplan
Form CWM-7	Construction Waste Reduction Progress Report

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FORM CWM-1: CONSTRUCTION WASTE IDENTIFICATION							
MATERIAL CATEGORY	GENERATION POINT	EST. QUANTITY OF MATERIALS RECEIVED* (A)	EST. WASTE - % (B)	TOTAL EST. QUANTITY OF WASTE* (C = A x B)	EST. VOLUME CY (CM)	EST. WEIGHT TONS	REMARKS AND ASSUMPTIONS
Packaging: Cardboard							
Packaging: Boxes							
Packaging: Plastic Sheet or Film							
Packaging: Polystyrene							
Packaging: Pallets or Skids							
Packaging: Crates							
Packaging: Paint Cans							
Packaging: Plastic Pails							
Site-Clearing Waste							
Masonry or CMU							
Lumber: Cut-Offs							
Lumber: Warped Pieces							
Plywood or OSB (scraps)							
Wood Forms							
Wood Waste Chutes							
Wood Trim (cut-offs)							
Metals							
Insulation							
Roofing							
Joint Sealant Tubes							
Gypsum Board (scraps)							
Carpet and Pad (scraps)							
Piping							
Electrical Conduit							
Other:							

* Insert units of measure.

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FORM CWM-3: CONSTRUCTION WASTE REDUCTION WORK PLAN						
MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS	DISPOSAL METHOD AND QUANTITY			HANDLING AND TRANSPORTION PROCEDURES
			EST. AMOUNT SALVAGED TONS	EST. AMOUNT RECYCLED TONS	EST. AMOUNT DISPOSED TO LANDFILL TONS	
Packaging: Cardboard						
Packaging: Boxes						
Packaging: Plastic Sheet or Film						
Packaging: Polystyrene						
Packaging: Pallets or Skids						
Packaging: Crates						
Packaging: Paint Cans						
Packaging: Plastic Pails						
Site-Clearing Waste						
Masonry or CMU						
Lumber: Cut-Offs						
Lumber: Warped Pieces						
Plywood or OSB (scraps)						
Wood Forms						
Wood Waste Chutes						
Wood Trim (cut-offs)						
Metals						
Insulation						
Roofing						
Joint Sealant Tubes						
Gypsum Board (scraps)						
Carpet and Pad (scraps)						
Piping						
Electrical Conduit						
Other:						

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FORM CWM-7: CONSTRUCTION WASTE REDUCTION PROGRESS REPORT								
MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (D = B + C)	TOTAL QUANTITY OF WASTE RECOVERED % (D / A x 100)
			ESTIMATED TONS	ACTUAL TONS (B)	ESTIMATED TONS	ACTUAL TONS (C)		
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

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END OF SECTION

SECTION 01800

WASTEWATER POND SLUDGE REMOVAL AND DISPOSAL

PART 1 GENERAL

1.1 SUMMARY

This Section includes requirements for removing the accumulated sludge from the San Juan Bautista WWTP ponds. The Contractor shall be responsible for dewatering the pond sludge and for disposal offsite, elsewhere. One possible dewatering option could be to allow the ponds to settle. The water can be decanted, and the sludge allowed to dry in place. The sludge can then be removed for disposal offsite, elsewhere, as approved. Another dewatering option is mechanical dewatering. It is estimated that there are approximately 660 tons of dry sludge currently in the ponds. The actual cost of sludge removal and disposal will be based on the final insitu quantity (in dry tons) and the unit cost provided by the Contractor in the Bid Form and Schedule of Values. The final dewatering, drying, and sludge removal shall be as proposed by the Contractor and approved by the Engineer.

1.2 RELATED DOCUMENTS AND SECTIONS

- A. Section 02100 – Demolition, Clearing, Grubbing, Stripping
- B. Section 02200 – Earthwork

1.3 SUBMITTALS

- A. Contractor shall submit a Sludge Drying, Removal and Disposal Plan within 90 days of the Notice to Proceed for City approval. At a minimum, the Sludge Drying, Removal and Disposal Plan will include:
 - 1. Sludge dewatering and drying means and methods (e.g., allowing ponds to settle and dry, mechanical dewatering, etc.)
 - 2. Sludge removal means and methods
 - 3. Sludge disposal means and methods
- B. Sludge Drying/Removal/Disposal Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for the removal and disposal of the pond sludge.

- C. Sludge Drying/Removal/Disposal Records: Indicate receipt and acceptance of pond sludge by processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved Sludge Drying, Removal and Disposal Plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement the plan.
- B. Processing Facility: Engage a processing facility licensed to accept wastewater pond sludge to be responsible for final disposal of the wastewater pond sludge.
- C. Training: Train workers, subcontractors, and suppliers on proper sludge management procedures, as appropriate for the Work occurring at Project site.
 - 1. Distribute Sludge Drying, Removal and Disposal Plan to everyone concerned within three days of submittal return.

END OF SECTION

SECTION 02010

SUBSURFACE CONDITIONS

PART 1 GENERAL

1.1 DESCRIPTION

Crawford & Associates, Inc. prepared a soil investigation report entitled "Geotechnical Report, San Juan Bautista to Hollister Sanitary Force Main Project, San Benito County, California, dated September 2022.

A copy of the report is bound in the back of the Specifications in Appendix A. This report was obtained for the Owner's use in design and construction. Approximate test pit locations and test pit logs included in the reports are for Contractors information, but the report is not a warrant of subsurface conditions.

1.2 ADDITIONAL INFORMATION

Prior to bidding, the Contractor should visit the site and acquaint himself with all existing conditions. Bidders may make their own subsurface investigations to satisfy themselves as to site and subsurface conditions including, but not limited to, soil moisture conditions and current groundwater elevations. Such subsurface investigations shall be performed only under time schedules and arrangements approved in advance by the Owner. Neither the Owner nor its Consulting Design Engineers guarantee the accuracy of the information contained in the Geotechnical Report or any interpretation, deduction, or conclusion given in the report relative to subsurface conditions. Further it shall be the responsibility of the Contractor to satisfy himself of the type of soil and the level of the water table to be encountered during construction of the facilities. The bidder shall make his own deductions and conclusions as to the nature of the materials to be excavated; the difficulties which may arise from the subsurface conditions and of doing any other work affected by the subsurface conditions and shall accept full responsibility therefore.

1.3 QUALITY ASSURANCE

A Geotechnical Engineer will be retained by the Owner to provide testing and inspection of work in connection with excavating, filling, compacting, and grading.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 02020

GEOTECHNICAL REPORT AND STRUCTURAL DESIGN

PART 1 GENERAL

1.1 DESCRIPTION

Crawford & Associates, Inc. prepared a soil investigation report entitled “Geotechnical Report, San Juan Bautista to Hollister Sanitary Force Main Project, San Benito County, California, dated September 2022. This report pertains to the force main and does not include the City’s WWTP site where additional improvements, such as the Primary Pump Station, are planned. The geotechnical and final design at the City WWTP site shall be a design build component of the Project. The Contractor shall be responsible for the geotechnical and final design of the City WWTP site.

- A. This specification section details the minimum information required to be included in the Geotechnical Report for the City WWTP site. The Contractor will be responsible for employing a professional Geotechnical Engineer registered with the State of California to develop a Geotechnical Report that includes all elements set forth herein.
- B. The Contractor will also be responsible for the final design, including structural calculations, on the City WWTP site. The Contractor will be responsible for employing a professional Structural Engineer registered with the State of California to develop structural calculations and design details that includes all elements set forth herein and to verify or change the design details provided in the contract documents. The structural design elements on the WWTP site included in the contract documents are provided for bid purposes, but they all must be verified, approved or changed and stamped by a structural engineer. For bidding purposes, all foundation slabs shall be similar to the sidewalk detail but 12-inch thick with #6 EW EF, subject to Contractor confirmation.

1.2 RELATED INFORMATION DESCRIBED ELSEWHERE

- A. Section 01010 - General Construction Information and Requirements
- B. Section 01300 - Submittals
- C. Section 02200 - Earthwork
- D. Section 02225 - Structure Excavation & Backfill

E. Section 03100 - Concrete

1.3 GOVERNING CODES AND STANDARDS

- A. ACI-318 - Building Code Requirements for Structural Concrete
- B. ACI-350 - Code Requirements for Environmental Engineering Concrete Structures
- C. ACI - American Concrete Institute, Manual of Concrete Practice (MCP), Latest Edition, Applicable Standards
- D. CRSI - Concrete Reinforcing Steel Institute
- E. ASTM - Applicable Standards
- F. CCRL - Cement and Concrete Reference Laboratory
- G. SEAOC - Structural Engineers Association of California
- H. CBC – 2019 California Building Code

1.4 SUBMITTALS

- A. In accordance with Section 01300.
- B. The Contractor shall submit to the Engineer the name of the Geotechnical Engineer to be employed to develop the Geotechnical Report with the Bid (Specification Section 00434).
- C. Four weeks prior to beginning construction on the City WWTP site, the Contractor shall submit the items listed below to the Engineer for review and approval. The Contractor shall be solely responsible for the structural design of the City WWTP site and will be required to revise, or supplement, submitted information that is inadequate or incomplete in the opinion of the Engineer. The design shall comply with all governing codes, Federal ordinances, State ordinances, local ordinances, and generally accepted engineering principles.
 - 1. The Geotechnical Report prepared and signed by a professional Geotechnical Engineer registered with the State of California.
 - 2. Final design of the City WWTP site, including structural calculations, drawings, and specifications. Structural calculations and drawings shall be signed and sealed by a Civil or Structural Engineer registered in the State of California.

1.5 PAYMENT

The Contractor shall be responsible for all costs associated with the development of the Geotechnical Report and the final design of the City WWTP site. These costs shall be included in the bid amount.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

- A. The Geotechnical Engineer shall take the required number of borings depending on the site layout. Minimum one deep boring to 50 ft below ground surface or until competent bedrock is encountered to determine the risk of liquefaction. Locate as approved by the Engineer.
- B. Geotechnical engineer shall coordinate with the structural engineer and provide all the design parameters required for structural engineering, piles, sheeting and/or shoring including any not specifically identified herein.
- C. If shoring the structure is required, structural calculations shall show the anticipated loads, members, connections, and anchorage of the proposed shoring system.
- D. The following details the minimum structural-related requirements regarding the Geotechnical Report:
 - 1. Base the seismic parameters on the 2019 California Building Code.
 - 2. Describe subgrade preparation, including, but not limited to the following:
 - a. Specify soil types and remedies to handle such things as compressible soils and collapsible soils.
 - b. Address a 1-inch maximum settlement and ½-inch differential settlement.
 - 3. Include soil pressures (active, at rest, soil seismic, and passive) above and below (if applicable) groundwater.
 - 4. Specify allowable soil pressures for at grade and below grade structures as well as soil pressure for mat foundation at grade structures.
 - 5. Describe liquefaction and seismic settlement analysis. If liquefaction is of concern, grout or epoxy injection shall be evaluated. Liquefaction shall not be remedied with foundation system. Further, vibratory methods of soil densification are not desirable.
 - 6. Provide subgrade modulus.
 - 7. Provide soil coefficient of friction.

8. Provide groundwater information, including depth to groundwater.
 9. Provide, if applicable, hydrostatic uplift soil resistance (i.e. angle at which soil wedge would act to resist hydrostatic uplift).
 10. Provide skin friction and lateral bearing pressure for pole footings. Also, provide information for an increase due to short term loading (wind and seismic) and for structures that can accommodate ½-inch of movement.
- E. The following details other information required to be included in the Geotechnical Report, in addition to the structural requirements detailed above:
1. Site geology
 2. Fault rupture
 3. Summary of borings taken and laboratory testing
 4. Subsurface soil and groundwater conditions
 5. Existing and proposed pavement thicknesses
 6. Results of soil corrosivity tests
 7. Pipe trench backfill and compaction requirements
 8. Site limitations
 9. Any additional construction considerations, such as excavatability
 10. Shoring recommendations
 11. Appropriate times during construction when the Geotechnical Engineer will need to observe the site to verify the findings in the Geotechnical Report

END OF SECTION

SECTION 02100

DEMOLITION, CLEARING, GRUBBING, AND STRIPPING

PART 1 GENERAL

1.1 DESCRIPTION

Work included: Demolition, clearing, grubbing, and stripping required for this work includes, but is not necessarily limited to:

Removal of weeds, surface rock, and all debris at all locations identified for new construction and new grading and/or site work.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 02010 – Subsurface Conditions
- B. Section 02200 – Earthwork
- C. Section 02223 – Trenching, Backfilling, and Compacting
- D. Section 02225 – Structure Excavation and Backfill
- E. Section 02233 – Watering
- F. Section 03100 – Concrete

1.3 LIMITS OF WORK

Perform demolition, clearing, grubbing, and stripping operations to the following limits:

- A. Demolition: Perform demolition of existing facilities as designated on the contract drawings.
- B. Clearing: Perform clearing operations throughout the project site, as required for completion of the work designated on the contract drawings.

- C. Grubbing: Perform grubbing operations at all locations identified for clearing.
- D. Stripping: Perform stripping operations at all locations identified for demolition, new construction and new grading and/or site work.
- E. This project must be in compliance with the 2019 California Green Building Council Standards Code and shall meet the construction waste management and disposal mandates, as detailed in Specifications Section 01741.

1.4 PROJECT CONDITIONS

- A. Dust Control: Use all means necessary to prevent the spread of dust during performance of the work; thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors, and concurrent performance of other work on the site. Wind in excess of 10 MPH causing dust to leave site will require Contractor to limit dust causing activities.
- B. Burning: On-site burning will not be permitted.
- C. Protection: Use all means necessary to protect existing objects designated to remain and, in the event of damage, immediately notify the Engineer and make all repairs and replacements necessary for approval by the Engineer at no additional cost to the Owner.

PART 2 MATERIALS

2.1 TEMPORARY BARRICADES

Unless otherwise specifically approved by the Engineer, use only new and solid lumber of utility grade or better to construct temporary barricades around the objects designated to remain.

2.2 PRUNING PAINT

Use only a pruning paint specially formulated for horticultural application to cut or damaged plant tissue and approved by the Engineer for use on this work.

2.3 EXPLOSIVES

Do not use explosives on this work unless approved by the Engineer.

2.4 OTHER MATERIALS

All other material, not specifically described but required for proper completion of the work of this Section, shall be as selected by the Contractor subject to approval of the Engineer.

PART 3 EXECUTION

3.1 GENERAL DEMOLITION, CLEARING, GRUBBING, STRIPPING

- A. This project must be in compliance with the 2019 California Green Building Council Standards Code and shall meet the construction waste management and disposal mandates, as detailed in Specifications Section 01741.

3.2 PREPARATION

- A. Notification: Notify the Engineer at least two full working days prior to commencing the work of this section.
- B. Site Inspection
 - 1. Prior to all work of this section, carefully inspect the entire site and all objects designated to be removed and to be preserved. The Drawings do not purport to show all objects existing on the site. Before commencing the work of this section, verify with the Engineer all objects to be removed and all objects to be preserved.
 - 2. Locate all existing inactive utility lines to be encountered by the new work and determine all requirements for disconnecting and capping. Abandonment of piping requires capping at each end or plugging with concrete to the satisfaction of the Engineer.
 - 3. Locate all existing active utility lines traversing the site and determine the requirements for their protection to the satisfaction of the Engineer.
- C. Scheduling
 - 1. Schedule all work in a careful manner with all necessary consideration for neighbors, operation of the existing facilities, and the public.
 - 2. Avoid interference with the use of, and passage to and from, adjacent buildings and facilities.
- D. Disconnection of Utilities: Before starting site operations, disconnect or arrange for the disconnection of all utility services designated to be removed, performing all such work in accordance with the requirements of the utility company or Owner involved.
- E. Protection of Utilities: Preserve in operating condition all active utilities traversing the site and designated to remain.

3.3 STRUCTURE DEMOLITION

- A. Facilities so designated on the plans shall be demolished, and all materials there from shall become the property of the Contractor and shall be removed and disposed of away from the site. Any equipment or pipework connected within a structure which is designated to be removed and saved or relocated shall be removed before demolition begins. All other equipment within the structure shall become the property of the Contractor.
- B. All concrete and rock shall be removed to a depth of at least 2.5 feet below the finished grade unless otherwise noted and shall be disposed of off-site. Concrete not removed shall be broken to prevent entrapment of water, as directed by the Engineer. Concrete includes all reinforcement and embedded items. Pipework and conduit within 10 feet of a structure shall also be removed to a depth of 2.5 feet below existing grade unless otherwise noted. Existing concrete structures below new structural foundations shall be completely removed.
- C. Safety Requirements: The Contractor's attention is directed to the provisions of Subpart T of the OSHA Safety and Health Standards for Construction. The Contractor shall perform all the work hereunder in accordance with said provisions, and where in conflict, the more stringent shall apply.
- D. Backfill and Grading: After facilities have been demolished and all material removed, any remaining depression or hole shall be backfilled and the area finish graded as specified in Section 02200. Rubble and broken concrete will not be allowed to be used as fill material.

3.4 ROADWAY DEMOLITION

- A. Where shown on the contract drawings, Contractor shall remove entire pavement section including base material. This will also be necessary where deemed by the Engineer that extensive pipe construction has caused a loss of pavement integrity. Base material may be stockpiled and reused where appropriate and only with the approval of the Engineer.
- B. Asphalt concrete, concrete curb, and gutter materials to be demolished shall be broken up and removed from the site by the Contractor at no additional cost to the Owner.

3.5 PIPE DEMOLITION

- A. Unless otherwise specified, or in conflict with a proposed pipeline or structure, all pipes shown to be demolished shall be abandoned in place and have each end capped with at least a 24-inch long plug of at least class 4 concrete or grout material within the pipe. Piping subject to internal pressure upon abandonment shall be capped with pressure retaining caps or plugs. Pipes below new structural foundations shall be completely removed.
- B. All pipe materials to be removed including pipe, fittings, valves, and thrust blocking shall be disposed away from the site by the Contractor at no additional cost to the Owner.

3.6 CLEARING AND GRUBBING

A. Clearing, Grubbing, and Stripping

1. The Contractor shall restrict clearing and grubbing to the areas designated for new construction or adjustment of grades on the plans. Surrounding trees shall be protected from damage.
2. Remove and dispose of trees, snags, stumps, shrubs, brush, limbs, and other vegetative growth to the limits defined in Section 1. 3. Remove all evidence of branches greater than 1-inch in diameter of thickness. Remove and dispose of trash piles and rubbish. Protect structures and piping above and below ground, trees, shrubs, and vegetative growth and fencing which are not designated for removal or which exist outside project limits.
3. Where limbs or roots of trees designated to remain extend into work areas, the limbs or roots shall be trimmed in accordance with the provisions of this section.
4. Remove all surface rocks and all stumps, roots, and vegetation within the limits of construction. Roots shall be removed to at least 2.5 feet below proposed finish grade.
 - a. Conventional means shall be used to remove rocks, except isolated boulders exceeding 5 feet in dimension; these will require special excavation techniques (such as chiseling, air tools or rock splitting).
 - b. Non-explosive techniques are required, including ripping, chiseling, drilling, rock-splitting, etc. Blasting excavation is not allowed.
5. After grubbing, strip the organic material to the limits defined in Section 1. 3 to a depth of not less than 2-inches. Upon completion of the stripping operation, the remaining material, if utilized for structural fill, shall not exceed a concentration of organics in excess of 5 percent by dry weight. Dilution shall be accomplished by means of disking.
6. To encourage healthy vegetation, stockpile stripping and topsoil and re-install in locations where hydroseeding or landscaping is required.

B. Felling of Trees

1. Use all necessary care to protect the roots and branches of trees designated to remain, and to prevent damage to persons and properties.
2. Immediately after felling a tree, remove the branches, cut trunk and limbs as necessary for removal, and clear the debris.

C. Trimming of Trees

1. In company with the Engineer, ascertain the limbs and roots which are to be trimmed and clearly mark them to designate the approved point of cutting.
2. Cut evenly, using proper tools and skilled workmen to achieve neat severance with the least possible damage to the tree.

3. Promptly coat the cut area with the approved pruning paint in strict accordance with the manufacturer's recommendations.
4. In the case of root cuts, apply wet burlap or other protection approved by the Engineer, as required, to prevent drying out.

3.7 DISPOSAL OF STRIPPINGS

The stripped materials shall be removed from the project site at no cost to the Owner.

3.8 CONSTRUCTION OF BARRICADES

A. Layout

1. At all trees designated to be preserved, construct a temporary barricade around the tree at the tree's approximate drip line.
2. Make barricades at least three feet high, consisting of two inch by four inch or larger wood posts set at least 18 inches into the ground at not more than six feet on centers, joined at the top by one inch by six inch or larger wood boards firmly nailed to the posts. Metal post with orange safety fencing may also be used if allowed by the local Owner having jurisdiction.

B. Protection

1. Take special care in setting posts to not damage tree roots.
2. Do not permit stockpiling of materials or debris within the barricaded area nor permit the earth surface to be changed in any way except as specifically approved by the Engineer.

C. Maintenance: All protective fencing shall be inspected and maintained by the contractor at weekly intervals. Any damaged fencing shall be restored within one week.

D. Removal of Barricades: All protective fencing including posts and fabric shall be removed from the site at the completion of the work at the Contractor's expense.

3.9 REMOVAL OF DEBRIS

- A. Remove all debris from the site and leave the site in a neat and orderly condition to the approval of the Engineer. Dispose of debris off site at a location approved by the Engineer.
- B. Removal of demolished materials shall be included in the applicable lump sum base bid item and shall not be paid on a unit cost basis.

END OF SECTION

SECTION 02140

DEWATERING

PART 1 GENERAL

1.1 SCOPE

The work of this section consists of providing all labor, materials, and equipment necessary to dewater trench and structure excavations. Refer to the Specification Section 02010 – Subsurface Conditions, and the Geotechnical report included at the end of the Specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 - Submittals
- B. Section 02010 - Subsurface Conditions
- C. Section 02200 - Earthwork
- D. Section 02223 - Trenching, Backfilling, and Compacting
- E. Section 02225 - Structure Excavation and Backfill

1.3 SUBMITTALS

- A. In accordance with Section 01300.
- B. Two weeks prior to installation of dewatering facilities and commencement of excavation, submit:
 - 1. A dewatering plan prepared and stamped by a California Registered Geologist and/or a Certified Hydrogeologist and submitted to the Engineer for approval.
 - 2. Drawings and descriptions indicating numbers, locations, arrangements, depths, capacities, and construction details, as applicable, of all dewatering system equipment and components, including standby equipment and components.
 - 3. Methods of disposal of pumped water.

4. Methods of diverting precipitation and surface water away from excavations.
5. Method for collecting and removing precipitation within excavations as necessary.
6. Copies of executed permits necessary to perform work.
7. Pre-construction surveys, as specified in part 1.5.
8. Procedures for detecting movement, as specified in part 3.4.

1.4 PERMITS

The Contractor shall obtain and comply with all required permits for the dewatering system and operation, disposal of water, and pay all associated fees.

The Contractor shall be responsible for obtaining coverage under California Regional Water Quality Control Board, Central Coast Region (Central Coast Regional Water Board), Waste Discharge Requirements, Discharges with Low Threat to Water Quality (Order R3-2017-0042, NPDES No. CAG993001), if appropriate, for any dewatering activity, including removal of groundwater, removal of accumulated rainwater or removal of water from cofferdams or diversions resulting in a discharge to a surface water of the United States. Dewatering activities, within the boundary of the Central Coast Regional Water Board, shall comply with the conditions of the Central Coast Regional Water Board Limited Threat General Order, all conditions provided by the Regional Water Board in a Notice of Applicability for coverage under the Limited Threat General Order, and shall be in accordance with Caltrans BMP# NS-2 Dewatering Operations.

Following completion of dewatering activities, the Contractor shall be responsible for filing with the Central Coast Regional Water Board a Request for Termination of Coverage under the Limited Threat General Order.

1.5 PRE-CONSTRUCTION SURVEYS

The Contractor shall submit to the Engineer, for review and approval, pre-construction surveys for existing structures and facilities located above or adjacent to the new construction excavation dewatering work. The potential area of impact is considered infrastructure within a horizontal distance 1.5 times the depth of any excavation. These surveys shall include photographs, maps, plans, written descriptions and surveyed foundation levels as necessary to fully document pre-construction conditions. All surveys shall be performed by a licensed land surveyor.

PART 2 MATERIALS

2.1 FACILITIES AND EQUIPMENT

The Contractor shall provide all necessary facilities and equipment for the dewatering operations.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

- A. The Contractor shall have on hand, at all times, sufficient pumping equipment and machinery in good working condition and shall have available, at all times, competent workmen for the operation of the pumping equipment. Adequate standby equipment shall be kept available at all times to insure efficient dewatering and maintenance of dewatering operation during power failure.
- B. Dewatering shall commence at an appropriate time prior to commencing excavation, and shall be continuous until facilities and structures are completed, backfilled, and, as appropriate, filled with water to prevent damage from hydrostatic uplift and/or floatation.
- C. Excavations extending below site groundwater levels or encountering perched groundwater within permeable soil layers shall be dewatered. Dewatering of narrow trench excavations that penetrate less than a few feet below the groundwater level and do not encounter loose and/or cohesionless soils may be possible by directing inflow to a sump where water can be removed by a pump. Temporary dewatering of wider, deeper, and/or more extensive excavations may require well points, perimeter trench drains, and/or deep sumps. To help maintain bottom stability of wider, deeper, and/or more extensive excavations, groundwater levels shall be drawn-down a minimum of 5 feet below the lowest portion of the excavation.
- D. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation and protect temporary excavation slope stability during construction. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with drain rock on geotextile fabric at no additional cost to the Owner.
- E. Due to the potential for ground settlement attributable to temporary dewatering, the contractor shall survey all existing structures in the vicinity of the proposed dewatering operation, prior to the commencement of the dewatering operation. The contractor shall monitor the existing structures for settlement, both total and differential, throughout the dewatering operation. A daily report for each structure shall be prepared by the contractor and provided to the Engineer identifying the original baseline elevation; the elevation measured each day, and corresponding total and differential settlement. Modifications to the dewatering program may be necessary, as determined by the Engineer, should dewatering induced settlements be detected.
- F. Special consideration shall be given to the ponds on the Hollister WWTP site to ensure that the ponds and the embankment will be protected. The Contractor shall provide a detailed work plan for construction within the vicinity of the ponds describing the construction equipment, excavation means and methods, dewatering, sequencing, and schedule for Engineer approval.

3.2 DISPOSAL OF WATER

- A. The Contractor may dispose of the water into existing drainage courses at the plant site, subject to any applicable permitting to be obtained by the Contractor.
- B. The Contractor shall be responsible to design and control the dewatering operations such that disposal of water does not cause erosion or other damage and such that water to be disposed of is free from silt and other objectionable materials. Settling basins and/or other means shall be used as necessary.
- C. The Contractor shall utilize applicable construction activity Best Management Practices (BMP) for the project. Refer to "Caltrans Storm Quality Handbooks, Construction Site Best Management Procedures Manual", May 2017 or latest edition. Groundwater discharges are included in Section NS-2.
- D. The Contractor shall be responsible for obtaining coverage under the Central Coast Regional Water Board Limited Threat General Order for any dewatering activity, including removal and discharge of groundwater, accumulated rainwater and removing water from cofferdams or diversions, if necessary. Dewatering activities shall comply with the conditions of the Central Coast Regional Water Board Limited Threat General Order and all conditions provided by the Regional Water Board in a Notice of Applicability for coverage under the Limited Threat General Order.

3.3 TERMINATION OF DEWATERING

The termination of dewatering operations shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures, pipelines, and sewers. If damage occurs due to improper termination of dewatering, the Contractor is responsible to repair the damage to the satisfaction of the Engineer. Dewatering devices/features shall either be removed or abandoned in place in accordance with legal regulatory requirements and as approved by the Geotechnical Engineer.

3.4 DETECTION OF MOVEMENT

- A. For each existing infrastructure that are within the area of impact, defined above, install settlement markers capable of 0.005-foot accuracy.
- B. Take and record readings not less than once per day during dewatering work, until the permanent structure is completed to the ground level.
- C. If any movement is detected- stop work immediately, notify Engineer, and take immediate remedial action of infrastructure movement.

- D. Upon completion of dewatering work, take weekly readings of measurement points for a period of 4-weeks, or longer if movement persists, and report the results to the Engineer.
- E. The detection of movement shall be performed by a qualified licensed civil engineer or land surveyor.

3.5 RESTORATION

Restore existing infrastructure to conditions equivalent to those existing prior to the start of work, including repair of any settlement-related damage.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of excavation, filling, compaction, and grading for earthen embankments, roadways, and landscape fills including removal of unsuitable materials from the roadbed and beneath fill areas.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 02010 – Subsurface Conditions
- B. Section 02100 – Demolition, Cleaning, Grubbing, and Stripping
- C. Section 02140 – Dewatering
- D. Section 02223 – Trenching, Backfilling, and Compacting
- E. Section 02225 – Structure Excavation and Backfill
- F. Section 02233 – Watering
- G. Section 02270 – Stormwater Runoff Control Program
- H. Section 02272 – Vegetative Erosion Control
- I. Appendix A – Geotechnical Report, San Juan Bautista to Hollister Sanitary Force Main Project, San Benito County, California (Crawford & Associates, Inc., September 2022)

1.3 DEFINITIONS

- A. Local Borrow: Local borrow consists of approved soil from on-site. Borrow material shall meet the requirements of Engineered fill.
- B. Engineered Fill: On-site soil that meets the requirement of Part 2.2. of this section. The engineered fill shall be free (less than 5% by volume) of organic and deleterious materials.
- C. Imported Engineered Fill: All imported soil that meets the requirement of Part 2.2. of this section. The engineered fill shall be free of deleterious materials.
- D. Lime Treated Soil: On-site soil treated with high calcium quicklime as recommended by the project geotechnical engineer.
- E. Non-Engineered Fill: On-site soil that do not meet the requirements of Part 2.2 of this section.
- F. On-site Soil: Soil that is selected from the surplus material obtained from on-site excavation.
- G. Over-excavation: Over-excavation consists of authorized removal and satisfactory disposal of unsuitable soil located below subgrade surface. The Engineer determines the unsuitability of the soil.
- H. Relative Compaction: Relative compaction is defined as the ratio, in percent, of the as-compacted dry density to the laboratory maximum dry density. The laboratory maximum dry density is defined in accordance with ASTM D1557, latest edition. In-place density will be determined in accordance with ASTM D1556 or D6938, latest edition.
- I. Subbase: A layer of specified uniform bedding or leveling course between the base of a structure/foundation and subgrade.
- J. Subgrade: Surface remaining after completing the excavation or top surface of fill or backfill immediately below subbase or bedding as applicable.
- K. Standard Specifications: Where reference is made to Standard Specifications, reference shall mean: State of California, Business and Transportation Agency, Department of Transportation (Caltrans), Standard Specifications, latest edition, excluding measurement and payment items.
- L. Well Graded: Well graded as used in this section defines a mixture of soil particle sizes that have no specific concentration or lack thereof of one or more sizes. Well graded is used to help define a material that, when properly compacted, produces a strong and relatively incompressible soil.

1.4 QUALITY ASSURANCE

Testing required to determine compliance for the work of this section will be the responsibility of the Owner and at the Owner's expense. The Contractor shall cooperate by rerouting equipment or by temporarily closing the immediate work area being tested. Areas where test results indicate noncompliance shall be corrected before placing additional fill. Retesting of previously failing test areas will be charged to the Contractor in accordance with the Geotechnical Engineer's current rate schedule.

1.5 PROJECT CONDITIONS

Maintain fills, slopes, and ditches within the limits of the new construction until final acceptance. Repair areas damaged as a result of storms or construction. Take necessary precautions to prevent the entrance of soils and other materials into streambeds, lakes, or water courses.

PART 2 MATERIALS

2.1 GENERAL

- A. All fills shall be nearly free (less than 5% by volume) of from organic materials or other deleterious debris. The fill soil maximum particle size shall be less than 3 inches. Frozen material will not be permitted as fill.
- B. The near-surface, on-site soils should not be used for engineered fill within the upper 24 inches of subgrade to support structures such as concrete slab-on-grade and shallow equipment and building foundations.

2.2 ENGINEERED FILL

- A. All imported fill materials to be used for engineered fill shall be sampled and tested by the project Geotechnical Engineer prior to being transported to the site.
- B. Engineered fill material shall be utilized in the construction of earthen embankments, access roadways and all other areas identified on the contract drawings or as directed by the Geotechnical Engineer. Engineered fill shall meet the following minimum requirements:

Table 2.1
Engineered Fill Requirements

Engineered Fill Requirement		Test Procedures	
		ASTM ^(a)	Caltrans ^(b)
Gradation			
Sieve Size	Percent Passing		
3 inch	100	D422	202
¾ inch	70-100	D422	202
No. 4	50-100	D422	202
No. 200	20-70	D422	202
Plasticity			
Liquid Limit	Plasticity Index		
<40	<20	D4318	204
Organic Content			
Less than 5%		D2974	--
Expansion Potential (ASTM D4829)			
Less than 25%	--	--	--

(a) American Society for Testing and Materials Standards (latest edition).

(b) State of California, Department of Transportation, Standard Test Methods (latest edition).

- C. On-site soil could be used as engineered fill if it meets the requirements of Table 2.1 of this section and as approved by the Geotechnical Engineer.

2.3 AGGREGATE BASE

Aggregate base shall be Class 2 aggregate base, ¾" maximum, conforming to the Caltrans Standard Specifications.

2.4 CRUSHED ROCK

Material shall be crushed rock of one-inch (1") maximum size, with no material passing a Number four (#4) sieve.

2.5 GEOTEXTILE FABRIC

Geotextile fabric used in conjunction with aggregate base as an underlayment for access roadways shall be Propex 2006, Mirafi 600X, or equal. Overlap fabric minimum 1ft. The fabric shall be composed of high-tenacity polypropylene yarns, woven into a stable network to retain relative position. Fabric shall be inert to biological degradation and resistant to naturally encountered chemicals, alkalis, and acids.

Geotextile fabric used in conjunction with crushed rock base or gravel beneath structures shall be Mirafi 140N, Propex Geotex 401, Propex 4551, Reed and Graham RG60N, or equal. Overlap fabric minimum 1ft. Fabric shall be non-woven geotextile composed of polypropylene fibers, formed into a stable network of fibers retaining their relative position. The fabric shall be inert to biological degradation and resistant to naturally encountered chemicals, alkalis, and acids.

2.6 WATER FOR COMPACTION/DUST CONTROL

Water for compaction and dust control shall be clean and free of oil, acids, salts, and other deleterious substances. Water shall be supplied by the Contractor at no additional expense to the Owner. The Contractor shall provide all necessary labor and equipment to bring the water, and shall be responsible for the repair of any damage to the existing facilities that can be attributed to this operation.

2.7 IMPORTED MATERIAL ACCEPTANCE

All tests necessary for the Contractor to locate acceptable imported material shall be made by the Contractor. Certification that the material conforms to the Specification requirements along with copies of the test results from a qualified commercial testing laboratory shall be submitted to the Engineer for approval at least 30 days before the materials is required for use. All aggregate samples shall be furnished by the Contractor, at the Contractor's sole expense. Samples shall be representative and be clearly marked to show the source of the material and the intended use on the project. Sampling of the aggregate source shall be done by the Contractor under the supervision of the Engineer in accordance with ASTM D75. Tentative acceptance of the aggregate source shall be based on an inspection of the source by the Engineer and the certified test results submitted by the Contractor to the Engineer. No imported materials shall be delivered to the site until the proposed source and materials tests have been tentatively accepted in writing by the Engineer.

Final acceptance will be based on the tests made on samples of material taken from the completed and compacted course. The completed course is defined as a course or layer that is ready for the next layer or the next phase of construction. All testing for final acceptance shall be performed by the Engineer.

If tests conducted by the Contractor or the Engineer indicate that the material does not meet Specification requirements, material placement will be terminated until corrective measures are submitted and accepted by the Engineer. Material which does not conform to the Specification requirements and is placed in the work shall be removed and replaced at the Contractor's sole expense. Sampling and testing performed by the Contractor shall be done at the Contractor's sole expense. Retesting of failed test sections performed by the Engineer will be charged to the Contractor in accordance with the Geotechnical Engineer's current rate schedule.

2.8 DUST CONTROL

- A. Dust Control: Use all means necessary to prevent the spread of dust during performance of the work; thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors, and concurrent performance of other work on the site. Wind in excess of 10 MPH causing dust to leave site will require Contractor to limit dust causing activities.

PART 3 EXECUTION

3.1 GENERAL

The Contractor shall do all grading, filling-in or excavating as required to completely grade the site to lines and grades shown, and to provide for the indicated drainage. Where finish grade corresponds practically with existing grade, the ground shall be worked-up and graded-off evenly with existing grade.

3.2 STRIPPING

Perform clearing, grubbing, and stripping in accordance with Section 02100.

3.3 ORIGINAL GROUND PREPARATION

Perform all excavation of every description, regardless of the type, nature, or condition of material encountered as specified, shown on the contract drawings, or required to accomplish the construction.

- A. Over-Excavation: The zone of over-excavation shall extend laterally a minimum of 5 feet outside the limits of the structure. If the Engineer or Geotechnical Engineer directs the Contractor to perform over-excavation, the excess excavation and fill will be paid for as extra work. If the Contractor excavates below the required grade by chance, the Contractor shall fill the over-excavation at no cost to the Owner.
- B. Scarification and Recomposition: Following site stripping, grubbing, and any required over-excavation, areas to receive engineered fill or concrete slabs supported-on-grade shall be scarified to a depth of 8 inches, uniformly moisture-conditioned to between 3 and 5 percent of optimum moisture content, and compacted between 88 and 92 percent relative compaction. Within pavement areas (asphaltic cement and concrete) the top 12 inches of subgrade shall be scarified uniformly moisture conditioned between 2 and 4 percent above the optimum moisture content and compacted to at least 95 percent relative compaction.

3.4 GENERAL FOUNDATION SUBGRADE

A. Subsurface Structure Subgrades:

We anticipate subsurface structure excavations will extend below site groundwater levels. As a result, the bottom conditions are expected to be wet and unstable. Several alternatives exist for providing a stable working surface at the bottoms of such excavations. Following excavation and removal of all loose or disturbed materials, at least 12 inches of clean crushed rock surrounded by a filter fabric (Amoco 4551 or equivalent) shall be placed over the subgrade soil to provide a uniform base and leveling course below the structure. The crushed rock layer shall be compacted prior to construction of the structure over it.

As an alternative to crushed rock and fabric, a minimum 6-inch thick layer of lean concrete may be used as a base course as directed by the Geotechnical Engineer.

B. Embankment Fill Subgrades:

Prior to placement of fill materials in embankment areas, the existing pond bottoms and embankment slopes to remain shall be stripped of organic materials, debris, existing facilities to be abandoned, and any other deleterious materials to expose firm soil.

3.5 GENERAL COMPACTION REQUIREMENTS

Unless otherwise noted on the drawings, compaction shall be as follows:

Area	Relative Compaction
Embankment, Backfill and Earth Pads	90%
Beneath Structures	90%
Upper 12 inches of pavement subgrade	95%
Fill deeper than 5 feet	95%
Landscape Areas	90%

3.6 REMOVAL OF WATER

Provide and operate equipment adequate to keep all excavations and trenches free of water. Remove all water during periods when pipe is being laid, during the placing of backfill, and at such other times as required for efficient and safe execution of the work. Avoid settlement or damage to adjacent property. Dispose of water in a manner that will not damage adjacent property. When dewatering open excavations, dewater from outside the structural limits and from a point below the bottom of the excavation when possible. Water disposal shall meet all

Federal, State, and local requirements. Construction dewatering shall be in accordance with Section 02140.

3.7 MOISTURE CONTROL

- A. During compaction operations, maintain optimum moisture content as required per Section 3.5. in each lift of the earth fill. Maintain moisture content uniform throughout the lift. Insofar as practicable, add water to the material at the site of excavation. Supplement, if required, by sprinkling the earth fill. If the moisture content of the earth fill cannot be lowered to within the specified limit by aeration in a reasonable length of time, the Contractor shall import fill with which the specified moisture content can be achieved. At the time of compaction, the water content of the material shall be within the optimum water content range for the material being used.
- B. Do not compact fill material which contains excessive moisture to obtain the required compaction. Aerate the material by blading, discing, harrowing, or other methods, to hasten the drying process.

3.8 COMPACTION TESTS

The Geotechnical Engineer will determine in-place density and moisture content by any one or combination of the following methods: ASTM D1556 or D6938. The Contractor will cooperate with this testing work by excavating and leveling small test areas as designated by the Geotechnical Engineer. Tests in which either the moisture content requirements are not achieved or yield relative compaction results below the required minimum compaction requirements will constitute failure. Areas failing to meet the specified moisture content limits and/or minimum specified relative compaction shall be immediately reworked until such time as the minimum compaction requirements are achieved. Re-testing of previously failing test areas will be backcharged to the Contractor in accordance with the Geotechnical Engineer's current rate schedule.

3.9 SITE GRADING

Perform all earthwork to the lines and grades as shown and/or established by the Engineer. Shape, trim, and finish slopes of channels to conform with the lines, grades, and cross sections shown. Make slopes free of all exposed roots and stones exceeding 2-inches in diameter.

3.10 DISPOSAL OF EXCESS EXCAVATION

- A. Dispose of all excess excavated materials, in the areas as designated on the construction drawings or as directed by the Engineer. Material shall be placed level or sloped and compacted at a 90% relative compaction as directed by the Engineer at no cost to the Owner. If disposal location is not specifically identified on the drawings, haul and dispose all excess excavated materials off site, at no additional expense to the Owner.

- B. This project must be in compliance with the 2019 California Green Building Council Standards Code and shall meet the construction waste management and disposal mandates, as detailed in Specifications Section 01741.

3.11 DITCHES

Construct drainage swales, ditches, and inlet and outlet ditches for culverts as shown or as directed. Trim ditch slopes neatly to line. Final flow line grade shall be reasonably uniform to provide free drainage without puddling. Ditches shall be over-built where puddling is anticipated. The slope of all ditches shall be trimmed to leave a smooth and compacted surface. Surfaces trimmed with a backhoe are unacceptable.

3.12 SLOPE FINISHING

Fill slopes shall be over-built and cut back into firm material to finish grade.

3.13 PLACEMENT OF CRUSHED ROCK OR GRAVEL

Where crushed rock or gravel base is required, envelope the rock or gravel with geotextile fabric.

3.14 EROSION AND SEDIMENT CONTROL

The site shall be protected from erosion and sediment transport at all times utilizing a combination of best management practices (BMP) as identified below. Refer to General and Supplemental Conditions, General Stormwater Pollution Prevention Plan (SWPPP), and Contract Drawings for more information and prepare a site specific SWPPP in accordance with all applicable standards.

- A. Temporary Erosion & Sediment Control: Stormwater BMPs shall be employed in a system such that erosion and sediment transport shall be significantly minimized from unprotected earthwork activities. Refer to specification Sections 02270 for Stormwater Runoff Control Program and Section 02272 for SWPPP requirements.
- B. Permanent Erosion & Sediment Control: The permanent stormwater BMPs shall be employed in a system such that erosion and sediment transport shall be significantly minimized from unprotected earthwork activities. Refer to the contract drawings for location of all drainage ditches, fill areas, asphalt concrete roads, landscaped areas, and graveled areas. Track walking or other acceptable method shall be utilized on all embankment slopes. See Specification Section 02270 and 02272 for SWPPP requirements.

END OF SECTION

SECTION 02222

ABANDONMENT OF SEWERS

PART 1 GENERAL

1.1 DESCRIPTION

The work of this Section consists of in-place abandonment of existing sewers, junction structures, manholes, service lines, and force mains as shown and indicated on the drawings. Abandonment shall consist of filling existing sewers, junction structures, manholes, service lines, and force mains with a flowable fill or low density cellular concrete (LDCC) fill as specified here in and in the locations shown on the drawings.

1.2 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 01300: Submittals
- B. Section 02223: Trenching, Backfilling, and Compacting
- C. Section 03100: Concrete

1.3 GOVERNING CODES AND STANDARDS

- A. ASTM C150 - Standard Specification for Portland Cement.
- B. ASTM C494 - Standard Specification for Chemical Admixture for Concrete.
- C. ASTM C618 - Standard Specification for Fly Ash and Raw or Calcinated Natural Pozzolan for use as Mineral Admixture in Portland Cement Concrete.
- D. ASTM C869 – Standard Specification for Foaming Agents Used in Making Preformed Foam for Cellular Concrete.
- E. ASTM C937 - Standard Specification for Grout Fluidifier for Pre-placed Aggregate Concrete.

- F. ASTM C940 - Standard Test Method for Expansion and Bleeding of Freshly Mixed Grout for Replaced Aggregate Concrete in the Laboratory.
- G. ASTM C1017 - Standard Specification for Chemical Admixture for Use in Producing Flowing Concrete.
- H. ASTM C1107 - Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)
- I. ASTM D6103 – Standard Test Method for Flow Consistency of Controlled Low Strength Material (CLSM)
- J. ACI 523.1R-06: Guide for Cast-in-Place Low-Density Cellular Concrete

1.4 SUBMITTALS: IN ACCORDANCE WITH SECTION 01300.

- A. Flowable fill mix design report:
 1. Flowable fill type and production method. Describe if fill will be mixed to final proportions and consistency in batch plant or if constituents will be added in transit mixer at placement location.
 2. Use of ballast. Provide percentage of ballast of total placement and size limits for ballast if fill is intended to be used with ballast.
 3. Aggregate gradation of fill. Aggregate gradation of mix (excluding ballast) shall be used as pilot curve for quality control during production.
 4. Fill mix constituents and proportions including materials by weight and volume, and air content but excluding ballast. Give types and amounts of admixtures including air entrainment or air generating compounds.
 5. Fill densities and viscosities, including wet density at point of placement.
 6. Initial time of set.
 7. Bleeding and shrinkage.
 8. Compressive strength.
- B. LDCC fill mix design report:
 1. LDCC fill mix design and production method.
 2. Use of foaming agent. Provide foaming agent technical data and proposed used.
 3. Mix constituents and proportions including materials by weight and volume.
 4. Fill densities and viscosities, including wet density at point of placement.
 5. Initial time of set.

6. Bleeding and shrinkage.
 7. Compressive strength.
- C. Technical information for equipment and operational procedures including projected fill injection rate, grout or mix pressure, method of controlling grout or mix pressure, bulkhead and vent design, and number of stages of fill application.
 - D. Experience record for proposed crew, showing minimum of 100 cubic yards of flowable fill LDCC fill placed using proposed or similar equipment and methods.
 - E. At least 60 days prior to commencing abandonment activities, submit plan for abandonment, describing proposed grouting sequence, bypass pumping requirements and plugging, if any, and other information pertinent to completion of work.

PART 2 MATERIALS

2.1 FLOWABLE FILL

- A. Design Mix Criteria. Provide design of one or more mixes to meet design criteria and conditions for placement. Present information required by Paragraph 1.4A in mix design report including following:
 1. Cement: ASTM C150 Type I or II. Volume and weight per cubic yard of fill. Provide minimum cement content of 100 pounds per cubic yard.
 2. Fly ash: ASTM C618 Class C or F. Volume and weight per cubic yard of fill. Provide minimum Fly ash content of 200 pounds per cubic yard.
 3. Potable water: Volume and weight per cubic yard of fill. Amount of water determined by mix design testing.
 4. Aggregate gradation: 100 percent passing 3/8-inch sieve and not more than 10 percent passing No. 200 sieve. Mix design report shall define pilot gradation based on following sieve sizes 3/8-inch, Nos. 4, 8, 16, 30, 50, 100, and 200. Do not deviate from pilot gradation by more than plus or minus 10 percentage points for any sieve for production material.
 5. Aggregate source material: Screened or crushed aggregate, pit or bank run fine gravels or sand, or crushed concrete. If crushed concrete is used, add at least 30 percent of natural aggregate to provide workability.
 6. Admixtures: Use admixtures meeting ASTM C494 and ASTM C1017 as needed to improve pumpability, to control time of set, and reduce bleeding.
 7. Fluidifier: Use fluidifier meeting ASTM C937 as necessary to hold solid constituents in suspension. Add shrinkage compensator if necessary.

8. Performance additive: Use flowable fill performance additive, such as Darafill or equal, to control fill properties.

B. Flowable Fill Requirements

1. Unconfined compressive strength: minimum 75 psi and maximum 150 psi at 56 days as determined based on an average of three tests for same placement. Present at least three acceptable strength tests for proposed mix design in mix design report.
2. Placement characteristics: self-leveling.
3. Shrinkage characteristics: non-shrink.
4. Water bleeding for fill to be placed by grouting method in sewers: not to exceed 2 percent according to ASTM C940.
5. Minimum wet density: 90 pounds per cubic foot.

2.2 BALLAST

- A. Ballast Material: Natural rock or concrete pieces with minimum size equal to at least 10 times maximum aggregate size of flowable fill and maximum size of 24 inches. Maximum dimension shall not be more than 20 percent of minimum dimension of space to be filled.
- B. Ballast Composition: Free of regulated waste material.

2.3 LOW DENSITY CELLULAR CONCRETE (LDCC) FILL

- A. Portland cement shall comply with ASTM C150 (Type I, II, or III).
- B. Fly ash shall be Class C or Class F and compatible with foaming agent.
- C. Water shall be free from deleterious substances.
- D. Foaming agent shall be Geofoam Concentrate by California Lite Weight Concrete, Inc. or equivalent conforming to ASTM C869.
- E. Admixtures for water reducing, retarding, accelerating and other specific properties may be used when recommended by the manufacturer of the foaming agent.
- F. LDCC shall have the following properties:
 1. Range of Cast Density: 24-30, PCF
 2. Minimum Compressive Strength (28 Days): 40 PSI
 3. Flow Consistency per ASTM D6103: Greater than 7"

2.4 PLUGS

- A. Grout Plugs: Cement-based dry-pack grout conforming to ASTM C1107, Grade B or C.
- B. Manufactured Plug: Commercially available plug or cap specifically designed and manufactured to be used with pipe being abandoned.

PART 3 EXECUTION

3.1 PREPARATION

- A. Notify Engineer at least 24 hours in advance of grouting with flowable fill or LDCC fill.
- B. Select fill placement equipment and follow procedures with sufficient safety and care to avoid damage to existing underground utilities and structures. Operate equipment at pressure that will not distort or imperil portion of work, new or existing.
- C. Clean sewer lines and video with closed circuit television to identify connections, locate obstructions, and assess condition of pipe. Locate previously unidentified connections, which have not been redirected and reconnected as part of this project, and report them to Engineer. During placement of fill, compensate for irregularities in sewer pipe, such as obstructions, open joints, or broken pipe to ensure no voids remain unfilled.
- D. Perform demolition work prior to starting fill placement. Clean placement areas of sewers and manholes of debris that may hinder fill placement. Remove excessive amounts of solids or semi-solids and other substances that may degrade performance of fill. Do not leave solids or other debris in place if filling more than 2 percent of placement volume. Remove and dispose of waste material at appropriately licensed landfill.
- E. Remove free water prior to starting fill placement.

3.2 EQUIPMENT

- A. Mix flowable fill in automated batch plant and deliver it to site in ready-mix trucks. Performance additives may be added at placement site if required by mix design.
- B. Foam generation equipment for LDCC shall be used to produce a quantity of pre-formed foam which shall be mixed and blended with cementitious slurry, suitable for sewers segment or appurtenances to be abandoned. Equipment shall be calibrated to produce consistent foam with stable, uniform cellular structure.
- C. LDCC shall be produced utilizing specialized automated proportioning, mixing, and foam producing equipment, which is capable of meeting the specified properties.

- D. Avoid excessive handling of LDCC material. After sufficient mixing of the foam with slurry, the material shall be conveyed promptly in its final location.
- E. Use concrete or grout pumps capable of continuous delivery at planned placement rate.

3.3 DEMOLITION OF SEWER MANHOLES, PIPELINE STRUCTURES AND FORCE MAINS PRIOR TO ABANDONMENT

- A. Remove manhole frames and covers and castings from existing pipeline structures to be abandoned. Deliver castings to Owner for future use. Alternatively, salvaged castings may be used upon approval by Engineer, for constructing new manholes on this project.
- B. Demolish and remove precast concrete adjustment rings and corner section, or brick and mortar corbel and chimney, or other pipeline structure, to minimum depth of 4 feet below finished grade. Structure may be removed to greater depth, but not deeper than 18 inches above crown of abandoned sewer.
- C. When adjacent sewer lines are not to be filled, place temporary plugs in each line connecting to manhole, in preparation for filling manhole.
- D. Excavate overburden from force mains to be abandoned at locations indicated on Drawings, conforming to Section 02223 – Trenching, Backfilling, and Compacting. Cut existing force main, when necessary, to provide an end surface perpendicular to axis of pipe and suitable for plug to be installed. Remove force main piping material remaining outside of segment to be abandoned.

3.4 INSTALLATION

- A. Abandon sewer lines by completely filling sewer line with flowable fill or LDCC fill or other material as approved by Engineer. Abandon manholes and other structures by filling with flowable fill or LDCC fill, together with ballast as applicable, within depth of structures left in place.
- B. Placement of LDCC shall follow applicable guidelines of ACI 523.1R-06, Guide for Cast-in-Place Low Density Cellular Concrete.
- C. Place flowable fill or LDCC fill to-fill volume between manholes. Continuously place fill from manhole to manhole with no intermediate pour points, but not exceeding 500 feet in length (for flowable fill) or 2,000 ft for LDCC fill.
- D. Have filling operation performed by experienced crews with equipment to monitor density of flowable fill and LDCC fill characteristics and to control pressure.

- E. Temporarily plug sewer lines which are to remain in operation during pouring/pumping to keep lines free of fill.
- F. Pump fill through bulkheads constructed for placement of two 2-inch pipes or use other suitable construction methods to contain fill in lines to be abandoned. These pipes will act as injection points or vents for placement of fill.
- G. Place fill under pressure flow conditions into properly vented open system until fill emerges from vent pipes. Pump fill with sufficient pressure to overcome friction and to fill sewer from downstream end, to discharge at upstream end.
- H. Inject flowable fill through replaced ballast using grouting equipment and series of grout pipes discharging at bottom of placement, allowing fill to rise through ballast effectively filling all voids. Alternatively, sequentially place individual pieces of ballast at same time as flowable fill is placed. Do not fill with ballast more than 50 percent of volume at any level, to prevent nesting and void formation.
- I. Remediate placement of flowable fill or LDCC fill which does not fill voids in sewer, in manhole or other structures, or where voids develop due to excessive shrinkage or bleeding of fill, by using pressure grouting either from inside sewer or from surface.
- J. Plug each end of force main being abandoned.
- K. Force main abandonment
 - 1. Clean inside surface of force main at least 12 inches from ends to achieve firm bond and seal grout plug or manufactured plug to pipe surface. Similarly, clean and prepare exterior pipe surface if manufactured cap is to be used.
 - 2. When using grout plug, place temporary plug or bulkhead approximately 12 inches inside pipe. Fill pipe end completely with dry-pack grout mixture.
 - 3. When using manufactured plug or cap, install fitting according to manufacture's instructions, to form water tight seal.
- L. Backfill to surface, above pipe or structures left in place, with flowable fill in restricted areas, compacted bank run sand in unrestricted areas to be paved or select fill in unrestricted areas outside of pavement. Place and compact backfill, other than flowable fill, in compliance with Section 02223 – Trenching, Backfilling, and Compacting.
- M. Collect and dispose of excess fill material and other debris.

3.5 FIELD QUALITY CONTROL

- A. Provide batch plant tickets for each truck delivery of flowable fill. Note on tickets addition of admixtures at site.

- B. Check flow characteristics and workability of fill as placement proceeds.
- C. Obtain at least three test cylinders for each placement area for determination of 56-day compressive strength and bleeding. Acceptance of placement will be based on average strength of three tests.
- D. Record volume of ballast together with flowable fill placement for same space to demonstrate that voids have been filled.
- E. Measure and record wet cast densities and flow consistency of LDCC at the point of placement at regular intervals. Mix shall be adjusted as required to obtain the specified cast density and flow consistency.

3.6 PROTECTION OF PERSONS AND PROPERTY

- A. Provide safe working conditions for employees throughout demolition and removal operations. Observe safety requirements for work below grade.
- B. Maintain safe access to adjacent property and buildings. Do not obstruct roadways, sidewalks or passageways adjacent to work.

END OF SECTION

SECTION 02223

TRENCHING, BACKFILLING, AND COMPACTING

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of trenching and backfilling for the construction and installation of pipelines, conduits and cables. All trenching will be open cut, unless otherwise approved in writing. It includes all clearing and grubbing, trenching or tunneling, construction of cribbing and cofferdams, dewatering, incidental work, and providing specified backfill.

1.2 RELATED WORK SPECIFIED ESLEWHERE

- A. Section 01300: Submittals
- B. Section 01666: Testing of Pipelines, Gravity Sewer Lines, and Manholes
- C. Section 02010: Subsurface Conditions
- D. Section 02100: Demolition, Clearing, Grubbing, and Stripping
- E. Section 02200: Earthwork
- F. Section 02229: Utility Line Marking
- G. Section 02233: Watering
- H. Section 02270: Stormwater Runoff Control Program
- I. Section 02513: Asphalt Concrete Paving
- J. Section 03100: Concrete
- K. Section 10400: Identifying Devices
- L. Section 15010: General Process and Onsite Utility Piping Provisions

- M. Section 16010: General Electrical
- N. Appendix A: Geotechnical Report, San Juan Bautista to Hollister Sanitary Force Main Project, San Benito County, California (Crawford & Associates, Inc., September 2022)

1.3 SUBMITTALS

- A. Submit six copies of a report from a testing laboratory verifying that material conforms to the specified gradations of characteristics for granular material, imported sand, rock refill for foundation stabilization, and water.
- B. Submit method of compaction in pipe zone including removal sequence of shoring where used.
- C. Provide written description of barricading, shoring, cribbing, bracing, and sloping precautions.

1.4 PROJECT CONDITIONS

- A. Obtain all required permits and licenses before installing utilities under existing roads, other than County roads, and follow the rules and requirements of the authority having jurisdiction.
- B. Arrange construction sequences to provide the shortest practical time that the trenches will be open to avoid hazard to the treatment plant staff, subcontractors, and public, and to minimize the possibility of trench collapse.

1.5 Excavation of Rock/Boulders:

- A. Conventional means shall be used to remove rocks, except isolated boulders exceeding 5 feet in dimension; these will require special excavation techniques (such as chiseling, air tools or rock splitting).
- B. Non-explosive techniques are required, including ripping, chiseling, drilling, rock-splitting, etc. Blasting excavation is not allowed.

1.6 TESTING FOR COMPACTION

- A. The City will test for compaction at locations determined by the City.
- B. Relative compaction is defined as the ratio, in percent, of the as-compacted dry density to the laboratory maximum dry density. The laboratory maximum dry density is defined in

accordance with ASTM D1557, latest edition. As-compacted dry density will be determined in accordance with ASTM D3017 or D2922, latest edition.

- C. Where compaction tests indicate a failure to meet the specified compaction, the City will take additional tests every 50 feet in each direction until the extent of the failing area is identified. Rework the entire failed area until the specified compaction has been achieved.

1.7 STREET ZONE

The street zone includes the asphalt concrete and aggregate base pavement section placed over the trench backfill.

1.8 TRENCH ZONE

The trench zone includes the portion of the trench from the top of the pipe zone to the bottom of the street zone in paved areas or to the existing surface in unpaved areas.

1.9 PIPE ZONE

The pipe zone shall include the full width of trench from the bottom of the pipe or conduit to a horizontal level above the top of the pipe, as shown on the contract drawings. Where multiple pipes or conduits are placed in the same trench, the pipe zone shall extend from the bottom of the lowest pipes to a horizontal level above the top of the highest or topmost pipe.

1.10 PIPE BASE OR BEDDING

The pipe base or bedding shall be defined, unless noted otherwise on the Drawings, as a minimum 6-inches thick layer of material immediately below the bottom of the pipe or conduit and extending over the full trench width in which the pipe is bedded.

PART 2 MATERIALS

2.1 ENGINEERED FILL (TYPE 1)

Engineered fill shall consist of excavated native or imported material conforming to requirements of Section 02200.

2.2 IMPORTED SAND (TYPE 2)

Imported washed sand used for the pipe bedding, conduit and pipe zones shall be free of clay or organic material and have the following gradation:

Sieve Size	Percent Passing by Weight
3/8-INCH	100
No. 4	90 – 100
No. 30	12 – 50
No. 100	5 – 20
No. 200	0 – 5

Imported sand shall have a sand equivalent not less than 30.

2.3 CLASS 2 AGGREGATE BASE (TYPE 3)

Backfill material consisting of Class 2 Aggregate Base in accordance with Caltrans Standard Specifications Section 26-1.02. Recycled material such as recycled concrete or recycled asphaltic concrete shall not be used, unless approved by the Engineer.

2.4 ¾-INCH CRUSHED ROCK (TYPE 5)

Crushed rock base and gravel are defined as natural or crushed rock, free from organic matter, and meeting the following gradation:

Sieve Size	Percent Passing by Weight
1 -inches	100
¾ -inch	90 – 100
3/8"	20 - 55
No. 4	0 – 10
No. 8	0 – 5

Durability Index shall be at least 40 per California Test Method No. 229 or ASTM D3744.

2.5 CEMENT SLURRY (TYPE 6)

Cement slurry backfill materials shall be according to Caltrans Standard Specification Section 19-3.062 and shall consist of cement, fine aggregate/sand and sufficient water for workability. It shall contain at least 188 lbs cement for each cubic yard of material. Slurry shall be thoroughly machine-mixed and shall be placed with one hour after initial mixing.

2.6 BACKFILL MATERIAL SCHEDULE (FOR PLACEMENT)

Unless otherwise call out on the plans, backfill materials shall be provided according to the following schedule:

Location	Material
Street Zone	Class 2 AB (Type 3)
Trench Zone	Engineered/Native Fill (Type 1) Class 2 AB (Type 3)
Pipe Zone	Imported Sand (Type 2) Class 2 AB (Type 3)
Bedding	Imported Sand (Type 2) Class 2 AB (Type 3)

2.7 REFILL FOR FOUNDATION STABILIZATION

Loose materials at trench bottoms resulting from excavation disturbances should be removed to firm soil. If soft, loose or unstable areas are encountered these areas should be over-excavated to a firm base or a depth of 2 feet. Refill consists of materials for filling the over excavation as approved by the Geotechnical Engineer. Refill shall meet the material requirements specified for pipe zone. As an alternative, crushed rock, enveloped in geotextile fabric may be utilized subject to the approval of the Geotechnical Engineer.

2.8 CONCRETE FOR PIPE ENCASEMENT AND THRUST BLOCKS

- A. Concrete for pipe encasement and thrust blocks shall be per Section 03100, unless otherwise shown in the drawings.
- B. Size thrust block bearing area for 1500 PSF, unless noted otherwise on Drawings. Size thrust blocks based on the test pressures provided in the contract documents. All thrust forces shall be calculated according to “AWWA Manual M41”.

2.9 WATER FOR COMPACTION

Water for compaction shall be clean and free of oil, acids, salts, and other deleterious substances. Water shall be supplied by the Contractor at no additional expense to the Owner. Water shall be available as defined in Specification Section 02233. The Contractor shall coordinate with the Engineer for the use of the water shall provide all necessary labor and equipment to extract, transport and apply the water for compaction, and shall be responsible for the repair of any damage to the existing facilities which can be attributed to this operation.

2.10 COFFERDAM AND CUTOFF COLLARS

For steep trenches, provide concrete cut-off collar to prevent surface and groundwater concentration and erosion. For trench slopes over 10%, install concrete cut-off collar at intervals

no more than 100-feet (on center). For trench slopes over 15%, install concrete cut-off collar at intervals no more than 50-feet (on center).

PART 3 EXECUTION

3.1 COMPACTION REQUIREMENTS

Unless otherwise shown in the drawings or otherwise described in the specifications for the particular type of pipe installed, relative compaction in pipe trenches shall be as follows:

- A. Pipe Base: 90% or 95% relative compaction (see drawings).
- B. Pipe Zone: 90% or 95% relative compaction (see drawings).
- C. Backfill in Trench Zone not Beneath Paving or Aggregate Base Access Roadways: 90% or 95% relative compaction (see drawings).
- D. Backfill in Trench Zone to Street Zone in Paved Areas or Within Limits of Aggregate Base Roadways: 90% or 95% relative compaction (see drawings).
- E. Backfill in Street Zone in Paved Areas or within Limits of Aggregate Base Roadways: 95% of relative compaction.
- F. Refill for Foundation Stabilization: 95% relative compaction.
- G. Refill for Overexcavation: 95% relative compaction.
- H. Where compaction tests indicate a failure to meet the specified compaction, the Owner will take additional test every 50 feet in each direction until the extent of the failing area is identified. Rework the entire failed area until the specified compaction has been achieved.

3.2 MATERIAL REPLACEMENT

Remove and replace any trenching and backfilling material which does not meet the specifications, at the Contractor's expense. Note that this project must be compliant with the 2019 California Green Building Standards Code and shall meet the construction waste management and disposal mandates, as detailed in Specification Section 01741.

3.3 SLOPING, SHEETING, SHORING, AND BRACING OF TRENCHES

Trenches shall have sloping, sheeting, shoring, and bracing conforming with 29CFR1926, Subpart P – Excavations, CAL/OSHA requirements, and the General Conditions.

3.4 SIDEWALK, PAVEMENT, AND CURB REMOVAL

Cut bituminous and concrete pavements regardless of the thickness and curbs and sidewalks prior to excavation of the trenches with a pavement saw or pavement cutter. Width of the pavement cut shall be at least equal to the required width of the trench at ground surface plus 6-inches past each side of the trench. Haul pavement and concrete materials from the site. Do not use for trench backfill.

3.5 TRENCH WIDTHS

Trench widths in the pipe zone shall be as shown in the drawings. If no details are shown, the maximum width shall be 24 inches greater than the pipe outside diameter. Comply with 29CFR Part 1926 Subpart P – Excavations. Trench width at the top of the trench will not be limited except where width of excavation would undercut adjacent structures and footings. In such cases, width of trench shall be such that there is at least two feet between the top edge of the trench and the structure or footing.

3.6 TRENCH EXCAVATION

Excavate the trench to the lines and grades shown in the drawings with allowance for pipe thickness, sheeting and shoring if used, and for pipe base or special bedding. If the trench is excavated below the required grade, refill any part of the trench excavated below the grade at no additional cost to the City with foundation stabilization material. Place the refilling material over the full width of trench in compacted layers not exceeding 6-inches deep to the established grade with allowance for the pipe base or special bedding.

3.7 DEWATERING

- A. Provide and maintain means and devices to remove and dispose of all water entering the trench excavation during the time the trench is being prepared for the pipelaying, during the laying of the pipe, and until the backfill at the pipe zone has been completed. These provisions shall apply at all times during construction, including the noon hour as well as overnight. Dispose of the water in a manner to prevent damage to adjacent property and in accordance with regulatory agency requirements. Do not drain trench water through the pipeline under construction. Do not allow groundwater to rise around the pipe until jointing compound has set hard.
- B. Dewater in accordance with Section 02140.

3.8 LOCATION OF EXCAVATED MATERIAL

- A. During trench excavation, place the excavated material only within the working area. Do not obstruct any roadways or streets. Conform the federal, state, and local codes governing

the safe loading of trenches with excavated material. All trenches shall be backfilled at the end of each day's operation.

- B. Until permanent AC paving can be replaced, the Contractor shall backfill the trench to grade and maintain the subgrade and surface in a condition that is suitable to support and safely carry traffic. New AC paving shall be placed within one (1) week after backfilling and trench, unless otherwise approved by the Engineer.

3.9 LENGTH OF OPEN TRENCH

At no time shall the length of open trench exceed 500 feet in advance of pipelaying or amount of pipe installed in one working day, whichever is less, and not more than 500 feet in the rear of pipelaying, except as modified by encroachment permit requirements.

- A. At the end of each working day, the entire trench shall be backfilled to match existing surface. The length of open trench which may be left unattended overnight shall be limited to 20 feet or one pipe length, whichever is shorter.
- B. For any section of trench that will be left unattended the Contractor shall:
 - 1. Isolate the trench from unauthorized access with rigid barricades and/or temporary fencing and clearly mark and delineate it with warning signs, reflective cones, and warning lights.
 - 2. If within the street right-of-way, plate the trench using trench plates and provide sheeting shoring and bracing to support the trench plates sufficient to carry H-20 traffic loads. Applicable state, county, and municipal traffic safety rules will govern installation and maintenance of trench plates.

3.10 TRENCH EXCAVATION IN BACKFILL AND EMBANKMENT AREAS

Construct trench excavation for pipe, pipes, or conduit in backfill or embankment areas in accordance with the following procedures:

- A. Construct and compact the embankment to an elevation of 1-foot minimum over the top of the layer of the largest pipe or conduit to be installed.
- B. Excavate trench in the compacted backfill or embankment. Place cement slurry in the pipe base and pipe zone. Compact backfill above the pipe zone to the relative compaction required for trench zone backfill.

3.11 FOUNDATION STABILIZATION

- A. After the required excavation has been completed, the City and/or Agency will inspect the exposed subgrade to determine the need for any additional excavation. It is the intent that

additional excavation be conducted in all areas within the influence of the pipeline where unacceptable materials exist at the exposed subgrade. Overexcavation shall include the removal of all such unacceptable materials that exists directly beneath the pipeline to the required trench width and to the depth required. Backfill the trench to subgrade of pipe base with refill material for foundation stabilization. Place the foundation stabilization material over the full width of the trench and compact in layers not exceeding 6-inches deep to the required grade. Foundation stabilization work shall be executed in accordance with a change order.

- B. Refill used by the Contractor for his convenience will not receive any additional payment.

3.12 INSTALLING BURIED PIPING

- A. Backfill per the detailed piping specification for the particular type of pipe and per the following.
- B. Handle pipe in such a manner as to avoid damage to the pipe. Do not drop or dump pipe into trenches under any circumstances.
- C. Inspect each pipe or fitting prior to placing into the trench. Inspect the interior and exterior protective coatings. Patch damaged areas in the field with material recommended by the protective coating manufacturer. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after installation.
- D. All pipelines indicated in the construction drawings shall be properly identified using the following methods:
 - 1. Install locator tape in accordance with details specified in Section 02229.
 - 2. Furnish and install colored pipe (applicable to PVC pipe only) – Potable Water/Blue, Reclaimed Water/Purple, Sanitary Sewers/Green, White may be used only with prior approval of the Engineer.
 - 3. Locator wire shall be installed in accordance with details specified in Section 02229.
 - 4. Alternate systems for marking water pipelines may only be used with prior approval of the Engineer.
- E. Grade the bottom of the trench to the line and grade to which the pipe is to be laid, with allowance for pipe thickness and bedding depth. Remove hard spots that would prevent a uniform thickness of bedding. Place the specified thickness pipe base material over the full width of trench. Grade the top of the pipe base ahead of the pipelaying to provide firm, continuous, uniform support along the full length of pie, and compact to the relative compaction specified herein. After laying each section of the pipe, check the grade and alignment and correct any irregularities prior to laying next joint.

- F. Excavate bell holes at each joint to permit proper assembly and inspection of entire joint. Fill the area excavated for the joints with the bedding material specified or detailed in the drawings.
- G. Install cofferdams and concrete cutoff collars are required to prevent erosion and water movement.
- H. When installing pipe, do not deviate more than 1-inch from line or 1/4 –inch from grade. Measure elevation at the pipe invert. The Contractor shall verify pipe grade at not more than 50 feet intervals, in the presence of the City’s Representative.
- I. After pipe has been bedded, place pipe zone material simultaneously on both sides of the pipe, in maximum 6-inch lifts, keeping the level of backfill the same on each side. Carefully place the material around the pipe so that the pipe barrel is completely supported and that no voids or compacted areas are left beneath the pipe. Use particular care in placing material on the underside of pipe to prevent lateral movement during subsequent backfilling.
- J. For pipe sizes greater than 12-inches in diameter, no more backfill material than the lesser of 6-inches or 1/3rd of the pipe diameter shall be placed prior to shovel slicing. Sufficient care shall be taken to prevent movement of the pipe during shovel slicing. Shovel slicing shall be witnessed by the Field Inspector and/or Engineer.
- K. Compact each lift to the relative compaction specified herein.
- L. Push the backfill material carefully onto the backfill previously placed in the pipe zone. Do not permit free fall of the material until at least 2 feet of cover is provided over the top of the pipe. Do not drop sharp, heavy pieces of material directly onto the pipe or the tamped material around the pipeline. Do not operate heavy equipment over the pipe until at least 3 feet of backfill has been placed and compacted over the pipe.
- M. When pipelaying is not in progress, including the noon hours, close the open ends of pipe. Do not allow trench water, animals, or foreign material to enter the pipe.
- N. Remove and dispose of all water entering the trench during the process of pipelaying. Keep the trench dry until the pipelaying and jointing are completed.

3.13 BACKFILL COMPACTION

Compact per the detailed piping specification for the particular type of pipe and per the following:

- A. Compact trench backfill to the specified relative compaction. Compact by using mechanical compaction or hand tamping. Do not use high impact hammer-type or heavy

equipment except where the pipe manufacturer warrants in writing that such use will not damage the pipe. Ponding or jetting is not allowed.

- B. Compact material placed within 12-inches of the outer surface of the pipe by hand tamping and/or small hand held tamping equipment.
- C. Do not use any axle-driven or tractor-drawn compaction equipment within 5 feet of building walls, foundations, or other structures.

3.14 CEMENT SLURRY BACKFILL

When cement slurry backfill is utilized, pipe shall be supported by mounding imported backfill material or sandbags filled with imported backfill material. Pipe shall not be supported on wooden or concrete blocks.

END OF SECTION

SECTION 02225

STRUCTURE EXCAVATION AND BACKFILL

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of all structure excavation and backfill required to complete the work, including rock excavation, furnishing select or imported backfill, and disposal of surplus or unsuitable material.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 – Submittals
- B. Section 02010 – Subsurface Conditions
- C. Section 02100 – Demolition, Clearing, Grubbing and Stripping
- D. Section 02140 – Dewatering
- E. Section 02200 – Earthwork
- F. Section 02233 – Watering
- G. Section 02270 – Stormwater Runoff Control Program
- H. Section 02400 – Dewatering
- I. Appendix A – Geotechnical Report, San Juan Bautista to Hollister Sanitary Force Main Project, San Benito County, California (Crawford & Associates, Inc., September 2022)

1.3 QUALITY ASSURANCE

Evaluation of all fill materials and testing required to determine compliance for the work of this section will be the responsibility of the Contractor and at the Contractor's expense. Areas where test results indicate noncompliance shall be corrected before placing additional backfill.

1.4 PROJECT CONDITIONS

Take necessary precautions to prevent the entrance of soils and other materials into streambeds, lake, or other water sources.

1.5 RELATIVE COMPACTION TEST

- A. The Owner shall test for compaction at locations determined by the Engineer.
- B. Relative compaction is defined as the ratio, in percent, of the as-compacted dry density to the laboratory maximum dry density. The laboratory maximum dry density is defined in accordance with ASTM D1557, latest edition. As-compacted dry density is defined in accordance with ASTM D3017 or D2922, latest edition.
- C. Where compaction tests indicate a failure to meet the specified compaction, the Contractor will take additional tests every 50 feet in each direction until the extent of the failing area is identified. Rework the entire failed area until the specified compaction has been achieved at no cost to the Owner.

PART 2 MATERIALS

2.1 IMPORTED NON-EXPANSIVE BACKFILL

Fill Requirement		Test Procedures	
		ASTM ^(a)	Caltrans ^(b)
Gradation			
Sieve Size	Percent Passing		
3 inch	100	D422	202
¾ inch	70-100	D422	202
No. 4	50-100	D422	202
No. 200	20-70	D422	202
Plasticity			
Liquid Limit	Plasticity Index		
<30	<12	D4318	204
Organic Content			

Less than 3%		D2974	--
Expansion Potential (ASTM D4829)			
Less than 20	--	--	--
(a) American Society for Testing and Materials Standards (latest edition)			
(b) State of California, Department of Transportation, Standard test Methods (latest edition)			

2.2 CRUSHED ROCK

See Section 02200 for Material Requirements.

2.3 AGGREGATE BASE

See Section 02200 for Material Requirements.

2.4 DRAIN ROCK

See Section 02200 for Material Requirements.

2.5 DRAIN ROCK FABRIC

See Section 02200 for Material Requirements.

2.6 ENGINEERED FILL

See Section 02200 for Material Requirements.

PART 3 EXECUTION

3.1 CLEARING

Perform clearing operations in accordance with Section 02100.

3.2 STRUCTURAL EXCAVATION

- A. General: All excavation for structures shall be done to the dimensions and levels indicated on the drawings or specified herein.
- B. Under all deeper structures, the Contractor shall:

1. Excavate to subgrade, remove and dispose of organic material and unsuitable soils.
 2. Scarify the surface a minimum depth of 8-inches, bring the moisture content between 3 and 5 percent above optimum and compact between 88 and 92 percent minimum relative compaction.
 3. For uniform base and leveling course below structures, refer to Section 02200.3.4.B.
 4. At grade or near grade structures are covered in Part 3.3 of this section.
- C. Under all pavements, the Contractor shall:
1. Excavate to below subgrade, remove and dispose of organic material and unsuitable soils.
 2. Scarify the surface a minimum depth of 8-inches, bring the moisture content between 3 and 5 percent above optimum and compact between 88 and 92 percent relative compaction.
 3. Compact upper 12 inches of pavement subgrade to at least 95% relative compaction.
 4. For class 2 aggregate base thickness, refer to Section 02513 Asphalt Concrete Paving.
- D. Excavation shall be made to such width outside the lines of the structure to be constructed therein as may be required for proper working methods, the erection of forms and the protection of the work. Care shall be taken to preserve the foundation surfaces shown on the drawings in an undisturbed condition. If the Contractor excavates or disturbs the foundation surfaces shown on the drawings or specified herein without written authorization of the Engineer, the Contractor shall replace at his expense such foundations with compacted gravel foundation fill or other material approved by the Engineer in a manner which will show by test an equal bearing strength with the undisturbed foundation material at no cost to Owner.
- E. Bracing, Sheeting, and Shoring: Care shall be exercised in excavating for lower footings not to disturb bearing under higher adjacent footings or structures. Existing structures and pipework shall be adequately braced and cared for so that no damage will result. The Contractor shall submit structural calculations and drawings stamped and signed by a civil or structural engineer registered in the State of California showing members, connections, and anchorage of the proposed bracing, sheeting, and shoring. All bracing, sheeting, and shoring shall conform to CAL/OSHA requirements. The Contractor shall provide suitable sheeting and shoring, where necessary, for protection of the excavations. All such sheeting and shoring shall be removed unless otherwise specifically authorized.
- F. Unsuitable Materials: To suit field conditions, excavation below the depths shown may be ordered, but changes may only be made as directed by the Engineer. Soft, spongy, or unsuitable bearing material of any kind shall be entirely removed down to solid bearing soil and replaced with an engineered fill that meets the requirements of Table 2.1 of Section 02200 Earthwork. In such event only the excess excavation and fill will be paid for as extra work.

- G. Dewatering: Any water that may be encountered or that may accumulate in excavations shall be removed and kept out by pumping or other approved methods, and all construction shall be carried on in the dry. Water shall be kept down until structures are complete to above water, safe from uplift and horizontal water pressure and the backfill has been placed. Dewatering shall be in accordance with Section 02140.
- H. Approval of Excavation: The Contractor shall notify the Engineer when excavation for a structure is complete and no forms, reinforcing steel or concrete, shall be placed until the excavation has been approved by the Engineer. Once the excavation is approved, the Contractor must protect the work from flooding or groundwater uplift.
- I. Disposal of Surplus Soil or Soil High in Organics: Excavated material determined by the Engineer to be unsuitable, or in excess of the amounts required for backfill shall be stockpiled or disposed, as follows:
 - 1. Topsoil shall be stockpiled separately from other excavation materials.
 - 2. Removed topsoil shall first be placed and compacted in a 6-inch layer on the surface of filled slopes. Surplus topsoil shall be spread in locations where hydroseeding or landscaping is required as directed by the Engineer.
 - 3. Surplus excavation may be spread under topsoil in locations where hydroseeding or landscaping is required as directed by the Engineer. Material shall be screened to exclude rocks larger than 4-inches. Rocks shall be disposed offsite.
- J. Excavation of Rock/Boulders:
 - 1. Conventional means shall be used to remove rocks, except isolated boulders exceeding 5 feet in dimension; these will require special excavation techniques (such as chiseling, air tools or rock splitting).
 - 2. Non-explosive techniques are required, including ripping, chiseling, drilling, rock-splitting, etc. Blasting excavation is not allowed.

3.3 ENGINEERED FILL

- A. General: All soil under pavements, embankments, and at other locations where indicated on the drawings or identified in this specification or as directed by the Geotechnical Engineer shall be made using engineered fill subgrade, carefully controlled and compacted on a prepared native subgrade. The near-surface, on-site soils consist predominantly of lean and fat clays. These soils shall not be used for engineered fill within the upper 24 inches of subgrades to support the following structures (see Section 3.3.B of the specification):
 - 1. Headworks
 - 2. New drive way improvements, west of existing WWTP building
 - 3. MCC and generator

4. Chemical Feed System
 5. All slab-on grades.
 6. Precast vaults and manholes less than 8 feet depth.
- B. Imported non-expansive engineered fill in conformance with Table 2.0 shall be compacted in the upper 24 inches (and 3 feet beyond) of subgrade under the above structures.
- C. Surface Preparation: The surface on which fill is to be placed shall be free of all vegetation, debris, or other objectionable material, and all large roots shall be grubbed out to a depth of at least 2 feet below footing, slab, or pavement elevations and 5 feet beyond the limits of the proposed improvements. The surface shall be scarified to a depth of 8 inches, brought to a moisture content between 3 and 5 percent above optimum and compacted between 88 and 92 percent relative compaction. It may be necessary to adjust the moisture content of the subgrade soil by watering or aeration to bring the moisture content of the soil near optimum in order that the specified densities can be obtained.
- D. Placement of Fill:
1. Fill materials shall be spread in a maximum of 8-inch loose lifts and shall have a specified uniform moisture content. If necessary to obtain uniform distribution of moisture, water shall be added to each layer by sprinkling and the soil disced, harrowed, or otherwise manipulated after the water is added. If the material is too wet, the moisture content shall be reduced as necessary by spreading and aerating.
 2. Field density tests shall be used to check the compaction of the fill materials. Sufficient tests shall be made on each layer by the Engineer to assure adequate compaction throughout the entire area. If the dry densities are not satisfactory, the Contractor will be required to increase the weight of the roller or the number of passes as required to produce the specified densities at no cost to the Owner.
 3. Where trenches must be excavated in Engineered Fill these trenches shall be backfilled with the fill materials excavated. The backfill shall be placed in 8-inch layers and each layer compacted with pneumatic tampers to provide densities as specified above. Backfill placed adjacent to walls shall be placed in a similar manner to that specified for backfill in excavated trenches.
 4. No fill shall be placed during weather conditions which will alter the moisture content of the fill materials sufficiently to make adequate compaction impossible. After placing operations have been stopped because of adverse weather conditions, no additional fill material shall be placed until the last layer compacted has been checked and found to be compacted to the specified densities.

3.4 BACKFILL AGAINST STRUCTURES

- A. Walls for the following listed subsurface structures shall be backfilled with imported non-expansive fill (that meets the requirements of Table 2.0 of this Section):

1. Primary Pump Station
 2. Storage Pump Station
 3. Meter and pigging vaults
- B. The zone of non-expansive fill should extend at least 3 feet behind the wall. Engineered fill shall be used beyond the 3 feet non-expansive fill zone. For structures and buildings not listed above, non-expansive fill zone is not needed and engineered fill shall be used for backfill. Alternative to non-expansive fill, well graded sandy gravels such as Caltrans Class 2 aggregate base material could be used for structure backfill upon review and approval by the Geotechnical Engineer. Backfill shall be uniformly moisture conditioned between 3 and 5 percent above the optimum moisture content placed in horizontal lifts less than 8 inches in loose thickness and compacted between 88 and 92 percent relative compaction.
- C. Do not place backfill against newly constructed concrete structures for a period of 14 days unless authorized by the Engineer, and not until the concrete has reached the specified 28-day compressive strength requirement, as detailed in Specification Section 03100. Hand-held compactors shall be used for backfill against concrete walls within a horizontal distance of H/2 of the structure, where H is defined as the vertical height of the backfill above the foundation.

3.5 ONSITE SOILS

- A. On-site soils may be used as an alternative to import fill.
- B. If required to stabilize materials, the contractor may utilize lime treatment approved for use by geotechnical engineer.
1. Contractor shall perform lab testing to sufficiently determine the percentage of lime needed to meet the specifications. Geotechnical engineer shall observe mixing of lime with soil. Lime treatment shall be done on all segregated soils as specified below.
 2. Lime Treatment
 - a. Lime treatment may be used to reduce the expansion potential of the on-site clay soils, to dry out wet soils to facilitate compaction, and to construct stable working surfaces for construction of the plant improvements. For estimating purposes to assume an application rate of 3 percent high calcium quicklime by dry weight of soil. Ratio modification shall remain as specified, unless approved otherwise by Engineer after Contractor has performed lab testing to determine the percentage of lime necessary. Lime treatment may be performed on in-place materials or on stockpiled soils immediately prior to placement and compaction. Placement of lime treated fill materials shall be performed in accordance with the requirements for structural backfill.

- b. Lime treatment shall be performed by a specialty contractor experienced in this work and shall be performed in general accordance with the Caltrans Standard Specifications.
- c. Treatment with lime shall require the initial application and mixing followed by remixing prior to placement and/or compaction. Lime treated materials shall be thoroughly mixed, moisture conditioned between 0 and 3 percent above the optimum moisture content, and compacted as indicated herein.
- d. The presence of organic materials and/or sulfates in the soil can affect lime treatment operations. In no case should lime treatment be performed in sulfate rich soils, as formation of the ettringite mineral can occur and cause excessive expansion and ground heave.
- e. Lime treatment will result in a soil pH over 10 and shall be avoided in landscaped areas.

END OF SECTION

SECTION 02229

UTILITY LINE MARKING

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of furnishing and installing utility line marking, identifying devices for valves, and underground warning tape for buried utilities.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300: Submittals
- B. Section 02200: Earthwork
- C. Section 02223: Trenching, Backfilling, and Compacting
- D. Section 10400: Identifying Devices
- E. Section 15010: General Process and Onsite Utility Piping Provisions
- F. Section 16010: General Electrical

1.3 SUBMITTALS

- A. In accordance with Section 01300.
- B. Samples: 24-inch strips of tape, 2 surface markers, and valve tags.
- C. Certification that the materials used in the tape fabrication meet the requirements of this section.
- D. Submit a complete schedule of all surface markers and valve box identification tags.

PART 2 MATERIALS

2.1 MARKING TAPE

- A. Capable of being inductively detected electronically.
- B. Construction: Metallic foil laminated between two layers of plastic film not less than 2 inches wide. The adhesive shall be colored and be compatible with the foil and film.
- C. Film: Inert plastic. Each film layer shall be not less than 0.0005 inch thick (1/2 mil).
- D. Foil: Not less than 0.001 inch thick (1 mil).
- E. Imprint: 3/4-inch or larger bold black letters.
- F. Underground warning tape for buried utilities shall be imprinted with the legend identified in the Underground Utilities Schedule found in Part 3 of this Section.
- G. Legend: The buried utility line tape shall be identified with imprint such as “CAUTION: SEWER LINE BELOW” and the identification repeated on approximately 24-inch intervals.
- H. Detectable marking and warning tape shall be as manufactured by Lineguard, Inc., Paul Potter Associates, both of Wheaton, Illinois; Griffolyn Company, Inc., of Houston, Texas, Carlton Industries of La Grange, Texas; Brady of Milwaukee, WI; and Seton Nameplate of Branford, CT, or approved equal.

2.2 SURFACE MARKERS

- A. All piping shall include surface markers:
 - 1. Local stakes (directly above pipe): Carsonite CRM3-072-01 with 4” x 5” anchor bard kit (as distributed by Berntsen International, SURV-KAP Inc., or approved equal).
 - 2. Offset stakes (adjacent to piping): Carsonite Tufflex Utility Marker – green.
- B. Affix the following labels to all piping surface stake markers:
 - 1. For local markers, located directly above piping: affix green caution decals with white lettering stating– “Caution Sewer Line, Buried Below” affixed to all local stakes, #5337-RWL. Also affix decal stating “Underground Service Alert – Call Before You Dig (811)”.
 - 2. For offset markers, located adjacent to the piping: affix green caution decals with white lettering stating – “Caution Sewer Line, xyz-feet Offset” where xyz will be specific to the actual offset distance to the pipe (and represents the distance, to

the nearest foot, measured perpendicular, from the face of the marker post to the center of the piping). Also affix decal stating “Underground Service Alert – Call Before You Dig (811)”.

2.3 TRACER WIRE

- A. Tracer wire shall be 10 AWG soft drawn solid copper. All tracer wire shall be insulated. Insulation shall be in the color (s) indicated in the Underground Utility Marking Schedule found in Paragraph 3.4 of the Section.
- B. Tracer wire shall be brought to the surface at each valve box, fire hydrant, manhole, structure, and any other location indicated in the Project Drawings. Tails shall be able to extend not less than 18 inches above finished grade.

PART 3 EXECUTION

3.1 MARKING TAPE

- A. Install tape in backfill directly over each buried utility line, directly above the pipe zone. Multiple strands of tape needed for different sized pipe:

Pipe Size	Tape Strands Required
¾" – 12"	1
15" – 30"	2
36" and larger	3

- B. Install warning tape in backfill, with the legend facing up, directly over each buried utility line, directly above the pipe zone, unless otherwise noted on the drawings.
- C. Where utilities are buried in a common trench, identify each line by a separate warning tape. Bury tapes side by side directly over the applicable line.
- D. Tape color shall conform to typical industry standards.
- E. For “Reclaimed Water” pipe, wrap the pipeline with metallic tape, 12-inches minimum width, purple in color labeled “Reclaimed Water”. Wrap spirally around the pipe throughout the entire pipe length, with a pitch such that no gap greater than 12-inches exists longitudinally down the pipe. Secure circumferentially at intervals not exceeding 2 pipe diameters with duct tape.
- F. For above grade piping identification markers, see specification section 10400.

3.2 SURFACE MARKERS

Provide stakes for the 10 inch HDPE force main at 250 feet intervals and at all changes in alignment or end of pipe. Stakes may be offset to avoid drive areas (in the shoulder) as approved by the Engineer. No stakes are required through the Rancho Vista development area (Caetano Place, Rancho Way, and Third Street).

3.3 TRACER WIRE

- A. Tracer Wire shall be installed for each pipeline indicated in the table below. Tracer wire shall be secured to the top of each pipeline at intervals not to exceed 4 feet.
- B. Tracer wire shall be brought to the surface at each valve box, fire hydrant, manhole, structure, and any other location indicated in the Project Drawings. Tails shall be able to extend not less than 18 inches above finished grade.

3.4 UNDERGROUND UTILITY MARKING SCHEDULE

Utility diameter sizes 12-inches and smaller shall have 3-inch wide marking tape, all others shall be 12-inches wide. Underground warning tape shall be color coded as specified below and shall be imprinted with a two-line message. The top shall read, "CAUTION CAUTION..." and the bottom line shall read as indicated below:

Service	Width	Color	Legend	Tracer Wire
Potable Water	3"/12"	Blue	Buried Water Line Below	Blue/Black
Gravity Sewer	3"/12"	Green	Buried Sewer Below	Green/Black
Sewer Main Force	3"/12"	Green	Buried Sewer Below	Green/Black
Chemical (SHC, SHX, Lime, Bioxide, etc.)	3"	Yellow	Buried Chemical Service Below	N/A
Electric	3"	Red	Buried Electrical Service Below	N/A
Communications/Fiber Optics/Cable/Telephone	3"	Orange	Buried Communications Service Below	N/A
All Others	3"	Yellow	Caution Buried Utility Below	N/A

END OF SECTION

SECTION 02233

WATERING

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of furnishing, hauling, and applying water required in the compaction of embankments, backfills, subgrade, and base course, and for landscaping, dust control, and other construction operations.

PART 2 MATERIALS

2.1 WATER

- A. Potable water is available at or near the project site. Potable water for use by the Contractor for Construction or other purposes shall be coordinated by the Contractor at the Contractor's expense.
- B. No provision in this section is intended to prevent the Contractor from making arrangements for water from other than Owner sources. All costs involved shall be the responsibility of the Contractor.

PART 3 EXECUTION

3.1 EQUIPMENT

- A. Contractor shall provide all necessary pumping equipment, piping, meters, tanks, and water trucks to withdraw and utilize the water. Water trucks shall be of at least 1,000 gallon capacity, equipped with a spray bar of ample capacity and design to insure uniform application of water in the amounts required.
- B. The Contractor shall identify all equipment using or hauling "Reclaimed Water" and "Non-Potable Water" to notify workmen of potential for contact. Signage shall be as approved by the Engineer.

END OF SECTION

SECTION 02270

STORMWATER RUNOFF CONTROL PROGRAM

PART 1 GENERAL

1.1 DESCRIPTION

- A. This specification section describes requirements for compliance with State Water Resources Control Board (State Board) National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities Order No. 2009-009-DWQ (Construction General Permit), as amended by Order No. 2012-006-DWQ and Order No. 2010-014-DWQ. The Construction General Permit contains requirements for the preparation and implementation of a Stormwater Pollution Prevention Plan (SWPPP) to minimize surface water pollution from construction-related activities prior to disturbing a site. Requirements to perform a Risk Assessment, to prepare and implement a Construction Site Monitoring Program (CSMP) and select appropriate Best Management Practices (BMPs) to be employed by the Contractor to reduce or eliminate sediment and other pollutants in stormwater and non-stormwater discharges to local surface waters during all phases of construction are also contained within the Construction General Permit. The Contractor will be responsible for compliance with the Construction General Permit and any other applicable stormwater regulations. The Contractor will be required to produce a SWPPP and CSMP, pursuant to the requirements of the Construction General Permit.
- B. The Contractor will be responsible for producing all of the documentation necessary to obtain coverage under the Construction General Permit prior to the commencement of construction activity. The Contractor shall prepare all documentation as specified in Attachment B “Permit Registration Documents (PRDs)” to Comply with the Terms of the General Permit to Discharge Storm Water Associated with Construction Activity General Instructions” of the Construction General Permit.
- C. This specification section, in addition to specification Section 02272, details the minimum essential elements of the SWPPP, Risk Assessment and CSMP. The Contractor will be responsible for employing a Qualified SWPPP Developer (QSD) to develop a complete SWPPP that includes all elements set forth in Section XIV, “Storm Water Pollution Prevention Plan”, of the Construction General Permit. In addition, the Contractor will be responsible for implementing a CSMP consistent with the requirements in Attachment C “Risk Level 1 Requirements”, Attachment D “Risk Level 2 Requirements”, or Attachment E “Risk Level 3 Requirements” of the Construction General Permit, and a “Risk Determination Worksheet” included in Appendix 1 of the Construction General Permit.

- D. The Contractor will be responsible for complying with all aspects of the Construction General Permit, including the development and implementation of a SWPPP, by a QSD, and CSMP prior to disturbing the site and commencing construction. The initial SWPPP and CSMP must be reviewed and accepted as part of the construction contract by the Engineer before they are considered finalized. Further, all Permit Registration Documents (PRDs) prepared for obtaining coverage under the Construction General Permit must be reviewed and accepted as a part of the construction contract by the Engineer before they are considered finalized for submittal via the Stormwater Multiple Applications and Report Tracking System (SMARTS).
- E. Disposal of construction water from operations such as groundwater dewatering and water used for testing, disinfecting, and flushing pipelines is not part of the work under this section. Refer to Sections 02140, and 02223 for permit requirements for those discharges.

1.2 RELATED INFORMATION DESCRIBED ELSEWHERE

- A. Section 01010 - General Construction Information and Requirements
- B. Section 01300 - Submittals
- C. Section 02140 - Dewatering
- D. Section 02223 - Trenching, Backfilling, and Compacting
- E. Section 02272 - Vegetative Erosion Control
- F. California Stormwater Quality Association (CASQA) Stormwater Best Management Practice Handbook, Construction: www.cabmphandbooks.com/construction.asp
- G. California Stormwater Quality Association, Construction Site Best Management Practices (BMP) Handbook/Portal, 2019:
<http://www.casqa.org/LeftNavigation/BMPHandbooksPortal/tabid/200/Default.aspx>
- H. State Water Resources Control Board Construction Storm Water Program website:
http://www.swrcb.ca.gov/water_issues/programs/stormwater/construction.shtml

1.3 STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY AND LAND DISTURBANCE ACTIVITIES GENERAL PERMIT

- A. The Contractor shall read and be familiar with all requirements contained in the Construction General Permit necessary to implement and maintain a viable SWPPP and CSMP. The Contractor shall comply with all the requirements set forth in the Construction General Permit.

- B. The Contractor shall note that compliance with the requirements contained in the Construction General Permit may require the use of pollution control procedures outside the limits of immediate construction activity, (e.g., tarping haul truck to prevent fugitive dust or debris).

1.4 NOTICE OF INTENT

To obtain coverage under the Construction General Permit, a Notice of Intent (NOI) must be filed via SMARTS prior to commencement of construction activity. A copy of the completed NOI and Waste Discharge Identification (WDID) Number must be included in the SWPPP. The Contractor shall complete the NOI and provide a copy to the Owner with the completed SWPPP and CSMP, which will ultimately be Certified and filed by Owner. The Contractor shall prepare all documentation as specified in Attachment B “Permit Registration Documents (PRDs) to Comply with the Terms of the General Permit to Discharge Storm Water Associated with Construction Activity General Instructions” of the Construction General Permit. All PRDs must be provided by the Contractor in electronic form for submittal via SMARTS.

1.5 RISK ASSESSMENT

The Contractor shall conduct a Risk Assessment to determine the project’s Risk Level using the procedure described in Appendix 1 “Risk Determination Worksheet” of the Construction General Permit. There are two elements used to define the project’s overall risk; 1) Project Sediment Risk, and 2) Receiving Water Risk. These two elements are used to further define the project into three risk categories which are identified as Levels 1, 2, and 3. These Risk Levels determine the type and extent of monitoring and reporting as further described in Attachment C “Risk Level 1 Requirements”, Attachment D “Risk Level 2 Requirements” and Attachment E “Risk Level 3 Requirements” of the Construction General Permit. The results of the Risk Assessment must be submitted and approved by Engineer prior to uploading to SMARTS. The Risk Assessment shall be included within the PRDs that are submitted electronically via SMARTS.

1.6 SUBMITTALS

- A. Within ten (10) calendar days after issuance of the Notice to Proceed, the Contractor shall submit (as per Section 01300, Submittals), at a minimum, the following information for review and, upon acceptance by the Engineer, incorporation into the SWPPP:
 - 1. SWPPP Compliance Certification-Contractor(s) (form in Caltrans Stormwater Quality BMP Handbook Appendix B);
 - 2. Contractor’s Summary of Responsibilities;
 - 3. Erosion Prevention Plan, narrative and detailed graphic (figures shall not be at scales greater than 100 feet per inch);
 - 4. Sediment Control Plan, narrative and detailed graphic (figures shall not be at scales greater than 100 feet per inch);

5. Documentation of Qualifications for the Qualified SWPPP Developer(s) and Qualified SWPPP Practitioner(s) designated for the project;
 6. Confirmation that the Contractor has obtained a SMARTS account and appropriate username information;
 7. Rain Event Action Plan (REAP), if Risk Level 2 or Risk Level 3 project as described in the Construction General Permit;
 8. Project Construction Schedule (refer to Caltrans BMP #SS-1);
 9. BMP Selection and Implementation Schedule (refer to Caltrans BMP Handbook or CASQA Stormwater Construction BMP Handbook);
 10. Contractor's weather forecast source (i.e., National Weather Service rain gauge or website or Company and report name or on-site rain gauge) for storm event preparation;
 11. Hazardous Materials Inventory List with reference to Contractor's Hazardous Materials Business Plan (Federal and County requirement);
 12. Safety Plan: Cal OSHA. Title 8, Chapter 4, Subchapter 4 - Construction Safety Orders Sections 1500 through 1938 and Subchapter 7 – General Industrial Safety Orders, with emphasis on chemical handling and storage (refer to www.dir.ca.gov/samples/search/query.htm).
- B. The submittal shall detail the Contractor's selected BMPs with brief justification on why that BMP is selected, the intended installation date and location on the site. BMP materials and specifications shall be provided, including, where applicable, reference to BMPs described in the Construction General Permit and specification Section 02272. If the Contractor believes additional or alternative BMPs are necessary, details shall be provided. The Contractor will be required to revise, or supplement, submitted information that is inadequate or incomplete in the opinion of the Engineer.
- C. Once the information is compiled, the Contractor will finalize and submit the proposed SWPPP, all Permit Registration Documents, and NOI for coverage under the Construction General Permit to the Owner and Engineer for final acceptance. The SWPPP will be kept on-site for reference in compliance monitoring.
- D. The Contractor shall submit all of the PRDs required for submittal of an NOI for coverage under the Construction General Permit to the Engineer for review and acceptance. All PRDs must be provided in an electronic format compatible with SMARTS.
- E. In the event the Contractor desires to implement environmental protection BMPs differently than detailed in the Plans and Specifications or the SWPPP, the Contractor may provide a submittal with his alterations/amendments to the Engineer. All alterations or amendments must get prior authorization from the Engineer as outlined in the SWPPP. However, if the Contractor desires to implement alternative BMPs to those detailed exclusively in the SWPPP for an emergency repair to prevent an offsite discharge, he may

do so without prior consent. No schedule delays will be allowed due to BMP revisions proposed by the Contractor, unless authorized by the Owner.

- F. Within 90 days of completion of construction activities, the Contractor shall prepare a Notice of Termination (NOT) of coverage under the Construction General Permit for electronic submittal via SMARTS. The Contractor will be responsible for meeting all of the conditions for termination of coverage, as specified in Section II.D of the Construction General Permit and including all of the required items in the NOT.

1.7 MEASUREMENT AND PAYMENT

The Contractor shall be responsible for all costs associated with the development of NOI and Permit Registration Documents, including the SWPPP and CSMP. The Contractor shall be responsible for maintaining and implementing the SWPPP and CSMP consistent with Construction General Permit requirements. This includes the installation, maintenance, and removal of erosion and sediment control practices specified in the SWPPP upon completion of the project or as requested by the Engineer. These costs shall be included in the lump sum bid amount.

PART 2 MATERIALS

2.1 STORMWATER POLLUTION PREVENTION PLAN

- A. The Contractor shall utilize all materials as approved and as necessary to implement a successful site-specific SWPPP in accordance with the requirements specified in the Construction General Permit. Refer to specification Section 02272 for materials used in vegetative erosion control and CASQA Construction Stormwater BMP Handbook/Portal for material used in additional BMPs.
- B. The Contractor is responsible for appointing a Qualified SWPPP Practitioner (QSP) to implement the BMPs to maintain positive pollution prevention, as described in the SWPPP, in response to the monitoring program reports, or as circumstances require. Materials and the costs thereof, for stormwater pollution prevention, are the responsibility of the Contractor.

PART 3 EXECUTION

3.1 GENERAL

- A. The SWPPP, NOI and CSMP shall be provided by the Contractor and submitted to the Owner. The SWPPP and CSMP must be accepted by the Owner and the Engineer prior to commencement of construction activities in the field.

- B. The Contractor shall be responsible for employing a Qualified SWPPP Developer (QSD) to compose, revise and certify the SWPPP.
- C. The Contractor will provide, at a minimum, site specific information as listed in 1.6 Submittals.
- D. Contractor shall provide SWPPP in electronic format suitable for upload to SMARTS (i.e. .doc / .pdf), and shall upload the SWPPP to SMARTS following approval.
- E. The Contractor shall comply with all conditions identified in the Construction General Permit, which apply to the work under this contract.
- F. The Contractor shall be responsible for the compliance of his personnel and subcontractors with the SWPPP and implementation of the CSMP.
- G. The SWPPP (document) shall be kept on site during construction activity and made available upon request of a representative of the State Board, Regional Water Quality Control Board (Regional Water Board), and/or other regulatory agency.
- H. The Contractor shall employ BMPs as detailed in the SWPPP during and post construction operations to adequately prevent the discharge of pollutants to surface waters, including the municipal storm sewer system.
- I. The Contractor shall be responsible for employing a QSP to oversee implementation of the SWPPP & BMP's to comply with the Construction General Permit.

3.2 STORMWATER POLLUTION PREVENTION PLAN

The SWPPP shall include the required elements set forth in Section XIV, "Storm Water Pollution Prevention Plan", of the Construction General Permit. At a minimum, the SWPPP shall provide a description of potential sources which are likely to add significant quantities of pollutants to stormwater discharges or which may result in non-stormwater discharges from the construction site. The SWPPP, in accordance with this specification section and specification Section 02272, shall also provide guidelines on how to prevent potential pollutants and commingled waters from leaving the site, as well as wind-induced sediment transport. The CSMP shall be included within the SWPPP as an appendix or a separate chapter. Risk assessment worksheets shall also be included within the SWPPP as an appendix or a separate chapter.

3.3 CONSTRUCTION SITE MONITORING PROGRAM

- A. The Contractor shall implement the CSMP based on the Risk Level determined during the Risk Assessment. Specific monitoring and reporting requirements are required based on the assigned Risk Level. The Contractor shall also be responsible for monitoring and inspecting his actions and the activities of those responsible to the Contractor.

B. Monitoring and Inspection:

The Contractor will be responsible for maintaining an Activity Log, which includes documentation of the following information:

1. Location (using grid map) of weekly construction activities;
2. Confirmation that the appropriate BMPs have been installed per the respective BMP specifications by a QSP;
3. Confirmation that each BMP is being properly maintained per the respective BMP specifications by a QSP;
4. Any corrective action taken by the Contractor to ensure proper BMP installation and maintenance;
5. Confirmation that proper housekeeping is being maintained at the site;
6. Confirmation that trash/debris is being controlled and properly stored in covered containers;
7. Confirmation that identified oil spills/leaks are being cleaned up and the contaminated waste and soils are being properly stored and disposed of;
8. Evidence that any leaking equipment or vehicles are being taken out of service and repaired prior to continued use; and
9. Records of all Construction General Permit required visual inspections and sample collection.

C. The Contractor's Activity Log input will be reviewed for accuracy and completeness by the Engineer or an assigned representative of the Owner. The logs become a part of the Stormwater SWPPP/CSMP as partial evidence of compliance with stormwater management regulations. Any deficiencies identified by the Engineer will be brought to the Contractor's attention and shall be corrected at no additional cost to the Owner.

D. In addition to the Activity Log, it is the Contractor's responsibility to report to the Owner any discharges immediately after discovery. At the Owner's discretion, the Contractor may be required to notify the appropriate regulatory agency (i.e. Regional Water Board, DHS). These discharges may include, but are not limited to:

1. fuels
2. oils
3. chemicals
4. sanitary wastes
5. process and wash waters
6. sediment laden waters

- E. The Contractor shall allow representatives of the Owner, the Agency, the State Board, the Regional Water Board, and/or other regulatory agencies to enter the construction site, inspect the construction site for compliance, and sample and monitor the construction site discharges.
- F. The CSMP may extend past the completion date for this contract. The Contractor's responsibilities for the CSMP will cease upon closure of three conditions: 1) acceptance by the Owner of all work under the contract; 2) the Contractor submits information to the Engineer verifying the site meets the criteria for the NOT, which the Contractor will complete for electronic submittal via SMARTS for approval; and 3) final acceptance not given by Owner until the State Board or Regional Water Board issues approval of the NOT.
- G. The Contractor will be responsible for implementing an CSMP based on the determined Risk Level consistent with the requirements in Attachment C "Risk Level 1 Requirements", Attachment D "Risk Level 2 Requirements, and Attachment E "Risk Level 3 Requirements" of the Construction General Permit.
- H. The Contractor will be responsible for preparing an annual report by September 1 of each year for electronic submittal via SMARTS. Annual reports are required to include all elements identified in Section XVI of the Construction General Permit, including certification of compliance with the requirements specified in Section XVI of the Construction General Permit.

3.4 DUTY TO COMPLY

- A. The Contractor shall comply with all conditions identified in the Construction General Permit, SWPPP, and CSMP. Non-adherence with the conditions specified in the Construction General Permit may constitute a violation of the Clean Water Act and the Porter-Cologne Water Quality Control Act and may be grounds for enforcement action by the State, which can carry civil or criminal penalties (some cases under Porter-Cologne exceed CWA penalties of \$37,500 per day).
- B. The Contractor shall take all reasonable steps to minimize or prevent any discharge in violation of the Construction General Permit.

3.5 COMPLIANCE CERTIFICATION

- A. A QSD of the Contractor shall certify the Contractor's stormwater handling roles and responsibilities by signing the "SWPPP Compliance Certification" for the SWPPP (included in Caltrans BMP Handbook Appendix B), as well as annual reports required under the Construction General Permit. The purpose of these forms is to certify that the construction activity is, and has been, in compliance with or has been modified to comply with, the requirements of the Construction General Permit and the SWPPP.

- B. During construction, if the Contractor determines that he cannot maintain the site in full compliance with the Construction General Permit and SWPPP requirements, he shall notify the Engineer and Owner immediately. It shall be the responsibility of the Contractor to provide a written Notice of Noncompliance to the Regional Water Board within 30 days of knowledge of the following noncompliant conditions; which the Contractor may need to provide information for:
1. Failure to certify, by July 1 of each year, that the project's construction activities comply with the provisions of the SWPPP and the Construction General Permit;
 2. Failure to implement the BMPs listed within the SWPPP, in accordance with the schedule outlined within the SWPPP;
 3. Failure to conduct inspection, monitoring and/or reporting as described within the SWPPP; and/or
 4. Failure to initiate corrective actions to BMP breaches, failures, and emergency situations.
- C. The Contractor shall prepare an annual report by September 1 of each year for electronic submittal via SMARTS. Annual reports are required to include all elements identified in Section XVI of the Construction General Permit, including certification of compliance with the requirements of the Construction General Permit.

END OF SECTION

SECTION 02272

VEGETATIVE EROSION CONTROL

GENERAL

1.1 DESCRIPTION

The work of this specification section consists of furnishing and installing vegetative erosion control as specified herein. Vegetative erosion control shall be applied on all disturbed areas that are not paved, graveled, lined, or landscaped, including all graded or disturbed areas at the wastewater treatment plan site and access road. This section describes both the vegetative erosion control efforts with and without anchored straw. The approach without straw shall be utilized from May 1st until October 15th and the process utilizing anchored straw from October 15th through April 30th.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- B. Planting materials shall meet or exceed the specifications of federal, state, and local laws requiring inspection for plant disease and insect control.

1.3 SUBMITTALS

- A. Comply with pertinent provisions of Section 01300.
- B. Submit complete materials list of items proposed to be submitted under this section, complete data on source and quality, and sufficient data to demonstrate compliance with the specified requirements.

MATERIALS

1.4 FERTILIZER

- A. Commercial fertilizer shall be ammonium phosphate (16-20-0) and contain a minimum of 16 percent nitrogen, 20 percent available phosphoric acid, zero percent water soluble potash, uniform in composition, dry and free flowing, pelleted or granular.
- B. All fertilizer shall be delivered in unbroken or unopened containers, labeled in accordance with applicable State regulations and bearing the warranty of the producer for the grade furnished.

1.5 SEED

- A. All seed shall be delivered to the site tagged and labeled in accordance with the California Agricultural Code, and shall be acceptable to the County Agricultural Commissioner. Seed mixture shall be guaranteed for a minimum of 80% germination.
- B. Bag tag figures will be evidence of purity and germination. Time since date of seed test shall not exceed 9 months.
- C. Seed shall be of a quality that weed seed shall not exceed 0.5 percent of the aggregate of pure live seed (PLS) (percent germination x percent purity) and other material.
- D. Seed shall be a mixture acceptable to the City of San Juan Bautista standards. Mixture shall include following in proportion to application rates:

Grasses and Legumes	Pound/Acre
Small Fescue (<i>Festuca microstachys</i>)	6
California Brome (<i>Bromus carinatus</i>)	9
Blue Wildrye (<i>Elymus glaucus</i>)	8
Barley (<i>Hordeum brachyantherum</i>)	7
Purple Needlegrass (<i>Stipa pulchra</i>)	8
Junegrass (<i>Koeleria macrantha</i>)	0.2
Western Yarrow (<i>Achillea millefolium</i>)	0.4
California Brome (<i>Bromus carinatus</i>)	9
California Poppy (<i>Eschscholzia californica</i>)	1
California Buckwheat (<i>Eriogonum fasciculatum</i>)	1
Golden Yarrow (<i>Eriophyllum confertiflorum</i>)	0.3
Deerweed (<i>Acmispon glaber</i>)	1
Black Sage (<i>Salvia mellifera</i>)	0.5
Wildflowers	Pound/Acre
California Goldfields (<i>Lasthenia californica</i>)	2
Spanish Lotus (<i>Acmispon americanus</i>)	3
Bicolor Lupine (<i>Lupinus bicolor</i>)	2
Wetland Revegetation	Pound/Acre
Chaparral Broom (<i>Baccharis pilularis</i>)	0.03
Santa Barbara Sedge (<i>Carex barbarae</i>)	1
Mexican Rush (<i>Juncus mexicanus</i>)	0.2
Beardless Wildrye (<i>Elymus triticoides</i>)	4

- E. Seed shall be furnished separately or in mixture of the proportionate quantities listed above in standard containers with the variety and net weight shown. Based on bag tags, seeding rates shall be adjusted to insure the required amounts of pure live seed.

1.6 INOCULANTS

- A. The inoculant for treating legume seeds shall be a pure culture of Nitrogen fixing bacteria prepared specifically for the plant species and shall not be used later than the date indicated on the container. A mixing medium, as recommended by the manufacturer or approved substitute, shall be used to bond the inoculant to the seed. For nonpellet inoculated seed, two times the amount of the inoculant recommended by the manufacturer shall be used and seed shall be sown within 24 hours.
- B. For pellet inoculated seed, at least 30 pounds of inoculant shall be used per 1,000 pounds of raw seed and the seed shall be labeled to show the Lot Number, Expiration Date, and Percent Coat of the finished product. Pellet inoculated seed shall be kept cool and sown within 180 days. Use only fresh, age-dated inoculant specifically labeled for the legume to be seeded.

1.7 WOOD FIBER MULCH

- A. Wood fiber shall be a wood cellulose fiber that contains neither germination nor growth inhibiting factors. The wood fiber shall be produced from nonrecycled wood such as wood chips or similar wood materials. It shall be manufactured in such a manner that after addition and agitation in slurry tanks with fertilizer, seed, water, and other approved additives, the fibers in the material will become uniformly suspended to form a homogeneous slurry; and that when hydraulically sprayed on the ground, the material will form a blotter-like ground cover impregnated uniformly with seed; and which after application, will allow the absorption of moisture and allow the rainfall to percolate to the underlying soil. It shall be colored with a nontoxic water-soluble green dye to provide a proper gauge for metering of material over ground surfaces.
- B. The wood fiber mulch may also be produced from the following materials:
 - 1. Recycled wood fiber, such as wood chips or similar wood materials;
 - 2. A combination of recycled newsprint and cardboard materials that contain at least 50 percent cardboard; or
 - 3. A combination of recycled newsprint and non-recycled wood fiber or recycled wood fiber materials that does not contain more than 50 percent newsprint.
- C. Cellulose shall be certified to indicate that laboratory and field testing of the product has been accomplished and that it meets all of the foregoing requirements based on testing. Weight specifications of this material from suppliers and for all application shall refer only to air dry weight of the fiber material.
- D. Absolute air dry weight is based on the normal standards of the Technical Association of the Pulp and Paper Industry for wood cellulose and is considered equivalent to 10% moisture. Each package of the cellulose fiber shall be marked by the manufacturer to show the air dry weight content.

- E. Alternate Mulching Methods: Contractor may either stockpile topsoil (or “duffing”) and reapply it six inches thick to exposed areas as approved by the Engineer. Or, Contractor may use mechanically punched clean (free of noxious weed seeds and molds), rice barley, or wheat straw with fibers at less than six inches in length, as approved by the Engineer.

1.8 TACKIFIER

Tackifier/soil binder material shall be one of the following and shall have the property to be evenly dispersed and suspended in water when agitated: M-Binder, Sentinel, Ecotak-SAT, Fish-STIK, Soil Master WR, and Soil Sement.

1.9 WATER

See Specification Section 02233 for water availability. Add to the slurry mixture in sufficient amount to spread uniformly the required quantity of hydromulch solids.

1.10 STRAW

Straw shall be new straw derived from rice, wheat, oats, or barley that meets the County Agricultural Commissioner’s standards for weed pests. Clearance shall be obtained from the County Agricultural Commissioner, as required by law, before straw obtained outside the county in which it is to be used is delivered to the site.

EXECUTION

1.11 APPLICATION PROCEDURE

- A. General: Erosion control shall consist of surface preparation, seeding, fertilization, mulching, and maintenance, and potentially irrigation. Prior to October 15th, all vegetative erosion control efforts utilizing the hydroseed technique without straw will be the two-stepped process of applying seed, inoculant (if applicable), fertilizer, water, and wood fiber mulch, followed by second step of more mulch, water and tackifier/soil binder. Post October 15 application shall include a middle step of blown straw, which shall then be anchored. After the Engineer has accepted the graded surface, it shall be seeded and mulched. Seeding shall be done preferably between September 15th and October 15th, however, hydroseeding can be used as a BMP during the construction season prior to September 15th, if appropriate measures are additionally provided for (i.e. eliminate vehicular traffic on area).
- B. Site Preparation: Large rocks (2-1/2” or greater) should be removed from the slopes. Any uneven area should be graded so that water will not collect and cause concentrated flows; refer to Caltrans BMP# SS-4: Hydroseeding, for grading prior to hydroseeding. If the soil surface is crusted from a previous rain, then it should be raked or dragged to break it up. Small clods or a rough appearance should not be of concern as they help to hold the seed and the rainfall. Remove all trash, weeds, and other debris.
- C. Seedbed preparation shall be suspended when soil moisture conditions are not suitable for obtaining a satisfactory seedbed.

- D. Fertilization: Fertilizer shall not be applied more than 15 days prior to seeding. Fertilizer shall be distributed uniformly over the seedbed at the rate of 500 pounds per acre.
- E. Fertilizer shall be applied in any way that will result in uniform distribution. It is recommended that fertilizer be applied hydraulically by hydroseeder in the form of a slurry. The slurry shall also contain the required seed, inoculants (if applicable), mulch, and water. Fertilizer shall not remain in the slurry longer than two (2) hours.
- F. Seedings: The seed shall be drilled, broadcast, or distributed uniformly in a water slurry by hydroseeder. The seeds shall be covered by approximately ¼- to ½-inch mulch.
- G. The hydroseeder shall be equipped with a built-in continuous agitation system of sufficient operating capacity to produce a homogeneous slurry and a discharge system that will apply the slurry to the slopes at a continuous and uniform rate.
- H. Seed shall not remain in the slurry longer than 30 minutes. The slurry in this first application shall also contain wood fiber mulch at the rate of 500 pounds per acre and the required fertilizer.
- I. Application rates for wood fiber mulch products that have moisture contents greater than 15 percent shall be increased by the following factor, *c*:
- J.
$$c = \frac{85 \text{ percent}}{\text{percent fiber (solids) in product}}$$
- K. The wood fiber shall not remain in the slurry longer than two (2) hours. Water used shall be potable water or Class 1 or 2 agricultural irrigation water.
- L. The slurry shall be continuously mixed and shall be mixed for at least five (5) minutes after the last addition before application starts. The slurry shall be applied uniformly over the site at a rate that is nonerosive and minimizes runoff.
- M. Mulching Areas Equal to or Greater Than 2:1 Slope (netting installation regardless of application date): Material shall be hand punched straw or wood fiber blankets or bio-composite reinforcing matting. Regions with concentrated flow shall have American Excelsior Curlex Enforcer II or equal while regions with high velocity flows shall have American Excelsior Curlex III or equal. Netting rolls shall be applied up and down the slope with a 4-inch minimum side-to-side overlap and a 3-foot minimum end-to-end overlap.
- N. The upper end of the netting shall be buried at least eight (8) inches into the soil. Overlap of matting shall be provided. Anchor pin or staple spacing shall be five (5) feet down sides and center of rolls driven perpendicularly into soil. Spacing at top end and at end overlaps shall be one (1) foot. If manufacturer installation recommendations are more conservative, manufacturer recommendations take precedence.
- O. Mulching Areas Less Than 2:1 Slope (hydromulch seeding installation):

1. General Equipment Requirements: Use hydraulic equipment for the application of the fertilizer, seed, and slurry of prepared wood pulp of the type approved by the Engineer. This equipment shall have a built-in agitation system and operating capacity sufficient to agitate, suspend and homogeneously mix a slurry containing up to 40 pounds of fiber plus combined total of 70 pounds fertilizer solids for each 100 gallons of water. The slurry distribution lines shall be large enough to prevent stoppage and be equipped with a set of hydraulic spray nozzles which will provide a continuous non-fluctuating discharge and delivery of the slurry of the prescribed quantities uniformly, without misses, waste, or erosion. The slurry tank shall have a minimum capacity of 1,000 gallons and be mounted on a traveling unit which may be either self-propelled or drawn with a separate unit which will place the slurry tank and spray nozzles within sufficient proximity to the areas to be seeded so as to provide uniform distribution. The Engineer may allow equipment with smaller tank capacity provided that the equipment has the necessary agitation system and sufficient pump capacity to spray the slurry in a uniform coat.
2. Mulching Application May 1st to October 15th:
 - a. Wood fiber with tackifier shall be distributed uniformly over the seeded area in a water slurry by hydroseeder. Application shall be made within 48 hours following seeding.
 - b. The hydroseeder shall be equipped with a built-in continuous agitation system of sufficient operating capacity to produce a homogeneous slurry and a discharge system that will apply the slurry to the slopes at a continuous and uniform rate.
 - c. The slurry in this second step of application shall contain wood fiber at the rate of 1500 pounds per acre and tackifier. The wood fiber shall not remain in the slurry longer than two (2) hours. Water used shall be potable water or Class 1 or 2 agricultural irrigation water.
 - d. Irrigation: Irrigation of hydroseeded regions shall only be mandated if application is prior to September 15th, and early rains caused germination. Irrigation shall continue until natural atmospheric moisture is enough to sustain growth.
3. Mulching Application October 15th to May 1st:
 - a. A straw covering shall be distributed uniformly over the seeded area within 48 hours after seeding. Straw shall be applied at the rate of two (2) tons per acre. The straw shall be applied by hand, blower, or other suitable equipment. If straw is applied by blower, it shall not be chopped in lengths less than six (6) inches.
 - b. Anchoring The Mulch Mechanically: The straw mulch shall be anchored in place via hand tools, mulching rollers, disks, or similar types of suitable equipment alone or in combination with a hydro-mulch material and shall be performed in a satisfactory manner.
 - c. Anchoring Straw Mulch With Hydro-Process: All applications from October 15th to May 1st shall utilize a hydro-mulch anchoring process. The hydro-mulch material shall be applied uniformly over the straw in a water slurry by hydroseeder within 48 hours following mulching. The hydromulch shall be wood fiber mulch, a tackifier, and water in the following portions per acre:

Tackifier	Rate (pounds)	Wood Fiber Mulch (pounds)	Water (gallons)
M-Binder	100	150	700
Ecotak-SAT	100	150	700
Sentinel	100	500	2,000
Fish -STIK	60	500	3,000
Soil Master WR	100	250	1,000

- d. The hydroseeder shall be equipped with a built-in continuous agitation system of sufficient operating capacity to produce a homogeneous slurry and a discharge system that will apply the slurry to the slopes at a continuous and uniform rate.
 - e. The materials shall not remain in the slurry longer than two (2) hours. Water used shall be potable water or Class I or 2 agricultural irrigation water.
 - f. The slurry shall be continuously mixed and shall be mixed for at least five (5) minutes after the last addition before application starts. The slurry shall be applied uniformly over the site at a rate that is non-erosive and minimizes runoff.
- P. Preliminary Inspection: Notify the Engineer 48 hours in advance of all seeding. Inspection and favorable review of the completed work shall begin the plant establishment period.
- Q. Plant Establishment Maintenance:
1. General plant maintenance shall immediately follow seeding and continue until all seeded areas are 85% germinated and covered with acceptable stands of grass and clover.
 2. Protect areas against all damage, including erosion and trespass, and provide proper safeguards. Maintain and keep in good repair all temporary barriers erected to prevent trespass. Check all barriers and temporary fencing daily, and make immediate repairs or replacements.
 3. Repair all damage to seeded areas.
 4. Contractor shall irrigate as necessary (refer to 3.1.F.2.d) to maintain a minimum moisture of 30% percent to a depth in soil of two (2) inches to ensure vigorous growth.
 5. Continue maintenance for at least 45 days or until the grass is established as accepted by Engineer.
- R. Initial Inspection for Acceptance: Initial inspection for acceptance will be conducted upon completion of maintenance replacements, and corrective work. Three (3) days notice shall be given. If project improvements, corrective work, and maintenance have not been performed as specified and to the satisfaction of the Engineer, maintenance shall continue at Contractor's expense until such time as work has been successfully completed.
- S. Guarantee, Replacement, and Final Acceptance:

1. Guarantee all planting to be in a healthy, thriving condition until the end of the maintenance period.
2. Replace all seeded areas not in vigorous condition as soon as directed by Engineer. Repair any erosion in areas where grass does not become established. Seed mixture used for replacement must be of the same type and quantity as specified in this specification section.
3. Final acceptance requires a four (4) inch high stand of plant material, 200 grass plants/ft², and 100% coverage (i.e. no areas larger than one [1] ft² with less than the specified coverage).

END OF SECTION

SECTION 02400

SHEETING, WALING, AND SHORING

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section covers protective installations consisting of shores, wales, braces, posts, piling, sheeting, anchorages and fastenings required for the work of this project.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 - Submittals
- B. Section 02140 - Dewatering
- C. Section 02223 - Trenching, Backfilling, and Compacting

1.3 QUALITY ASSURANCE

- A. In accordance with Section 01300.
- B. Design Criteria. Contractor shall design and construct temporary and permanent sheeting, shoring, and cofferdams, which are to be used as an aid in construction and portions shall be left in permanently to prevent sediment scour. Design shall be prepared in conformance with applicable requirements of Article 6, "Excavations, Trenches, Earthwork" of Construction Safety Orders of California State Division of Occupational Health and Safety. In addition, sheet piling design shall be based on the material requirements specified herein. Sloping of excavations shall not be employed below the groundwater or maximum aqueduct water elevation. Designs shall be prepared and signed by a Civil or Structural Engineer registered in the State of California and shall be based on the stresses for various materials of construction contained in the International Building Code latest Edition and latest supplement. The allowable stresses permitted by the International Building Code may be increased 15 percent for temporary shoring used as an aid to construction.
- C. Prior to the start of any work involving sheeting and bracing, the Contractor shall obtain a valid excavation permit from the Cal OSHA District office as required. A copy of the

permit and all accompanying drawings, data, and calculations shall be submitted to the Engineer for record purposes only and not for review or approval.

1.4 SUBMITTALS

- A. Submit to the Engineer for record purposes copies of the drawings and calculations used to determine the strength, size, and stability of the protective installations. All designs submitted under this section shall be signed by a Structural or Civil Engineer duly registered in the State of California.
- B. Prior to the start of any work involving sheeting and bracing, the Contractor shall obtain a valid excavation permit from the Cal OSHA District office as required. A copy of the permit and all accompanying drawings, data, and calculations shall be submitted to the Engineer for record purposes only and not for review or approval.

1.5 ALTERNATIVES

The use or application of alternative methods and materials, or the employment of propriety systems in lieu of those specified herein, will be allowed if the Contractor demonstrates their suitability in conformance with the design submittal and excavation permitting requirements of Paragraph 1.4 and the quality assurance requirements of Paragraph 1.3. Demonstration of suitability and compliance with these specifications and approval of the Owner shall be required.

PART 2 MATERIALS

2.1 MATERIALS

Sheet Piling – Designated to be left in place.

- A. Sheeting shall be continuous interlock type. Steel sheeting shall be made in accordance with ASTM A857 from steel meeting the requirements of ASTM A570, Grade 30. Sheeting shall be hot-dipped galvanized per ASTM A123 at a rate of two ounces per square foot total both sides. The sides of each piece of sheeting shall be furnished with an interlock that is continuous for the full length of the sheeting. The interlock shall have an opening of sufficient width to allow free slippage of the adjoining sheet. Sheeting shall be “Metric Sheeting” as manufactured by Contech Construction Products, Inc.
- B. Dimensions and Section Properties. Steel sheet piling used for cofferdams or shall be standard rolled metric sections. The sheeting shall be galvanized after fabrication and have the minimum physical and sectional properties; Physical Properties: 5 gauge (0.209 inches), Sectional Properties: Modulus – 6.28 in 3, Moment of Inertia – 11.04 in 4.

PART 3 EXECUTION

3.1 INSTALLATION

- A. General. Install sheeting and bracing for trench and structure excavation as the work requires. Butt planks to and/or interlock sheets to exclude groundwater and fines, preventing the erosion of voids outside sheeting. In soft, wet ground drive sheeting to a lower level as excavation progresses so that sheeting is embedded in undisturbed earth. Bracing of sheet piling may be permitted to penetrate the structural concrete only as approved by the Engineer. Refer to Section 03100. Install wales and struts at close intervals so as to prevent displacement of the surrounding earth and to maintain safe conditions in the work area. Any damage proven to result from improper installation shall be the responsibility of the Contractor.

Temporary sheeting for trench and structure excavation may be removed and re-used. Withdraw individual planks alternatively as the backfill is raised, maintaining sufficient sheeting and bracing to protect the work and workmen. Remove bracing completely. Where unstable conditions occur in the underlying strata from any cause, and withdrawal of sheeting will endanger the work, a portion of the sheeting, including bracing, may be left in place with approval of the Owner. Remove all wood within a zone extending to four (4) feet below finished grade. Leaving such material in place shall not be cause of an increase in Contract in price.

- B. Sheet Piling. The Contractor has the option of using steel sheet piling for temporary protective installations. All piling installations shall be continuous.
1. Installation of Sheet Piling. Depth of piling shall be sufficient to prevent heave when the trench is dewatered. Piles shall be driven with a hammer with an adequate capacity to complete pile driving without changing hammers. The use of air or water jets to assist in driving the sheet piling will be permitted, providing that the last 5 feet of advance is by driving. Piles shall be driven accurately to the lines and grades shown or required, with each section interlocked with the sheet piles driven previously. To ensure proper alignment of the sheet piles, a driving template or jig shall be used. If any pile is damaged during driving, it shall be removed and replaced. If piles are driven out of interlock or are not properly plumbed or aligned, the piles shall be pulled and re-driven.
 2. Prevention of Damage. In installing, cutting off, or removing sheet piles, every precaution shall be taken to ensure that damage to the structure or pipeline does not occur. If damage does occur, the Contractor shall perform the necessary repairs at his own expense.

3.2 PROTECTION OF EXISTING FACILITIES

It is the Contractor's responsibility to protect existing facilities from the consequences of his work. Where any sloped excavation infringes on or potentially endangers any existing facilities

or structures, provide shoring, sheeting, and bracing according to shop drawings and calculations signed and stamped by a structural or civil engineer registered in the State of California.

END OF SECTION

SECTION 02445

FENCING

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of furnishing and installing the gates, chain link fencing, and barbed wire extension fencing, as shown and called for on the drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300: Submittals
- B. Section 03100: Concrete

1.3 SAMPLES AND APPROVAL OF MATERIALS

Certificates of compliance indicating that the materials conform to the requirements of these specifications shall be submitted and approved prior to any fabrication or installation. Submit product literature, drawings, technical information and samples to demonstrate compliance with the specified materials in conformance with Section 01300.

PART 2 MATERIALS

2.1 CHAIN LINK FENCING

- A. Standards: Metal posts, fabric, braces and attachments shall conform to the requirements of Caltrans Standard Specification Section 80-4, except as specified herein.
- B. Chain Link Fabric:
 - 1. 9-gauge, 2-inch mesh, height shall be 6 feet unless otherwise shown on the drawings.
 - 2. Zinc coated steel wire fabric.
 - 3. Color: galvanized

- C. Barbed Wire:
 - 1. 12-gauge (minimum) wire with 12 gauge, 4 point barbs spaced 4-inches apart.
 - 2. Galvanized steel, ASTM A121.
 - 3. Color: galvanized
- D. Security: Fence shall include truss arm and three strands of barbed wire on top.
- E. Fittings:
 - 1. All required fittings and hardware shall be galvanized.
 - 2. Extension arms for barbed wire shall be of a type that can be attached to the tops of the posts and carry three wires at approximately 5-1/2-inch centers in a plane approximately 45 degrees from the vertical, inclined as shown on the drawings or as directed by the Engineer.
 - 3. Color: galvanized

2.2 BARBED WIRE FENCING (Caltrans BW)

- A. Materials for the barbed wire fencing shall conform to the Caltrans Specifications, Section 80-2.01, galvanized U-shape, Section 80-2.01D through F , and Section 80-3.01F paragraphs one, three and four.
- B. Fence shall be Type BW and consist of 5 lines of barbed wire with metal posts, complying with Caltrans Specification Section 80-2.02D. Fence shall be installed in accordance with Caltrans Specification Section 80-2.03 and Standard Plans Plate A86.
- C. Gates shall conform to Section 80-2.02G of the Caltrans Specifications, and shall be sized as shown.

PART 3 EXECUTION

3.1 INSTALLATION CHAIN LINK

- A. General: Install per Caltrans Standard Specifications Section 80-4.02, except as indicated otherwise on the drawings or specified herein.
- B. Height and Width: Fence fabric height shall be a minimum of 6 feet high and gate widths shall be as shown on the drawings.
- C. Fence Posts:

1. Fence line post spacing shall be 10 foot maximum with concrete footings minimum of 12-inch diameter and three feet deep.
2. All posts shall be set in concrete footings and crowned at the top to shed water.
3. Changes in fence lines, where the horizontal angle is 15 degrees or more, shall be considered as corners and corner posts shall be installed.
4. Bracing shall be provided at all end, gate, and corner posts, the latter in both directions. Horizontal brace rails shall be set midway between top rail and ground running from the corner, end, or gate post to first line post. Diagonal tension members shall connect tautly between posts below horizontal braces.
5. Corner posts shall be installed in lieu of line posts at intervals not exceeding 500 feet and shall be braced horizontally in both directions.

D. Tension Wire and Fabric Ties:

1. The fabric shall be stretched and securely fastened to the posts, and between posts the top and bottom edges of the fabric shall be fastened to the top bar and bottom tension wire. Tension wires shall be stretched tight. The bottom tension wire shall be installed on straight grade between posts by excavating the high points of ground and in no case will filling of depressions be permitted.
2. The fabric shall be fastened to end, latch, corner, and gate posts with stretcher bars and stretcher bar bands spaced at one foot intervals. The fabric shall be fastened to line posts with tie wires or post clips and to tension wires with tie wires or hog rings. The fasteners shall be spaced at approximately 14-inches on line posts and at approximately 18-inches on tension wires. Wire ties shall be given at least one complete turn. Hog rings shall be closed with ends overlapping. The tension wires shall be wrapped around terminal posts. The distance from the top of the fabric to the top rail shall be 2-inches maximum.
3. In lieu of using stretcher bars and bar bands, the fabric may be fastened to the end and corner posts by threading through loops formed on the posts.
4. Chain link fabric shall be fastened on the side of the posts designated by the Engineer.
5. Not less than 7 days shall elapse after placing the concrete footings before the fence fabric or barbed wire is fastened to the posts.

- E. Truss or Tension Rods: End, latch, and corner posts shall be braced to the nearest line post. At the Contractor's option bracing shall be accomplished either with diagonal braces used as compression members or with horizontal braces used as compression members and truss rods used as tension members. Each truss rod shall be equipped with a turnbuckle or truss tightener with tensile strength equal to the truss rod. Line posts shall be braced horizontally and trussed in both directions at intervals not to exceed 1,000 feet, except that this bracing and trussing may be omitted when the fabric is installed by stretching with equipment.

3.2 INSTALLATION OF BARBED WIRE

Barbed wire extensions shall extend out from site and be installed per Caltrans Standard Specifications Section 80.

END OF SECTION

SECTION 02513

ASPHALT CONCRETE PAVING

PART 1 GENERAL

1.1 DESCRIPTION

This section includes materials, testing, and installation of asphalt concrete pavement, aggregate base course, herbicide, prime coat, tack coat, and seal coat.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 - Submittals
- B. Section 02200 – Earthwork
- C. Appendix A – Geotechnical Report, San Juan Bautista to Hollister Sanitary Force Main Project, San Benito County, California (Crawford & Associates, Inc., September 2022)

1.3 SUBMITTALS

Submit in accordance with Section 01300 copies of a report from a testing laboratory verifying that aggregate material and asphalt binder conform to the specified gradations or characteristics.

1.4 STANDARD SPECIFICATIONS

Where reference is made to State Specifications, reference shall mean California Department of Transportation (Caltrans) Standard Specifications, and, where appropriate, the San Benito County Transportation Department Standards.

In case of conflict between any requirements set forth in this Section and any provisions of the San Benito County Transportation Department Standards, the most stringent requirement will govern.

PART 2 MATERIALS

2.1 ASPHALT CONCRETE PAVING

Asphalt concrete paving shall conform to Type A in Section 39 of the State Specifications, having ½-inch-maximum medium grading with paving grade asphalt PG 64- 10 if using conventional hot mixed asphalt and PG 64-16 if using rubberized asphalt unless otherwise directed by the Engineer. Recycled asphalt, reclaimed asphalt paving (RAP) may be used up to 15% of the hot mix asphalt, as defined in Section 39 of State Specifications.

2.2 AGGREGATE BASE COURSE

Aggregate base shall be Class 2 aggregate base, ¾-inch-maximum size per Section 26 of the State Specifications. Aggregate shall contain no detectable asbestos.

2.3 TACK COAT

Tack Coat shall conform with Viscosity Grade AR1000 paving asphalt per Section 92 in the State Specifications.

2.4 ASPHALT BINDER

Asphalt binder to be mixed with the aggregate shall be paving asphalt grade PG 64-10 if using conventional hot mixed asphalt and PG 64-16 if using rubberized asphalt conforming to Section 92 of State Specifications.

2.5 AGGREGATE FOR ASPHALT CONCRETE

Aggregate shall be Type B per Section 39-2.02 of State Specifications. Aggregate shall contain no detectable asbestos.

2.6 SEAL COAT

Seal coat shall be Type II Slurry seal per Section 37 of State Specifications.

2.7 REDWOOD HEADER

Size of redwood headers shall be 2-inches by the depth of the asphalt concrete paving; minimum size shall be 2-inches by 4-inches. Redwood shall be Construction Grade as per California Redwood Association conforming to Sections 57 and 58 of State Specifications.

2.8 HERBICIDE OR WEED KILLER

Use a CalTrans approved herbicide from the approved chemical list.

2.9 PAINT FOR TRAFFIC STRIPING AND MARKING

Provide white and yellow thermoplastic paint per Section 84 of the State Specifications.

2.10 GEOTEXTILE FABRIC

Use Amoco 2006 or equal.

PART 3 EXECUTION

3.1 PAVEMENT REMOVAL

- A. Initially cut asphalt concrete pavement with pneumatic pavement cutter or other equipment at the limits of the excavation and remove the pavement. After backfilling the excavation, saw cut asphalt concrete pavement to the full depth of pavement at a point not less than 1 foot outside the limits of the excavation or the previous pavement cut, whichever is greater, and remove the additional pavement.
- B. Saw cut concrete pavement, including cross gutters, curbs and gutters, sidewalks, and driveways, to the full depth of pavement at a point 1 foot beyond the edge of the excavation and remove the pavement.

The concrete pavement may initially be cut at the limits of the excavation by other methods prior to removal and the saw cut made after backfilling the excavation. If the saw cut falls within 3 feet of a concrete joint or pavement edge, remove the concrete to the joint or edge.

- C. Make arrangements for and dispose of the removed pavement.
- D. Final pavement saw cuts shall be straight along both sides of trenches, parallel to the pipeline alignment, and provide clean, solid, vertical faces free from loose material. Saw cut and remove damaged or disturbed adjoining pavement. Saw cuts shall be parallel or perpendicular to the pipeline alignment or the roadway centerline, unless otherwise shown on contract drawings.

3.2 PAVEMENT INTERFERENCE:

- A. At no cost to the owner, the Contractor will be required to relocate or replace any vaults, boxes, posts, or other facilities which must be disturbed for new construction work and which are required for plant operation, or make other arrangements satisfactory to the Engineer. This includes, but is not limited to, raising or lowering elevations of existing facilities to align with new finish grade.

3.3 PAVEMENT INSTALLATION:

New asphalt concrete pavement installation shall be as shown on the drawings.

3.4 PAVEMENT REPLACEMENT

Remove and dispose of (dispose off site) all existing AC pavement, all underlying aggregate base, and all subgrade necessary to replace pavement in damaged as a result of this construction project. Repavement shall be based on pavement installation instructions as specified in subsection 3.3, above. Install new section of asphalt concrete pavement, in place of damaged road.

This project must be in compliance with the 2019 California Green Building Council Standards Code and shall meet the construction waste management and disposal mandates, as detailed in Specifications Section 01741.

3.5 INSTALLATION

Producing, hauling, placing, compacting, and finishing of asphalt concrete shall conform to Section 39 of the State Specifications. Apply seal coat to all paving except open graded asphalt concrete.

3.6 CONNECTIONS WITH EXISTING PAVEMENT

Where new paving joins existing paving, saw cut the existing surfaces 12 inches back from the joint line full depth. Dispose of waste material offsite. Tack prior to placing the asphalt concrete. Meet lines shall be straight and the edges vertical. Paint the edges of meet line cuts with liquid asphalt or emulsified asphalt prior to placing asphalt concrete. After placing the asphalt concrete, seal the meet line by painting with a liquid asphalt or emulsified asphalt and then immediately cover with clean, dry sand.

3.7 PREPARATION OF SUBGRADE

- A. Scarify subgrade to a depth of 12 inches below finished subgrade elevation, uniformly moisture conditioned between 2 and 4 percent above optimum and compacted to 95% minimum relative compaction. Shape subgrade to line, grade, and cross section shown in the drawings. The subgrade shall be considered to extend over the full width of the base course.
- B. The finished subgrade shall be within a tolerance of 0.05 of a foot of the grade and cross section shown and shall be smooth and free from irregularities and at the specified relative compaction.

3.8 PROOF ROLLING

Proof roll the prepared base material surface to check for unstable areas. Proof rolling shall be accomplished using a water truck or similar equipment with a rear axle load of at least 18,000 pounds with tires inflated to at least 65 psi. Paving work shall begin only after areas have been corrected and are ready to receive paving. The Engineer must be present during proof rolling.

3.9 PLACING AGGREGATE BASE COURSE

Place aggregate base course to a minimum thickness as specified for the roadway. Compact to 95% relative compaction. Install in accordance with Section 26 of the State Specifications.

3.10 COMPACTION OF AGGREGATE BASE AND LEVELING COURSES

Compaction and rolling shall begin at the outer edges of the surfacing and continue toward the center. Apply water uniformly throughout the material to provide moisture for obtaining the specified compaction. Compact each layer to the specified relative compaction before placing the next layer.

3.11 PLACING PRIME COAT

Prime coat shall be installed when warranted by project conditions and as directed by the Engineer. Apply prime coat to the surface of the leveling course of aggregate base at the rate of 0.25 gallon per square yard per Section 39-4.02 in the State Specifications.

3.12 PLACING TACK COAT

Apply tack coat on surfaces to receive finish pavement at the rate of 0.10 gallon per square yard per Section 39-4.02 of State Specifications. Apply tack coat to metal or concrete surfaces that will be in contact with the asphalt concrete paving.

3.13 PLACING ASPHALT PAVING

Install in accordance with Section 39-6 in the State Specifications. Type B mix shall be spread and compacted before temperature of mix drops below 200° F and shall be placed only when the atmospheric temperature is above 50° F.

3.14 COMPACTION OF ASPHALT CONCRETE PAVING

Compact until roller marks are eliminated and a density of 92% minimum to 98% maximum has been attained per ASTM D2041. Compacting equipment shall be vibratory drum rolled or equal conforming to the provisions of Section 39-5.02, "Compacting Equipment" unless Engineer approved alternative compaction equipment.

3.15 APPLYING SEAL COAT

Apply seal coat, if indicated on the Contract Drawings, and in accordance with Section 37 of the State Specifications.

3.16 JOINTS

- A. Where new paving joins existing paving, saw cut the existing surfaces 12 inches back from the joint line full depth. Dispose of waste material offsite. Tack prior to placing the asphalt concrete. Meet lines shall be straight and the edges vertical. Paint the edges of meet line cuts with liquid asphalt or emulsified asphalt prior to placing asphalt concrete. After placing the asphalt concrete, seal the meet line by painting with a liquid asphalt or emulsified asphalt and then immediately cover with clean, dry sand.
- B. Place each asphaltic paving layer as continuous as possible to keep the number of joints to a minimum. Create joints between old and new pavement, between successive days work, and where the mixture has become cold (less than 140 degrees F). Make these joints in such a manner as to create a continuous bond between the old and new pavement construction courses. Offset joints in successive, overlaying courses by at least 6 inches.
- C. Transverse Joints: If placing of material is discontinued or if material in place becomes cold, make a joint running perpendicular to the direction traveled by the paver. Before placement continues, trim the edge of the previously placed pavement to a straight line perpendicular to the paver and cut back to expose an even vertical surface for the full thickness of the course. When placement continues, position the paver on the transverse joint so that sufficient hot mixture will be spread in order to create a joint after rolling that conforms to the required smoothness. If the temperature of the previously placed pavement material drops below 140 degrees F before paving is resumed, give the exposed vertical face a thin coat of liquid asphalt just before paving is continued.
- D. Longitudinal Joints: Coat longitudinal joints that are not completed before the previously laid mixture has cooled to a temperature below 140 degrees F, with liquid asphalt just before paving is continued.

3.17 SURFACE TOLERANCE

- A. Finished grade shall not deviate more than 0.02 foot in elevation from the grade indicated in the Contract Drawings. Slopes shall not vary more than 1/4 inch in 10 feet from the slopes shown in the Contract Drawings.
- B. After paving has been installed and compacted, spray water over the entire paved area. Correct any areas where water collects and does not drain away.

3.18 APPLYING PAINT FOR TRAFFIC STRIPING AND MARKING

Apply in accordance with Section 84 of the State Specifications.

END OF SECTION

SECTION 02623

FILTER FABRIC

PART 1 GENERAL

1.1 SUMMARY

Section Includes: Nonwoven Engineering Fabrics (Geotextile).

1.2 REFERENCES

American Society for Testing and Materials (ASTM):

- A. D3776 - Test Methods for Mass per Unit Area (Weight) of Fabric
- B. D4491 - Test Methods for Water Permeability of Geotextiles by Permittivity
- C. D4632 - Test Method for Grab Breaking Load and Elongation of Geotextiles
- D. D4833 – Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products

1.3 DEFINITIONS

Filter Fabric: Nonwoven filter fabric manufactured from polyester, nylon, or polypropylene material, or any combination thereof.

1.4 PROJECT CONDITIONS

Take field measurements to determine the exact lengths and dimensions of the surfaces to receive the fabric.

1.5 SUBMITTALS

- A. Product Data.
- B. Samples.

- C. Quality Control Submittals:
 - 1. Certificates of Compliance.
 - 2. Manufacturer's Instructions.

1.6 DELIVERY, STORAGE, AND HANDLING

Storage and Protection: Furnish engineering fabrics in protective covers capable of protecting the fabric from ultraviolet rays, abrasion, and water.

PART 2 MATERIALS

2.1 MANUFACTURERS

One of the following or equal:

- A. Amoco 4550.
- B. Mirafi 140N.

2.2 MATERIAL REQUIREMENTS

Physical Properties: Meet the following minimum requirements.

Property ^(a)	Test Method	Requirements
Weight, minimum	ASTM D3776	4.8 ounces per square yard
Grab tensile strength (ultimate)	ASTM D4632	120 pounds
Grab tensile elongation (ultimate)	ASTM D4632	50 percent
Puncture strength	ASTM D4833	40 pounds
Permitivity, minimum	ASTM D4491	1.8 per second

(a) Minimum average roll values.

PART 3 EXECUTION

3.1 PREPARATION

- A. Surface Preparation: During grading operations, take care not to disturb or scarify the subgrade. This may require use of lightweight dozers for low strength soils such as saturated, cohesionless, or low cohesion soils. Recompact if subgrade is scarified.

- B. Prior to placement of fabric; prepare surface to smooth conditions free of debris, depressions, or obstructions which may damage the fabric.

3.2 INSTALLATION

- A. Follow manufacturer's installation instructions and as complemented herein.
- B. Place the geotextile fabric smoothly without folds or wrinkles.
- C. Use special care when placing the geotextile in contact with the soil so that no void spaces occur between the geotextile and the prepared surface.
- D. Overlap the geotextile sheets according to manufacturer's installation.
- E. Place drainage aggregate on the geotextile as specified.

3.3 FIELD QUALITY CONTROL

Inspection: Before covering, the conditions of the fabric will be observed by the Engineer to determine that no holes or rips exist in the fabric. Repair all such occurrences by placing a new layer of fabric extending beyond the defect in all directions a distance equal to the minimum overlap required for adjacent rolls.

END OF SECTION

SECTION 02763

PAINTED PAVEMENT MARKINGS

PART 1 GENERAL

1.1 SUMMARY

Section Includes:

- A. Traffic lines and markings.
- B. Legends.
- C. Paint.
- D. Glass beads.

1.2 STRIPING REQUIREMENTS

- A. Striping within City of San Juan Bautista limits shall utilize thermoplastic striping.
- B. Striping within County rights of way shall adhere to these and related specifications.
- C. Striping shall include:
 - 1. Fog lines along City and County roads
 - 2. Centerlines along City and County Roads
 - 3. Bike lane demarcation along San Juan Highway
 - 4. Crosswalks at County road intersections

1.3 RELATED SECTIONS:

Section 02513 - Asphalt Concrete Paving

1.4 REFERENCES

- A. American Association of State Highway and Transportation Officials:

1. AASHTO M247 - Standard Specification for Glass Beads Used in Traffic Paint.
- B. ASTM International:
1. ASTM D34 - Standard Guide for Chemical Analysis of White Pigments.
 2. ASTM D126 - Standard Test Methods for Analysis of Yellow, Orange, and Green Pigments Containing Lead Chromate and Chromium Oxide Green.
 3. ASTM D562 - Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer.
 4. ASTM D711 - Standard Test Method for No-Pick-Up Time of Traffic Paint.
 5. ASTM D713 - Standard Practice for Conducting Road Service Tests on Fluid Traffic Marking Materials.
 6. ASTM D969 - Standard Test Method for Laboratory Determination of Degree of Bleeding of Traffic Paint.
 7. ASTM D1301 - Standard Test Methods for Chemical Analysis of White Lead Pigments.
 8. ASTM D1394 - Standard Test Methods for Chemical Analysis of White Titanium Pigments.
 9. ASTM D1475 - Standard test Method for Density of Liquid Coatings, Inks, and Related Products.
 10. ASTM D1640 - Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature.
 11. ASTM D2202 - Standard Test Method for Slump of Sealants.
 12. ASTM D2371 - Standard Test Method for Pigment Content of Solvent-Reducible Paints.
 13. ASTM D2621 - Standard Test Method for Infrared Identification of Vehicle Solids From Solvent-Reducible Paints.
 14. ASTM D2743 - Standard Practices for Uniformity of Traffic Paint Vehicle Solids by Spectroscopy and Gas Chromatography.

1.5 PERFORMANCE REQUIREMENTS

- A. Paint Adhesion: Adhere to road surface forming smooth continuous film one minute after application.
- B. Paint Drying: Tack free by touch so as not to require coning or other traffic control devices to prevent transfer by vehicle tires within two minutes after application.

1.6 SUBMITTALS

- A. Submit in accordance with Section 01300.
- B. Product Data: Submit paint formulation for each type of paint.
- C. Test Reports: Submit source and acceptance test results in accordance with AASHTO M247.
- D. Manufacturer's Installation Instructions: Submit instructions for application temperatures, eradication requirements, application rate, line thickness, type of glass beads, bead embedment and bead application rate, and any other data on proper installation.

1.7 QUALITY ASSURANCE

Perform Work in accordance with City of San Juan Bautista standards.

1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years experience.
- B. Applicator: Company specializing in performing work of this section with minimum three years experience.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Invert containers several days prior to use when paint has been stored more than two months. Minimize exposure to air when transferring paint. Seal drums and tanks when not in use.
- B. Glass Beads. Store glass beads in cool, dry place. Protect from contamination by foreign substances.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.
- B. Do not apply exterior coatings during rain or snow when relative humidity is outside humidity ranges, or moisture content of surfaces exceed those required by paint product manufacturer.
- C. Do not apply paint when temperatures are expected to fall below 50 degrees F for 24 hours after application.

- D. Volatile Organic Content (VOC). Do not exceed State or Environmental Protection Agency maximum VOC on traffic paint.

1.11 WARRANTY

Furnish three year manufacturer's warranty for traffic paints.

PART 2 MATERIALS

2.1 PAINTED PAVEMENT MARKINGS

- A. Manufacturers: The pavement paints manufacturer shall be one of the following or equal:
 - 1. Franklin Paint Company
 - 2. Pervo Paint Company
 - 3. Pathmark Traffic Products
 - 4. Safety Coatings Inc.
 - 5. Hydrophast
 - 6. EZ-Liner Industries
- B. All materials furnished shall be in accordance with State and City of San Juan Bautista and shall comply with State and City regulations.
- C. Paint: Ready mixed, conventional and fast dry waterborne traffic paints, lead-free, non-toxic, NASSHTO Test Deck, minimum retroreflectance of 100 mcads, durability rating of 6 or more after in place for nine months; within following limits:
 - 1. Pigment, percent by weight: 60 plus or minus 2
 - 2. Vehicle, percent by weight: 40 plus or minus 2
 - 3. Non-Volatile, percent by weight of paint: 76.0
 - 4. Weight per gallon, pounds minimum 13.0
 - 5. Viscosity: 80-95Kreb Units at 77 degrees F.
 - 6. Grind (Hegeman Guage), minimum Field Tested no tracking time under ambient conditions: 20-90 seconds.
 - 7. Dry Through Time, 15 mils wet at 90 percent relative humidity, 72 degrees F, ASTM D1640: 125 minutes maximum.
 - 8. VOC (Volatile Organic Content): shall be in compliance with State and City standards.

- D. Glass Beads: AASHTO M247, Type 1, coated to enhance embedment and adherence with paint.

2.2 EQUIPMENT

- A. Continuous Longitudinal Line Application Machine: Use application equipment with following capabilities.
 - 1. Dual nozzle paint gun to simultaneously apply parallel lines of indicated width in solid or broken patterns or various combinations of those patterns.
 - 2. Pressurized bead-gun to automatically dispense glass beads onto painted surface, at required application rate.
 - 3. Measuring device to automatically and continuously measure length of each line placed, to nearest foot.
- B. Machine Calibration:
 - 1. Paint Line Measuring Device: Calibrate automatic line length gauges to maintain tolerance of plus or minus 25 feet per mile.
 - 2. Cycle Length/Paint Line Length Timer: Calibrate cycle length to maintain tolerance of plus or minus 6 inches per 40 feet; calibrate paint line length to maintain tolerance to plus or minus 3 inches per 10 feet.
 - 3. Paint Guns: Calibrate to simultaneously apply paint binder at uniform rates as specified with an allowable tolerance of plus or minus 1 mil.
 - 4. Bead Guns: Calibrate to dispense glass beads simultaneously at specified rate. Check guns by dispensing glass beads into gallon container for predetermined fixed period of time. Verify weight of glass beads.
- C. Other Equipment: For application of crosswalks, intersections, stop lines, legends and other miscellaneous items by walk behind strippers, hand spray or stencil trucks, apply with equipment meeting requirements of this section. Do not use hand brushes or rollers. Optionally apply glass beads by hand.

2.3 SOURCE QUALITY CONTROL

Test and analyze traffic paints in accordance with specified standards.

PART 3 EXECUTION

3.1 EXAMINATION

Do not apply paint to concrete surfaces until concrete has cured for 28 days.

3.2 PREPARATION

A. Maintenance and Protection of Traffic:

1. Provide short term traffic control in accordance with Sections 01170 and 01180.
2. Prevent interference with marking operations and to prevent traffic on newly applied markings before markings dry.
3. Maintain travel lanes between 7: 00 AM to 9: 00 AM, and between 4: 00 PM and 6: 00 PM.
4. Maintain access to all adjacent properties.

B. Surface Preparation.

1. Clean and dry paved surface prior to painting.
2. Blow or sweep surface free of dirt, debris, oil, grease or gasoline.
3. Spot location of final pavement markings as specified and as indicated on Drawings by applying pavement spots 25 feet on center.

3.3 APPLICATION

Install Work in accordance with State and City standards.

3.4 APPLICATION TOLERANCES

- A. Maximum Variation from Wet Film Thickness: 1 mil.
- B. Maximum Variation from Wet Paint Line Width: Plus or minus 1/8 inch.
- C. Maintain cycle length for skip lines at tolerance of plus or minus 6 inches per 40 feet and line length of plus or minus 3 inches per 10 feet.
- D. Maximum Variation from Specified Application Temperature: Plus or minus 5 degrees F

3.5 FIELD QUALITY CONTROL

- A. Inspect for incorrect location, insufficient thickness, line width, coverage, retention, uncured or discolored material, and insufficient bonding.
- B. Repair lines and markings, which after application and curing do not meet following criteria:
 - 1. Incorrect Location: Remove and replace incorrectly placed patterns.
 - 2. Insufficient Thickness, Line Width, Paint Coverage, Glass Bead Coverage or Retention: Prepare defective material by acceptably grinding or blast cleaning to remove substantial amount of beads and to roughen marking surface. Remove loose particles and debris. Apply new markings on cleaned surface in accordance with this Section.
 - 3. Uncured or Discolored Material, Insufficient Bonding: Remove defective markings in accordance with this Section and clean pavement surface one foot beyond affected area. Apply new markings on cleaned surface in accordance with this Section.
- C. Replace defective pavement markings as specified throughout three year warranted period. Replace markings damaged by anti-skid materials, studded tires, tire chains, chemical deicers, snow plowing or other loss of marking material regardless of cause. When markings are damaged by pavement failure or by Owner's painting, crack sealing, or pavement repair operations, Contractor is released from warranty requirements for damaged work.
- D. A three member team will evaluate warranty provisions. Team will consist of one member from Owner, one member from Contractor, and third person who is mutually acceptable to Owner and Contractor. Any costs for third person will be equally shared between Owner and Contractor. At least once each year, beginning with year after acceptance, team shall:
 - 1. Observe Owner taking readings by retroreflectometer, or review Owner records of such evaluation. The number of readings will be as large as necessary to ensure that minimum criteria are satisfied. Readings will be during period from March 15 through October, when pavement is clean and dry.
 - 2. Determine color fade, discoloration or pigment loss based on visual color comparison between original sample plates with glass beads and in-place pavement markings.
 - 3. Determine magnitude of material loss.
- E. Prepare list of defective areas and areas requiring additional inspection and evaluation to decide where material may need replaced. Provide traffic control as necessary if markings require more detailed evaluation.
- F. Replace failed or defective markings in entire section of defective markings within 30 days after notification when any of the following exists during warranty period:
 - 1. Average retroreflectivity within any 528 foot section is less than 1225 mcd/m²/1x for white pavement markings and 100 mcd/m²/1x for yellow pavement markings.

2. Marking is discolored or exhibits pigment loss, and is determined to be unacceptable by three member team based on visual comparison with beaded color plates.
 3. More than 15 percent of area of continuous line, or more than 15 percent of combined area of skip lines, within any 528 foot section of roadway is missing.
- G. Replace pavement marking material under warranty using original or better type material. Continue warranty to end of original three year period even when replacement materials have been installed as specified.
- H. When eradication of existing paint lines is necessary, eradicate by shot blast or water blast method. Do not gouge or groove pavement more than 1/16 inch during removal. Limit area of removal to area of marking plus 1 inch on all sides. Prevent damage to transverse and longitudinal joint sealers, and repair any damage according to requirements in Section 02513.
- I. Maintain daily log showing work completed, results of above inspections or tests, pavement and air temperatures, relative humidity, presence of any moisture on pavement, and any material or equipment problems. Make legible entries in log in ink, sign and submit by end of each work day. Enter environmental data into log prior to starting work each day and at two additional times during day.

3.6 PROTECTION OF FINISHED WORK

Protect painted pavement markings from vehicular and pedestrian traffic until paint is dry and track free. Follow manufacturer's recommendations or use minimum of 30 minutes. Consider barrier cones as satisfactory protection for materials requiring more than 2 minutes dry time.

END OF SECTION

SECTION 02961

CEMENTITIOUS MANHOLE REHABILITATION

PART 1 GENERAL

1.1 GENERAL

This specification defines the method and material for the rehabilitation of sanitary sewer structures (manholes, wet wells, lift/pump stations, large diameter concrete pipe, etc.) utilizing a spray applied 100% calcium aluminate cementitious structural rehabilitation system. The purpose of this product is to obtain a dense and durable concrete lining that is resistant to biosulfuric acid attack and meets the strength requirements described elsewhere in this specification. The work covered in this specification consists of furnishing all labor, equipment, materials, and supervision necessary to accomplish the rehabilitation as specified. The following sanitary sewer manholes are to be rehabilitated per this specification: Hollister Domestic WWTP Manhole B10-1 (upstream of influent pump station), and the Storage Pump Station wet well and influent channels. When complete the rehabilitated structure shall:

- A. Provide for a uniformly smooth surface of specified thickness.
- B. Minimize, if not eliminate sources of inflow/infiltration (I/I).
- C. Provide a service life that is supported by documented test analysis.

1.2 CONTRACTORS SEQUENCE OF OPERATION

- A. The Contractor's sequence of operation relative to structural rehabilitation shall include, but not be limited to the following:
 - B. Eliminate all sources of groundwater infiltration and voids in walls.
 - C. Rehabilitate all interior walls and benches in accordance with specification and nature of the sub-surfaces.
 - D. Provision to "cure" the installed lining material.
 - E. Provision to "test" lining and structural rehabilitation materials.

1.3 SUBMITTALS

- A. The Contractor shall furnish detailed and complete data pertaining to the surfaces of the structure to be rehabilitated, the rehabilitation product, surface preparation and installation to the engineer for approval. The submission of this data shall be made in a timely manner to prevent project delay. At the request of the Engineer, the Contractor shall test for adverse chemical conditions that may hinder overall product performance.
- B. Prior to initiating the work, the Contractor shall submit specific technical data with complete physical properties of the structure to be rehabilitated and the proposed product for the rehabilitation of the structure, as well as a specific plan for sub-surface preparation.
- C. A work plan.
- D. A safety plan. It is the contractor's responsibility to comply with OSHA standards and all regulations pertaining to the work including confined space entry.

PART 2 MATERIALS

2.1 MATERIALS

- A. Lining material furnished under this specification shall be a prepackaged mortar mix, including all cement, aggregates, and any required additives. It is the intent of this specification that the Contractor only be required to add the proper amount of potable water so as to produce concrete suitable for spray application. Do not add portland cement, other aggregates, or any admixtures whatsoever to lining material. Typical package weights shall not be less than 50 lbs and shall be identical for all material furnished on this project.
- B. The chemical composition of the cement portion as well as the aggregates of the mortar mix shall be as follows:

Al ₂ O ₃	CaO	FeO + Fe ₂ O ₃	SiO ₂
39-44%	35-39%	9-14%	5-7%

- C. The properties of the mortar mix are typically as follows:

Compressive Strength (ASTM C109)	> 5,500 psi	24 hours
Flexural Strength (ASTM C293)	> 1,200 psi	24 hours
Splitting Tensile Strength (ASTM C496)	> 800 psi	24 hours
Slant Shear test (ASTM C882)	> 1,200 psi	24 hours
Shrinkage at 28 days (ASTM C596)	< 0.08% cured @ 90% relative humidity	
Freeze/Thaw after 300 Cycles (ASTM C666)	No visible damage after 300 cycles	

- D. The mortar mix shall be either “SewperCoat PG” or “SewperCoat 2000HS Regular”, both as manufactured by Kerneos Inc, or Engineer proved equal.
- E. Mortar mix must have at least ten (10) years of successful performance in similar applications and be supplied by an ISO 9001 certified manufacturer. Manufacturer’s ISO 9001 certificate shall be submitted to engineer and owner.
- F. In addition, the mortar mix shall be designed to withstand long-term exposure to a bacterially corrosive hydrogen sulfide environment that may be expected to produce a pH of 1 on normal Portland cement based concrete or typical brick and mortar surfaces.
- G. Water used in mixing shall be fresh, clean, potable water, free from injurious amounts of oil, acid, alkali, vegetable, sewage and/or organic matter. Water shall be considered as weighing 8.32 pounds per gallon.
- H. Mortar mix shall be stored with adequate provisions for the prevention of absorption of moisture. It shall be stored in a manner that will permit easy access for inspection and identification of each shipment.

PART 3 EXECUTION

3.1 SAMPLING AND TESTING

- A. A recognized independent testing laboratory shall test mortar materials used on the project. The Manufacturer, instead of an independent laboratory, may test project sample specimens, provided the Owner, Engineer, and Manufacturer are in agreement of this testing method prior to project commencement. Specific materials recommended by the Engineer shall then be tested.
- B. The cost of sampling and testing of the mortar mix during placement and the surface to which it is applied shall be born by the Contractor. Other testing required showing conformance with these specifications shall be the responsibility of the Contractor. Certified test reports and certificates, when so directed, shall be submitted in duplicate to the Engineer and to such other agencies or persons the Engineer may designate.
- C. Any materials failing to meet the requirements of these specifications shall not be incorporated into the work plan.

3.2 QUALIFICATION OF WORK CREW

- A. The lining material Manufacturer shall maintain a listing of competent contractors that have demonstrated requisite skill and training to be qualified applicators of their materials.

- B. Prior to project commencement, the Contractor must satisfy the Engineer that all Contractor's work crew personnel have performed satisfactory work in similar capacities elsewhere for a sufficient period of time to be fully qualified to properly perform the work in accordance with the requirements of the related specifications.
- C. Foreman shall have at least 4 years experience with similar work and project conditions.
- D. Nozzlemen shall be qualified by having had similar work experience.
- E. Work Crew responsibilities prior to application of lining material shall include the following:
 - 1. Surface preparation as discussed in section 4.1.
 - 2. Ensure the operating air pressure is uniform and provides adequate nozzle velocity for proper compaction.
 - 3. Continuously regulate the water content so that the applied materials consistently achieve proper compaction with a low percentage of rebound and no visible "sag".
 - 4. Ensure that the installation equipment nozzle is held at the proper distance away from and as nearly perpendicular to the prepared sub-surface as the working conditions will permit to secure maximum material compaction with minimum rebound and no visible "sag".
 - 5. Follow a sequence routine that will fill corners with adequately compacted material applied at a maximum practicable layer thickness.
 - 6. Determine necessary operating procedures for placement in confined spaces, extended distances or around unusual obstructions where placement velocities and mix consistency may need to be adjusted.
 - 7. Direct the crew as to when to start and stop the flow of materials during installation and to immediately stop all work when material is not arriving uniformly at the nozzle.
 - 8. Ensure that slough pockets are removed and prepared for installation of replacement material.
 - 9. Bring the installed materials to established finished elevations in a neat and timely manner and within established tolerances.
- F. Applicator's job foreman shall operate the mixing/placing equipment and direct the work of mixing crew personnel. Applicator's work crew shall also maintain proper line pressures throughout the mixing/placing equipment to ensure the necessary consistent nozzle velocity. Applicator's work crew shall further see that all material fed to the nozzle is uniformly fed through this equipment.

3.3 EQUIPMENT

Equipment shall be of spray type and approved by the material manufacturer. Alternate equipment may be utilized provided it meets the performance requirements of the specification. All equipment must be kept in operating condition and good repair.

3.4 SURFACE PREPARATION

- A. Ensure all sub-surfaces are clean and free of laitance, loose material, residue and all existing coating and lining materials. See Section 4.4 for Inflow and Infiltration Prevention. For detailed explanation of the required surface preparation see ACI RAP-3 “Spall Repair by Low Pressure Spraying” page 2. ACI 546R “Concrete Repair Guide”, chapter 2 also provides a good reference for important considerations for repairing concrete surfaces using mortar.
- B. Remove all visible roots from manhole sections prior to the application of the coating material.
- C. Fill all voids as part of the lining process.
- D. Sub-surfaces shall be thoroughly saturated with water prior to the application of the lining materials. In no instance shall shotcrete be applied in an area where running water exists. It is the intent of this specification that the existing surface be saturated and free of any running water just prior to installation – or SSD, “saturated surface dry condition.” To achieve this condition it may be necessary to presoak the sub-surface for a at least 24 hours.

3.5 OPERATIONS

- A. The Contractor shall provide all equipment necessary to individually gauge, control, and monitor the actual amounts of all component materials necessary to complete the lining installation. The type of equipment and methods used to gauge, control, and monitor component materials shall be subject to approval by the Engineer and Manufacturer.
- B. All lining materials shall be thoroughly mixed by mechanical means to ensure all agglomerated particles are reduced to original size or removed prior to placement into the application equipment (i.e. the hopper). Each batch of material should be entirely discharged before recharging with fresh material. Mixing equipment shall be cleaned at regular intervals to remove all adherent materials.
- C. The addition of water to the mix shall be in strict accordance with the Manufacturer’s recommendations.
- D. Re-mixing or tempering shall not be permitted. Rebound materials shall not be reused.

3.6 PROTECTION OF ADJACENT SURFACES

During progress of the work, adjacent areas or grounds which may be permanently discolored, stained or otherwise damaged by dust and rebound material, shall be adequately protected and, if contacted, shall be cleaned by early scraping, brushing or washing as the surroundings permit.

3.7 INFLOW AND INFILTRATION PREVENTION

- A. If inflow or infiltration is observed within the structure after surface preparation is complete, a rapid setting crystalline enhanced hydraulic cement product specifically formulated for infiltration control shall be used to stop minor infiltration flows in accordance with the manufacturer's recommendations. The material shall meet the following strength requirements:

Compressive Strength (ASTM C597B)	600 psi	(24 hours)
	1,000 psi	(7 days)
Bond Strength (ASTM C321)	30 psi	(1 hour)
	80 psi	(1 day)

- B. The material shall be Preco Plug, Octocrete, Burke Plug or Engineer approved equal. Where infiltration flows are more severe, pressure grouting may be required. The material for pressure grouting shall be Avanti A-100, DeNeef or Engineer approved equal installed in accordance with the manufacturer's written instructions.
- C. All materials, labor, equipment, and incidentals required to correct inflow and infiltration conditions will be considered incidental to rehabilitation.

3.8 APPLICATION OF MATERIALS

- A. Lining material shall not be applied to a frozen surface or to a surface that may freeze within 24 hours of application. Frozen conditions shall be defined as ambient temperatures of 32 degrees Fahrenheit or below.
- B. Sequence of application may be from bottom to top or vice versa if rebound is properly removed.
- C. Application shall be from an angle as nearly perpendicular to the surface as practicable, with the nozzle held at least 1 foot from the working sub-surface (except in confined control). If the flow of material at the nozzle is not uniform and slugs, sand spots, or wet sloughs result, the nozzleman shall direct the nozzle away from the work until the faulty conditions are corrected. Such defects shall be replaced as the work progresses.
- D. Application shall be suspended if:
1. Air velocity separates the cement from the aggregate at the nozzle.

2. Ambient temperature approaches freezing and the newly placed lining material cannot be protected and insulated.
- E. The time interval between successive layers of material application must be sufficient to allow “tackiness” to develop but not final set. If final set does occur, this surface shall be prepared in accordance with Sections 4.1.1 of this document.
- F. Construction joints within a manhole shall be avoided. In the event a construction joint is necessary and approved by the Engineer, it shall be sloped off to a thin, clean, regular edge, at a 45-degree angle. Prior to placement of the adjoining materials, the sloped portion and adjacent applied material shall be thoroughly cleaned as necessary, then moistened and scoured with an air jet.
- G. Nozzleman shall bring the material to an even plane and to well-formed corners.
- H. After the body coat has been placed, the surface shall be trued with a thin-edge screed to remove high areas and expose low areas. Low areas shall be properly filled with additional material to insure a true, flat surface in accordance with Section 4.5.5 of this document.
- I. For manhole applications, the minimum thickness of lining material shall be a ½-inch cover over all surfaces. For other larger structures (lift stations, wet wells, treatment plant structures, etc.), the minimum thickness of lining material shall be a 1-inch cover over all surfaces.

3.9 CURING

If the material has been applied and furnished in accordance to the specifications, and it has been determined that the environment is not moist enough for natural curing, the contractor will be required to apply a curing compound to all coated surfaces. Curing compound shall meet the requirements of ASTM C309 and have the approval of the lining material Manufacturer and the Engineer prior to use.

Moist curing may also be used in lieu of curing compound. If moist curing is selected, it should be implemented just after the notice of uniform heat generation of the installed lining. Moist curing can consist of the use of soaker hoses, water sprinklers, or vapor/misting machines. Regardless of delivery method, moist curing should continue for a minimum of 18 hours.

3.10 The following shall receive cementitious rehabilitation as specified above:

1. Storage Pump Station Wet Well
2. Hollister Influent Manhole

END OF SECTION

SECTION 02965

SEWER FORCEMAIN CLEANING

PART 1 GENERAL

1.1 INTENT

- A. The work under this section shall include all labor, materials, supplies, and equipment necessary to clean the interior surfaces on the pipeline utilizing a qualified expert. This specification does not include construction and installation of the pigging stations, which shall be as shown on the drawings.
- B. The principal items of service and equipment required shall include, but not be limited to the following:
 - 1. Factory Trained Service Personnel
 - 2. Cleaning Pigs or Swabs
 - 3. Pig Launchers and Receivers (installed per the drawings)
 - 4. Electronic Pig Tracking Equipment
 - 5. Pressure Profiling Equipment
 - 6. Primary Pumps or Temporary Pumps and Water Supply
 - 7. Two Way Radio Communications
 - 8. Construction of additional access points, if required, to be supplied by General Contractor or Owner

1.2 REFERENCES

- A. Contractor shall submit evidence of expert qualifications to include a list of ten (10) pipe cleaning (pigging) projects of equal or greater scope. Project list shall state the following: dates, feet of pipe, diameter of pipe, pipe material, contact person, phone number and three (3) letters on client letterhead from stated contact person from the above list of ten projects. All projects must have been completed within the past three years. All contractors must submit valid certification of training.
- B. Work shall be in accordance with the most recent revision of applicable codes, regulations, guidelines, rules and standards of the following relevant codes:

1. American Water Works Association (AWWA)
2. Occupational Safety and Health Administration (OSHA)
3. State and local regulations and codes

1.3 RELATED WORK SPECIFIED ELSEWHERE

Section 01300 – Submittals

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

3.1 CLEANING EQUIPMENT

Polyurethane Pipeline Pigs: The pigs shall be manufactured of 2 to 10 lb. per cubic foot density polyurethane foam with an open cell structure. The pig will have a bullet shaped nose with an exterior coating of closed cell urethane and shall be available for use in water systems. The peripheral surface on the pig shall be resilient and abrasive resistant and shall be capable of maintaining a constant sliding seal against the interior wall of the pipeline. The pig shall also be capable of scratching, scraping, plowing, and jetting. The selection and the type and number of pigs to be utilized shall be at the discretion of the qualified cleaning expert, Flowmore Services of Houston, TX (or equivalent specialist).

3.2 GENERAL

- A. Existing pipeline shall be cleaned free of all foreign growth, tuberculation, slurries or other matter, leaving the inside periphery of the pipe as smooth and as free from irregularities as age and attrition from use will permit. The cleaning operation shall be such that the system may be immediately put back in service once cleaning has been completed.
- B. The Contractor shall conduct his operations in conjunction with the Owner of the pipeline to minimize impact to natural waterways and shall not permit silt, clay, mud or sewage to enter any drainage system or wetland area.
- C. The Contractor shall have readily available on the site, manpower, equipment, and materials required to track and locate any pig that may become lodged in the pipeline. Locating the pipeline is the responsibility of the Contractor prior to final completion.

Pipeline repairs required to recover a lodged pig shall be the responsibility of the Contractor.

3.3 COORDINATION

Scheduling of flushing, cleaning, and testing operations shall be coordinated with and agreed to by the Owner or the Engineer.

3.4 PIGGING PLAN

- A. Contractor shall prepare a detailed pigging plan and submit to Engineer for approval.
- B. Contractor shall consider average influent flow rates and use of the EQ tanks located between ESB 1 and ESB 2 in developing the pigging plan to ensure sufficient volume to achieve desired pigging velocities. The EQ tanks provide approximately 65,000 gallons of storage. The EQ tanks will need to be filled prior to use.
- C. The pigging plan shall address cleaning the pipe from the Pig Launching Station on the SJB WWTP site to Remote Pigging Station 1 (Station 159+20.77), from Remote Pigging Station 1 (Station 159+56.24) to Remote Pigging Station 2 (Station 297+85.54), and from Remote Pigging Station 2 (Station 298+36.29) to the WYE fitting immediately upstream of the Hollister WWTP discharge manhole (Station 393+70.08).

3.5 TESTING

- A. Prior to cleaning, each pipeline may be tested by the qualified cleaning expert with the Owner's assistance, to calculate a field approximated -C- value. Determined values shall be reviewed with the Owner or Engineer. Computer programs for field calculations may be supplied by the qualified cleaning expert.
- B. Following pipeline cleaning and flushing, each pipeline may again be tested by the qualified cleaning expert, to determine new "C" values.
- C. Successful cleaning will have been accomplished after the field calculated "C" value is equal to or greater than 140 or to a value mutually agreed to by the Owner, General Contractor and cleaning expert.
- D. All flow testing shall be witnessed by and acceptable to the Owner or Engineer.

3.6 PIPE CLEANING

- A. General Contractor, with authorization from the Engineer, will install any additional piping, valves, etc. required to effectively conduct the pipeline cleaning.

- B. Contractor shall utilize the "progressive" method of pipeline cleaning and be responsible to select the sizes, quantities, and types of pigs to efficiently clean the pipeline.
- C. The Contractor may provide additional water pressure and volume that may be required to launch and propel the pigs through the pipeline. Consideration should be given to using the available storage in the EQ tanks.
- D. Contractor will launch the pig, monitor its progress through the pipeline, thoroughly flush the pipeline after recovering the pig, and test in accordance with Paragraph 3.4.
- E. Pipeline cleaning will be repeated as necessary if the specified "C" value or flow rate has not been achieved. Pipeline will be considered clean after the specified "C- value or flow rate has been achieved in accordance to Paragraph 3.4.

END OF SECTION

SECTION 03071

EPOXIES

PART 1 GENERAL

1.1 SUMMARY

Section Includes:

- A. Epoxy.
- B. Epoxy gel.
- C. Epoxy bonding agent.

1.2 RELATED SECTIONS

Section 03072 - Epoxy Resin/Portland Cement Bonding Agent.

1.3 REFERENCES

American Society for Testing and Materials (ASTM):

- A. D638 - Standard Test Method for Tensile Properties of Plastics.
- B. D695 - Standard Test Method for Compressive Properties of Rigid Plastics.
- C. D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

1.4 SYSTEM DESCRIPTION

Performance Requirements:

- A. Provide epoxy materials that are new and use them within shelf life limitations set forth by manufacturer.

- B. Perform and conduct work of this Section in neat orderly manner.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's data completely describing epoxy materials.
- B. Quality Control Submittals:
 - 1. Manufacturer's installation instructions.

PART 2 MATERIALS

2.1 MATERIALS

- A. Epoxy: Water-insensitive 2-part type low viscosity epoxy adhesive material containing 100 percent solids and meeting or exceeding following characteristics when tested in accordance with standards specified: Manufacturers: One of the following or equal:
 - 1. Master Builders, Inc., Concessive Standard LVI.
 - 2. Sika Chemical Corp., Sikadur 35 Hi-Mod LV.

Physical Characteristic	Test Method	Required Results
Tensile Strength	ASTM D638	8,000 pounds per square inch minimum at 14 days and 77 degrees Fahrenheit cure.
Flexure Strength	ASTM D790	11,000 pounds per square inch minimum at 14 days and 77 degrees Fahrenheit cure.
Compressive Strength	ASTM D695	16,000 pounds per square inch minimum at 24 hours and 77 degrees Fahrenheit cure.
Bond Strength	--	Concrete shall fail before failure of epoxy.
Gel Time for 5 Mil Film	--	Four hours maximum at 77 degrees Fahrenheit.
Elongation	ASTM D638	1 percent minimum at 14 days and 77 degrees Fahrenheit.

- B. Epoxy Gel: Manufacturers: One of the following or equal:
 - 1. Sika Chemical Corp., Sikadur 31, Hi-Mod Gel.
- C. Epoxy Bonding Agent: Manufacturers: One of the following or equal:
 - 1. Master Builders, Inc., Concessive 1001 Liquid LPL.
 - 2. Sika Chemical Corp., Sikadur 32, Hi-Mod.

3. If increased tack time is required for concrete placement, epoxy resin -Portland cement bonding agent as specified in Section 03072 may be used instead of epoxy bonding agent.
- D. Non-Shrink Epoxy Grout
1. ASTM C1107, Army COE CRDC 621, Grade B and C.
 - a. Fluid consistency over a range of 45 degrees to 95 degrees F over a 30 minute working time.
 2. Manufacturers
 - a. Master Builders, Master-Flow 928 Epoxy Grout or equal.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install and cure epoxy materials in accordance with manufacturer's installation instructions.
- B. Epoxy:
1. Apply in accordance with manufacturer's installation instructions.
- C. Epoxy Gel:
1. Apply in accordance with manufacturer's installation instructions.
 2. Use for vertical or overhead work, or where high viscosity epoxy is required.
 3. Epoxy gel used for vertical or overhead work may be used for horizontal work.
- D. Epoxy Bonding Agent:
1. Apply in accordance with manufacturer's installation instructions.
 2. Bonding agent will not be required for filling form tie holes or for normal finishing and patching of similar sized small defects.

END OF SECTION

SECTION 03072

EPOXY RESIN/PORTLAND CEMENT BONDING AGENT

PART 1 GENERAL

1.1 SUMMARY

Section Includes: Epoxy resin/portland cement bonding agent.

1.2 REFERENCES

- A. American Society for Testing of Materials (ASTM):
 - 1. C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
 - 2. C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.
 - 3. C496 - Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
 - 4. C882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear.
- B. Federal Highway Administration (FHWA):
 - 1. Program Report Number: FHWA/RD 86/193.

PART 2 MATERIALS

2.1 MANUFACTURERS

- A. Sika Corporation, Lyndhurst, New Jersey, Sika Armatec 110.
- B. Substitutions: The use of other than the specified product will be considered providing the Contractor requests its use in writing to the Engineer. This request shall be accompanied by:

1. A certificate of compliance from an approved independent testing laboratory that the proposed substitute product meets or exceeds specified performance criteria, tested in accordance with the specified test standards.
2. Documented proof that the proposed substitute product has a one year proved record of performance of bonding portland cement mortar/concrete to hardened portland cement mortar/concrete, confirmed by actual field tests and fives successful installations that the Engineer can investigate.

2.2 MATERIALS

Epoxy Resin/Portland Cement Adhesive:

- A. Component "A" shall be an epoxy resin/water emulsion containing suitable viscosity control agents. It shall not contain butyl glycidyl ether.
- B. Component "B" shall be primarily a water solution of a polyamine.
- C. Component "C" shall be a blend of selected portland cements and sands.
- D. The material shall not contain asbestos.

2.3 PERFORMANCE CRITERIA

- A. Properties of the Mixed Epoxy Resin/Portland Cement Adhesive:
 1. Pot Life: 75 to 105 minutes.
 2. Contact Time: 24 hours.
 3. Color: Dark gray.
- B. Properties of the Cured Epoxy Resin/Portland Cement Adhesive:
 1. Compressive Strength in Accordance with ASTM C109:
 - a. One Day: 810 pounds per square inch minimum.
 - b. Seven Days: 6,000 pounds per square inch minimum.
 - c. Twenty-Eight Days: 8,000 pounds per square inch minimum.
 2. Splitting Tensile Strength in Accordance with ASTM C496:
 - a. Twenty-Eight Days: 540 pounds per square inch minimum.
 3. Flexural Strength:
 - a. 1,100 pounds per square inch minimum in accordance with ASTM C348.

4. Bond Strength in Accordance with ASTM C882 Modified at 14 Days:
 - a. Zero Hours Open Time: 1,900 pounds per square inch minimum.
 - b. Twenty-Four Hours Open Time: 1,500 pounds per square inch minimum.
5. The epoxy resin/portland cement adhesive shall not produce a vapor barrier.
6. Material must be proven to prevent corrosion of reinforcing steel when tested under the procedures as set forth by the Federal Highway Administration Program Report Number FHWA/RD86/193. Proof shall be in the form of an independent testing laboratory corrosion report showing prevention of corrosion of the reinforcing steel.

PART 3 EXECUTION

3.1 INSTALLATION

- A. **Mixing the Epoxy Resin:** Shake contents of Components "A" and Component "B". Empty all of both components into a clean, dry, mixing pail. Mix thoroughly for 30 seconds with a jiffy paddle on a low-speed with 400 to 600 revolutions per minute drill. Slowly add the entire contents of Component "C" while continuing to mix for a minimum of 3 minutes and until uniform with no lumps. Mix only that quantity that can be applied within its pot life.
- B. **Placement Procedure:**
 1. Apply to prepared surface with stiff-bristle brush, broom, or "hopper type" spray equipment:
 - a. For Hand Applications: Place fresh, plastic concrete/mortar while the bonding bridge adhesive is wet or dry, up to 24 hours.
 - b. For Machine Applications: Allow the bonding bridge adhesive to dry for 12 hours minimum.
- C. Adhere to all limitations and cautions for the epoxy resin/portland cement adhesive in the manufacturers current printed literature.

3.2 CLEANING

Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent areas.

END OF SECTION

SECTION 03100

CONCRETE

PART 1 GENERAL

1.1 DESCRIPTION

This section describes the submittal, material, installation, and testing requirements for furnishing and placing formwork, reinforcement, waterstops, and concrete. It also describes finishing and curing requirements, placement tolerances, and testing and repair procedures.

Except as otherwise provided herein, the design and erection shall be in accordance with the applicable provisions of the latest ACI 318 and the concrete "Manual of Concrete Practice".

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 - Submittals
- B. Section 02200 - Earthwork
- C. Section 02225 - Structure Excavation & Backfill
- D. Section 03071 - Epoxies
- E. Section 03072 – Epoxy Resin/Portland Cement Bonding Agent
- F. Section 03480 - Precast Utility Vaults and Catch Basins
- G. Section 03700 - Concrete Saw Cutting and Core Drilling
- H. Section 05120 - Structural Steel
- I. Section 05500 - Metal Fabrications
- J. Section 07110 - Waterproofing
- K. Section 09900 - Painting

1.3 GOVERNING CODES AND STANDARDS

Furnish and install concrete in conformance with the current following standards:

- A. ACI-318 - Building Code Requirements for Structural Concrete
- B. ACI-350 - Code Requirements for Environmental Engineering Concrete Structures
- C. ACI - American Concrete Institute, Manual of Concrete Practice (MCP), Latest Edition, Applicable Standards
- D. CRSI - Concrete Reinforcing Steel Institute
- E. SS90 - Caltrans Standard Specification Section 90
- F. ASTM - Applicable Standards
- G. CCRL - Cement and Concrete Reference Laboratory
- H. SEAOC - Structural Engineers Association of California
- I. CBC – 2019 California Building Code

1.4 SUBMITTALS: In accordance with Section 01300.

- A. Formwork Shop Drawings
 - 1. Before starting concrete work, submit shop drawings of formwork showing size and thickness of members, dimensions and locations of openings and blockouts, vertical limits of concrete placements, horizontal lifts, plywood form pattern, proposed construction joints, form tie elevations and details, and any architectural features to be cast into the concrete. Incorporate the work of all trades.
 - 2. This review is for the purpose of assessing the Contractor's interpretation of the Contract Documents and will not include any considerations of the availability, suitability, constructability, or safety of concrete forming system.
 - 3. Drawings and structural calculations for all concrete other than slabs on grade shall be submitted for record purposes only and not for review or approval. Formwork drawings and structural calculations shall be signed and sealed by a Civil or Structural Engineer registered in California. Where superplastizers are used with Engineer's approval, design formwork to resist full liquid head.
 - 4. The Contractor shall be solely responsible for the design, installation, use, and safe removal of all formwork. The formwork design shall comply with all governing

codes, all Federal, State, and local ordinances; and generally accepted engineering principles.

5. Submit drawings showing the installation and removal sequence and procedures to be used. Include weight of formwork, assumed construction load, proposed minimum concrete strength for stripping of formwork, size and type of reshores, reshore spacing pattern, number of levels of reshores, and assumed load per reshore at each level.

B. Concrete

1. Prepare and submit proposed mix designs along with trial batch test results with a minimum of three test cylinders or a series of production compression tests with a minimum of 20 sets of test data within the last year. All test results shall be signed by a laboratory currently certified by CCRL and actively participating in their sample proficiency program verifying that the components and final products meet the requirements of ACI MCP and these specifications. Mix designs shall include fine, coarse, and combined aggregate gradations.
2. Provide certificates that the cement used complies with ASTM C150 and these specifications.
3. Provide delivery tickets for ready-mix concrete or weighmaster certificates per ASTM C94, including cement weights, aggregate size, the amount of water added at the plant and record of pours. Record the amount of water added on the job on the delivery ticket. Water added at the plant shall account for moisture in both the coarse and fine aggregates.
4. Provide certificate of compliance from the manufacturer of the concrete admixtures with these specifications.
5. Submit concrete drying shrinkage test data along with mix design submittals for concrete with required 28 day compressive strength of 4000 psi and above. Test shall comply with ASTM C157 as modified by SEAOC. The maximum limit for drying shrinkage shall be 0.045% for mix design and 0.058% for field cast after 28 days of drying after the wet cure period.

C. Reinforcing Steel Shop Drawings

1. Before starting concrete work, submit drawings complying with requirements of ACI MCP (latest edition), detailed in accordance with ACI SP66, and adapted to the proposed placement schedule, showing size, dimension, bending, placing, and construction joint details. Submit drawing showing locations of all construction joints. Submit type, size, and location of all slab and bar supports. Submit all reinforcement for a particular structure as a single complete submittal package. Shop fabrication shall not begin until corrected drawings bearing the Engineer's review stamp are returned in accordance with Section 01300.
2. The Contractor shall be wholly and completely responsible for the accuracy of the lists and for furnishing and placing reinforcing steel in accordance with the details shown on the plans and as specified.

3. Submit certified copies of mill test reports for each lot or heat of all reinforcing steel.
- D. Shoring: If shoring the structure is required, submit drawings and structural calculations signed and sealed by a Civil or Structural Engineer registered in the State of California showing anticipated loads, members, connections, and anchorage of the proposed shoring system. The submittal is for record purposes only and not for review or approval.
- E. Concrete Joints, Waterstops, and Epoxy Bonding Compound
1. Submit manufacturer's literature, catalog data, and statement of compliance with referenced standard and specifications for materials specified herein.
 2. Submit material samples of PVC waterstops.
 3. Provide technical data sheets for the Contractor's personnel and the Owner covering joint preparation, priming, and sealant materials application.
 4. Submit layouts for construction and expansion joints and proposed pour sequence. Unless otherwise noted, maximum length or width of one pour is 30 feet and a maximum area of 900 sf. Where walls meet at a corner, the maximum length of wall from the corner to a construction or expansion joint is 20 feet.
 5. Provide epoxy bonding compound manufacturer's specific instructions for use. Provide manufacturer's certifications as to suitability of product to meet job requirements with regard to surface preparation, pot life, set time, vertical or horizontal application, corrosive and/or submerged environments and forming restrictions.

PART 2 MATERIALS

2.1 CONCRETE

- A. General: Materials shall conform to Standard Specifications, this specification, and as approved by the Engineer.
- B. Portland Cement: Use domestic portland cement that conforms to Standard Specifications "Type II Modified/Type V". Use only one brand of cement in any individual structure. Do not use cement that is damaged, partially set, lumpy, or caked. Reject the entire contents of the sack or container that contains such cement. Do not use salvaged or reclaimed concrete.
- C. Water: Water for washing aggregates and for mixing and curing concrete shall be clean, free from oil, acid, alkalies, vegetable matter, or other deleterious substances. No salt or sea water or water containing excessive amount of sodium sulphate, magnesium sulphate or magnesium chloride shall be used.

- D. Coarse Aggregate: The coarse aggregate shall consist of clean, hard, dense, tough and durable natural gravel, crushed gravel, or crushed rock, conforming to Standard Specifications. It shall be free from oil, organic matter or other deleterious substances.
- E. Fine Aggregate: Fine aggregate shall consist of hard, durable, uncoated natural sand or other approved material, conforming to Standard Specifications. It shall be free from oil or other deleterious substances.
- F. Fly Ash: Fly ash shall conform to ASTM C618, Class F or N, except that the loss on ignition shall be limited to 1%.
- G. Admixtures
 - 1. A water reducing agent such as Pozzolith, WRDA, or equal shall be used in all concrete. The admixture shall conform to ASTM C494, Type A. Proportioning and mixing shall be as recommended by the manufacturer.
 - 2. Admixtures causing retarded/accelerated setting of cement in concrete shall not be used.
 - 3. Air entraining admixtures with demonstrated compatibility with the concrete mix shall be used as required as a moderate addition to the water reducing agent to obtain the specified percent air in the resultant concrete. The Contractor shall submit data verifying that the admixtures are compatible with the mix. Air-entraining admixture shall conform to ASTM C260.
 - 4. Shrinkage-reducing admixtures may be allowed to minimize the drying shrinkage of concrete. Manufacturer's recommendation's should be strictly followed with regard to dosage and suitability for use in freezing-and-thawing environments.

2.2 REINFORCING

- A. Reinforcing Steel Bars: Deformed Bars shall be in accordance with ASTM A615, including Supplementary Requirement S1, Grade 60, and free from rust, scale, oil, or frost. No. 3 bars may be Grade 40.
- B. Welded Wire Fabric: Shall be of gauge and mesh size shown and shall meet the requirements of ASTM A185 for plain wire fabric or ASTM A497 for deformed wire fabric. Wire fabric shall be free from rust, scale, oil, and frost.
- C. Reinforcement supported from formwork shall rest on Class 1 (plastic protected) bar supports, as specified in "Manual of Standard Practice" by the Concrete Reinforcing Steel Institute (CRSI), Chapter 3.

Reinforcement supported from the ground shall rest on 3-inch high precast concrete blocks not less than 4 inches square, and having a compressive strength equal to the specified compressive strength of the concrete being placed. The precast blocks shall have been cured as specified for concrete and shall contain soft steel wires embedded therein for fastening to the reinforcing.

- D. Details of concrete reinforcement not shown on drawings shall be in accordance with CRSI Manual of Standard Practice.

2.3 REINFORCING BAR COUPLERS

Reinforcing bar couplers shall be internally threaded to receive future threaded reinforcing bars or couplers. The couplers shall be cold-forged to the reinforcing bars or shall be internally threaded to receive threaded reinforcing bars. The ends of the reinforcing bars shall be upset before threading. Reinforcing bars not upset before threading may be used provided the bar size is increased one bar size. The entire assembly shall be capable of developing, in tension and compression, at least 125 percent of the specified yield strength of the bar. Provide plastic screw-caps to protect internal coupler threads. The couplers shall be of Lenton or equal.

2.4 PATCHING GROUT (Dry Pack)

Patching grout shall consist of neat Portland cement, water, and sand passing a No. 8 sieve. The ratio of cement to sand shall be one part Portland cement to two parts sand. Add sufficient water to form a damp formable consistency.

2.5 FORM RELEASE

Form release shall be non-staining and in accordance with Corps of Engineers Specification CE 204 Section 3.03K. Burke Release #1 V.O.C. manufactured by Edoco, or equal.

2.6 NONSHRINK GROUT

Nonshrink grout shall conform to the ASTM-C1107 for Nonshrink Grout, and to these specifications. Use a nongas-liberating type, cement base, premixed product requiring only the addition of water for the required consistency. Grout shall be Masterflow 713, as manufactured by Master Builders Company, Cleveland, OH, Upcon by Upco Co., Cleveland, OH, or equal.

2.7 EPOXY GROUT

See Section 03071 for material requirements.

2.8 JOINT SEALANT

Joint sealant shall be a single component, gray, nonstaining, nonsagging, gun-grade polyurethane sealant, and shall meet ASTM C920 for vertical and horizontal joints and, in addition, is recommended by the manufacturer for continuous immersion in water. Sealant shall be MasterSeal NP1 by BASF, Sikaflex-1a by Sika Corporation, or equal.

2.9 BACKING ROD FOR EXPANSION JOINTS

Backing rod shall be an extruded closed-cell polyethylene foam rod compatible with joint sealant and as recommended by sealant manufacturer.

The rod shall be ¼-inch larger in diameter than the joint width. Where possible, provide full length sections for the joint and minimize splices. Apply backing rod and bond breaker tape in expansion joints.

2.10 BOND BREAKER TAPE

Bond breaker tape shall be an adhesive-backed glazed butyl or polyethylene tape which will adhere to the premolded joint material or concrete surface. The tape shall be the same width as the joint. The tape shall be compatible with the sealant.

2.11 EXPANSION JOINT FILLERS (Walkways and Sidewalks)

Asphalt impregnated, premolded type, ASTM D1751, ½-inch by depth of slab minus ½-inch.

2.12 PREMOLDED JOINT FILLER

Joint filler shall be preformed, non-extruded type constructed of closed-cell neoprene conforming to ASTM D1752, Type I, as manufactured by W. R. Grace Company of Cambridge, MA; W. R. Meadows, Inc., Elgin, IL; or equal.

2.13 STEEL EXPANSION JOINT DOWELS

Steel expansion joint dowels shall conform to one of the following:

- A. Epoxy coated steel bar dowels with a 12-mil coating thickness. Steel bar dowels shall conform to ASTM A36 or ASTM A615, plain rounds, Grade 60. Epoxy coating shall be in conformance with ASTM A775; or,
- B. Stainless-steel bar dowels conforming to ASTM A276, Type 302.

2.14 EXPANDED POLYSTYRENE FILLER BLOCK

Expanded polystyrene filler blocks for future construction and expansion joints shall be Styrofoam SM brand as manufactured by Dow Chemical Company, or equal.

2.15 PREFORMED CONTROL JOINT

Preformed control joint shall be a one-piece, flexible, PVC joint former, such as Kold-Seal Zip-Per Strip KSF-150-50-50, manufactured by Vinylex, Corp., Knoxville, Tennessee, or a one-piece steel strip with preformed groove, such as Keyed Kold Retained Kap, manufactured by Burke Concrete Accessories, Inc., San Mateo, CA, or equal. Provide the preformed control joint material in full length unspliced pieces.

2.16 PVC WATERSTOPS

Waterstops shall be extruded from a PVC compound and shall be lock-rib, center-bulb or flat-strip type as manufactured by Greenstreak, Specon, Inc., JPSpecialties, Inc., or equal. Waterstop shall comply with Corps of Engineers Specification CRD-C-572. Waterstops shall be of the dimensions and profile as shown in the drawings.

Waterstops shall be extruded from virgin elastomeric PVC compound, resistant to chemical action with Portland cement, alkalies, acids, and not affected by mildew or fungi. It shall show no effect when immersed for 10 days in a 10% solution of sulfuric or hydrochloric acid, saturated lime solution or salt water. Waterstops shall be such that any cross section will be dense, homogeneous, and free from porosity and other imperfections. Waterstops shall be symmetrical in shape. When tested in accordance with Federal Standard No. 601, the material shall meet the following minimum requirements:

Minimum Requirement	ASTM Specification
Tensile Strength, 2000 psi	D638
Shore hardness A15, 60-80	D2240
Ultimate elongation, 300%	D638
Water absorption, 0.15	D570
Specific gravity, 1.3	D792
Stiffness in flexure, 700 psi	D747
Low temperature brittleness, -35 degrees F	D746
Tear Resistance, 300 lb/in	D624

2.17 BENTONITE WATERSTOPS

Where identified on the pipe penetration drawings, bentonite waterstops shall be bentonite strips,

Volclay “Water Stop-RX”, or equal. Bentonite waterstops shall not be used for structural construction joints unless approved by the Engineer.

2.18 FLOOR HARDENER

Liqui-Hard by W.R. Meadows; Lapidolith by Sonneborn Building Products, Division of Contech, Inc., Minneapolis, Minnesota, or equal. Hardener shall be compatible with curing method used.

2.19 ADHESIVE ANCHORS

Anchors called out on Contract Drawings as epoxy anchor, adhesive anchor or chemical anchors shall be stainless steel threaded rods, nuts, and washers (per respective ICC-ES reports) or Grade 60 rebar for epoxy dowels in two component resin adhesive. Adhesive shall be Simpson Set-XP Epoxy, HILTI RE 500-V3, or equal. Adhesive anchors shall meet the cracked section requirements of CBC 2019 and be suitable for submerged and corrosive environments.

2.20 STRUCTURAL ANCHORS

- A. Anchors called out on the Contract Drawings as expansion anchors (EA), expansion bolt (EB), or wedge anchor (WA) shall be stainless steel ITW Redhead Trubolt+, HILTI Kwikbolt TZ, or equal.
- B. Adhesive anchors may be substituted for structural anchors if approved by the Engineer.

2.21 CURING MATERIALS

- A. Sheet Materials: ASTM C171, 4 mil polyethylene film or waterproof paper.
- B. Spray Applied Membrane Forming Liquids: Meet or exceed requirements of ASTM C309, Type 1-D, Class B, except that the loss of water, when tested, shall be not more than 0.15 kilograms per square meter in 24 hours, nor more than 0.45 kilograms per square meter in 72 hours. Shall be a water-base, resin cure with fugitive dye, meeting California Air Regulation Board requirements. Products by Burke, W.R. Meadows, Inc., or equal.

Material shall only be allowed on concrete not scheduled to be coated.

- C. Burlap Mats: Burlap mats shall conform to AASHTO M182.

2.22 FORM TIES

- A. Notify Engineer 48 hours prior to placement of concrete. Concrete shall not be placed until Engineer has reviewed and approved the placement of all reinforcing steel.
- B. Locate form ties on exposed surfaces in a uniform pattern or as indicated on the drawings. Construct form ties so that the ties remain embedded in the concrete except for a removable portion at each end and do not leave an open hole through the concrete. Form ties shall have conical or spherical type inserts with a maximum diameter of 1 inch. Construct form ties so that no metal is within 1 inch of the concrete surface when the forms, inserts, and tie ends are removed. Do not use wire ties. Ties shall withstand all pressures and maintain forms within acceptable deflection limits.
- C. Flat bar ties for panel forms shall have plastic or rubber inserts having a minimum depth of 1 inch and sufficient dimensions to permit patching of the tie hole.
- D. Ties for water-holding structures or dry structures with access, such as basements or pipe galleries that are below finish grade shall have an integral steel waterstop that is tightly and continuously welded to the tie. The waterstop shall be at least two times larger in the area than the tie cross-sectional area and shall be oriented perpendicular to the tie and symmetrical about the center of the tie. Construct the ties to provide a positive means of preventing rotation or disturbance of the center portion of the tie during removal of the ends.
- E. Tapered form ties are allowed for dry structures only that are above finish grade and shall be tapered through-bolts at least 1 inch in diameter at the smallest end or through-bolts that utilize a removable tapered sleeve of the same minimum size.

2.23 BONDING AGENT

See Section 03071 for material requirements.

2.24 CONCRETE GROUT

Grout shall have a minimum compressive strength of 4000 psi at 28 days and shall consist of Portland cement, fine aggregate, coarse aggregate, and air entraining agent, and water which shall conform to the requirements of Section 90 of the Standard Specifications, as modified herein. Grout shall contain a minimum of seven sacks (658 pounds of Portland cement) per cubic yard. Maximum slump shall be four (4) inches. Coarse aggregate shall be 3/8-inch pea gravel. Grading shall be set forth in Section 90 of the Standard Specifications.

PART 3 EXECUTION

3.1 SAFETY REGULATIONS

Comply with all applicable safety regulations including the requirements of "The Construction Safety Orders" of the State of California and the provisions of OSHA.

3.2 CONCRETE MIX COMPOSITION

- A. Concrete Composition: Concrete shall consist of Portland cement, fine aggregate, coarse aggregate, an air entraining agent, and water which shall conform to the requirements of Section 90 of the Standard Specifications, and as modified herein.
- B. Submittal of Proposed Mix Design
 - 1. The proposed mix design, with samples of rock aggregate and any admixtures to be used, shall be submitted in accordance with Section 01300.
 - 2. Samples of fine and coarse aggregate and any admixtures to be used in concrete, shall be submitted along with the concrete mix design submittal.
 - 3. The grading or proportioning of the fine and coarse aggregates in the mix shall be changed whenever necessary or desirable, in the opinion of the Engineer, to secure the required economy, workability, density, impermeability or strength, and no additional compensation because of such changes shall be allowed.

C. Concrete Designations: Concrete will be designated as shown in the table below and subsequent sections.

Type of Use	Concrete Class	Maximum Aggregate Size (inches)	Minimum Compression Strength at 28 Days (psi)	Slump (inches)	Max. Water Cementitious Ratio (by weight)	Entrained Air Required (%)
LIQUID CONTAINING STRUCTURES:						
Slabs & Footings on grade	1	1 ½	4000	3 max	0.45	4-½ ± 1-½
Vertical Wall Sections and Columns	1	1	4000	4 max	0.45	4-½ ± 1-½
Mass Concrete and Unformed Slopes	1	1	4000	2 max	0.45	4-½ ± 1-½
OTHER STRUCTURAL CONCRETE:						
Interior and Exterior Slabs, Footings, Caissons, and Pipe Encasements	1	1 ½	4000	3 max	0.45	3 ± 1-½
Vertical Wall Sections and Columns	1	1	4000	4 max	0.45	3 ± 1-½
Curbs, Gutters, Sidewalks, Mowing Strips, Fence Posts	3	1	2500	4 max	0.55	3 ± 1-½
Thrust Blocks, Concrete Fill	4	1	2000	4 max	0.60	----
Concrete Lined Channels	2	¾"	3000	3 ½	0.60	5 + 1

D. Concrete Class:

1. Class 1 concrete shall contain a minimum of 675 pounds of cementitious material per cubic yard.
2. Class 2 concrete shall contain a minimum of 590 pounds of cementitious material per cubic yard.
3. Class 3 concrete shall contain a minimum of 505 pounds of cementitious material per cubic yard.
4. Class 4 concrete shall contain a minimum of 420 pounds of cementitious material per cubic yard.
5. Fibrous reinforced concrete shall contain a minimum of 590 pounds of cementitious material per cubic yard. Cementitious material shall be as defined in Section 90 of Standard Specifications.

E. Concrete Compressive Strength

1. Whenever the 28-day compressive strength shown on the plans is 3,500 pounds per square inch or greater, the concrete shall be considered to be designated by compressive strength.
2. When the concrete is designated by compressive strength the mix proportions shall be determined and concrete shall be furnished which contains not less than 675 pounds and not more than 800 pounds of cementitious material per cubic yard of concrete and which conforms to the strengths shown on the plans or as specified.
3. Batch proportions shall be adjusted as necessary to produce concrete having the specified cement factor.

F. Fly Ash: The Contractor may at his option substitute up to 15 percent by weight of fly ash for the cementitious material required herein except where high early strength is specified or where the use of fly ash is prohibited.

G. Aggregate Sizing

1. Coarse aggregate maximum grading shall be as specified in the table above. Grading shall be as set forth in Section 90 of the Standard Specifications.
2. Where the spacing of reinforcing bars is such as to result in minimum clearances, or in other locations where in the opinion of the Engineer difficulties may be experienced in pouring concrete with 1½-inch maximum size aggregate, concrete with 1-inch maximum size aggregate shall be used. In this event the air content shall be increased by ½ %.

3.3 MEASURING MATERIALS

Materials shall be measured by weighing except as otherwise specified or where other methods are specifically authorized by the Engineer. Scales shall be approved by the Engineer and have been certified by the local Sealer of Weights and Measures within one year of use. Each size of aggregate and the cement shall be weighed separately. The accuracy of all weighing devices shall be such that successive quantities can be measured to within one percent of the desired amount. Cement in standard packages (sacks) need not be weighed, but bulk cement and fractional packages shall be weighed.

3.4 CONCRETE MIXING AND DELIVERY

- A. All concrete shall be machine mixed at the site, or delivered to the site by transit mixers under conditions approved by the Engineer.
- B. No concrete shall be placed in the work after it has started to set. No concrete can be placed more than one hour after it has been mixed.

- C. If transit mix is used, the rate of delivery, haul time, mixing time and hopper capacity shall be such that all mixed concrete delivered shall be placed in the forms within one hour from the time of introduction of cement and water to the mixer. All concrete shall be kept continuously agitated until discharged in the hopper at the job site.
- D. Ready-mixed concrete shall be batched, mixed, and transported in accordance with ASTM C94 and Chapter 7 of ACI 301. Plant equipment and facilities shall conform to the "Check List for Certification of Ready Mixed Concrete Production Facilities" of the National Ready Mixed Concrete Association.
- E. Trucks rejected based on time limit or required test(s) failure shall not return with new concrete to the jobsite within three hours unless approved by the Engineer.

3.5 CONCRETE HANDLING AND PLACEMENT

A. Excavations and Formwork

1. Excavations shall be kept free from water while concrete is being placed, cured and finished therein. Fresh concrete shall be protected at all times from running water.
2. The order of placing concrete in all parts of the work shall be acceptable to the Engineer. In order to minimize the effects of shrinkage, the concrete shall be placed in units as bounded by construction joints shown. The placing of units shall be done by placing alternate units in a manner such that each unit placed shall have cured at least 14 days before the contiguous unit or units are placed.
3. Before placing concrete, all form work shall be cleaned of dirt and construction debris, water-drained, reinforcement securely and properly fastened in its correct position, forms at construction joints re-tightened, all ducts, sleeves, hangers, pipes, conduits, bolts, wires, etc., installed.
4. No concrete shall be placed before the forms and all work that is to be embedded have been set and observed by the Engineer.
5. All formwork and scaffolding shall comply to OSHA safety standards as given in Section 3.1.

B. Concrete Placement

1. Notify Engineer 48 hours prior to placement of concrete. Concrete shall not be placed until Engineer has reviewed and approved the placement of all reinforcing.
2. The working schedule and schedule of placement shall be as shown on the plans and worked out in conjunction with the Engineer. The schedule shall be worked out prior to commencement of work, and shall be rigidly adhered to.
3. Concrete shall be conveyed from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent the separation or loss of the materials. The concrete shall be deposited in the forms as nearly as practicable in its final

position to avoid rehandling. Use of vibrators for extensive shifting of the mass of fresh concrete will not be permitted.

4. Concrete shall be placed and consolidated by methods that will not cause segregation of the aggregates and will result in a dense homogeneous concrete which is free of voids and rock pockets. All concrete shall be used while fresh and before it has taken an initial set. Retempering any partially hardened concrete with additional water will not be permitted.
5. Surfaces on which concrete is to be placed shall be dampened with water immediately before placing concrete.
6. Concrete shall not be deposited on frozen or ice-coated ground nor on ice-coated forms, reinforcing steel, embedded items or construction joints.
7. Where pavement or surfacing is to be placed around or adjacent to manholes or drainage inlets which will be located within traffic lanes, such structures shall not be constructed to final grade until after the pavement or surfacing has been placed around these locations.
8. Where a schedule for placing concrete is shown on the plans no deviation will be permitted there from unless approved in writing by the Engineer.
9. Mixed concrete, after being deposited, shall be consolidated until all voids are filled and free mortar appears on the surface. The concrete shall be placed as nearly as possible in its final position and the use of vibrators for extensive shifting of the mass of fresh concrete, will not be permitted.
10. Except for concrete used in cast-in-place piles, fresh concrete shall not be permitted to fall from a height greater than 4 feet without the use of adjustable length pipes, tubes or double belting placed to prevent segregation of the concrete. Double belting shall not be used unless the thickness of the member is less than 16 inches.
11. In vertical sections, concrete shall be deposited continuously in horizontal layers of 24 inches maximum depth so as to maintain a horizontal plastic surface until the completion of the unit. No concrete shall be deposited on concrete which has hardened sufficiently to cause the formation of seams and planes of weakness within the section.
12. Concrete for horizontal members or sections shall not be placed until the concrete in the supporting vertical members or sections is no longer plastic and has been in place at least two hours.
13. In all slabs, concrete shall be deposited in a continuous or monolithic operation to the full thickness of the slab. Each batch shall be dumped against previously placed concrete and not away from it, and shall not be dumped in separate piles and then worked together.
14. The concrete in each integral part of the structure shall be placed continuously, and work will not be allowed to commence on any such part unless sufficiently inspected and approved material for the concrete is on hand, and forces and equipment are sufficient to complete the part without interruption in the placing of the concrete.

C. Concrete Vibrating

1. Consolidate concrete by means of high frequency internal vibrators within 15 minutes after it is deposited in the forms. The vibrators shall not be attached to or held against the forms or the reinforcing steel. The vibrating shall be done with care and in such manner that displacement of reinforcement, ducts, and embedded items is avoided.
2. All concrete shall be consolidated by vibration so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into corners of forms, eliminating all air or stone pockets which may cause honeycombing, pitting, or planes of weakness.
3. Internal vibrators used shall be the largest size and the most powerful that can be properly used in the work, as described in Table 5.1.4 of ACI 309. They shall be operated by competent workmen. Use of vibrators to transport concrete within forms shall not be allowed. The vibrator shall be inserted vertically at uniform spacing over the entire area of the placement. The distance between insertions shall generally be about 1½ times the radius of action, or such that the area visibly affected by the vibrator overlaps the adjacent just-vibrated area by a few inches. In slabs, the vibrator shall be sloped toward the horizontal as necessary to operate in a fully embedded position.
4. The vibrator shall penetrate rapidly to the bottom of the layer, and at least 6 inches into the preceding layer if there is such. At each insertion, the vibrator shall be held stationary for a time sufficient to consolidate the concrete but not cause segregation, generally from 5 to 15 seconds. The vibrator shall then be withdrawn slowly, at the rate of approximately 3 inches per second.
5. A spare vibrator in good working condition shall be kept on the job site during all concrete placing operations. Where the concrete is to have an as-cast finish, a full surface of mortar shall be brought against the form by the vibration process, supplemented if necessary by spading to work the coarse aggregate back from the formed surface.
6. The use of external vibrators for consolidating concrete will be permitted when, in the opinion of the Engineer, the concrete is inaccessible for adequate consolidation provided the forms are constructed sufficiently rigid to resist displacement or damage from external vibration.

D. Cold Weather Requirements

1. Provide adequate equipment for heating concrete materials and protecting concrete during freezing or near-freezing weather in accordance with ACI 306 and the following paragraphs.
2. When the temperature of the surrounding atmosphere is 40 degrees F or is likely to fall below this temperature, use heated mixing water not to exceed 140 degrees F. Do not allow the heated water to come in contact with the cement before the cement is added to the batch.

3. When placed in the forms during cold weather (as defined in ACI 306), maintain concrete temperature at not less than 55 degrees F for the first five days after placing, and above 35 degrees F for the remainder of the curing period. Provide thermometers to indicate the ambient temperature and the temperature 2 inches inside the concrete surface.
4. There will be no additional reimbursement made to the Contractor for costs incurred for placing concrete during cold weather.

E. Hot Weather Requirements

1. During hot weather, give proper attention to ingredients, production methods, handling, placing, protection, and curing to prevent excessive concrete temperatures or water evaporation in accordance with ACI 305 and the following paragraphs.
2. When the weather is such that the temperature of the concrete as placed would exceed 90 degrees F, use ice or other means of cooling the concrete during mixing and transportation so that the temperature of the concrete as placed will not exceed 90 degrees F.
3. Take precautions when placing concrete during hot, dry weather to eliminate early setting of concrete. This includes protection of reinforcing from direct sunlight to prevent heating of reinforcing, placing concrete during cooler hours of the day, and the proper and timely application of specified curing methods.
4. There will be no additional reimbursement to the Contractor for costs incurred for placing concrete in hot weather.

3.6 BONDING TO EXISTING CONCRETE

See Section 03072.

3.7 FORMWORK

- A. Arrange formwork construction to allow for proper sequencing and removal without damage. Use orderly and symmetrical panel arrangement with minimum number of joints. Before proceeding, secure approval of formwork and procedures.
- B. Lumber, prefabricated wood panels, metal, or plastic-lined panels shall be sound and free from any defects that will mar or detract from the surface of the finished concrete. Construct forms sufficiently tight to prevent loss of mortar. Design forms to withstand vibrator action. Treat forms with a nonstaining material to eliminate absorption of water and to act as a form release agent.
- C. Thoroughly remove all dirt, mortar, and foreign matter before each use. Where the bottom of the form is inaccessible from within, provide access panels to permit thorough removal of extraneous material before placing concrete.

- D. Kerf wood forms inserted for architectural treatment to accommodate swelling without pressure on the concrete.
- E. Chamfer all exposed horizontal and vertical edges or other corners $\frac{3}{4}$ -inch, both interior and exterior of structures.
- F. Earth trench forms for walls and footings below existing and final grades may be used, if approved after inspection of the trenches, provided the sides are clean, even, vertical, true, and provided the bottoms are level, clean, and without fill, and the width is increased two (2) inches.
- G. Where tolerances are not shown elsewhere, permissible deviations from established lines, grades, and dimensions are listed below:
 - 1. Variation from the Plumb
 - a. In the lines and surfaces of columns, piers, walls and in any other vertical members: in 10 feet, $\frac{1}{4}$ -inch; in any story or 20 feet maximum, $\frac{3}{8}$ -inch; in 40 feet or more, $\frac{3}{4}$ -inch.
 - b. For exposed corners and other conspicuous lines: in any bay or 20 feet maximum, $\frac{1}{4}$ -inch; in 40 feet or more, $\frac{1}{2}$ -inch.
 - 2. Variation from the Level or from the Grades Shown
 - a. In floors, ceilings, and beam soffits: in 10 feet, $\frac{1}{4}$ -inch; in any bay or 20 feet maximum, $\frac{3}{8}$ -inch; in 40 feet or more, $\frac{3}{4}$ -inch; in floors to receive tile, maximum of $\frac{1}{8}$ " in 10 feet.
 - b. For exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines: in any bay or 20 feet maximum, $\frac{1}{4}$ -inch; in 40 feet or more, $\frac{1}{2}$ -inch.
 - 3. Variation of the linear building lines from established position in plan and related position of columns, walls and partitions: In any bay or 20 feet maximum, $\frac{1}{2}$ -inch; in 40 feet or more, 1 inch.
 - 4. Variation in tank, channel or structural lines in 10 feet, $\frac{1}{4}$ -inch; in 20 feet, $\frac{3}{8}$ inch; in 40 feet or more, $\frac{1}{2}$ -inch.
 - 5. Variation in the sizes and locations of sleeves, floor openings and wall openings: $\frac{1}{4}$ -inch.
 - 6. Variation in cross-sectional dimensions of columns, beams and piers, and in the thickness of slabs and walls: minus, $\frac{1}{4}$ -inch; plus, $\frac{3}{8}$ -inch.
 - 7. Footings
 - a. Variation in Dimensions in Plan: Minus, $\frac{1}{2}$ -inch; plus, 2-inch.
 - b. Misplacement or Eccentricity: 2 percent of the footing width in the direction of misplacement but not more than 2 inches.

- c. Misplacement or Eccentricity of Footings Supporting Masonry Or Concrete: 1/2-inch.
 - d. Reduction in Thickness: Minus 5 percent of specified thickness.
 - 8. Variation in Steps
 - a. In a Flight of Stairs: rise, 1/8-inch; tread, 1/4-inch.
 - b. In Consecutive Steps: rise, 1/16-inch; tread, 1/8-inch.
 - 9. Variation from established lines and grades in sidewalks, plazas, outdoor concrete slabs, curb and gutter sections: in 10 feet, 1/4-inch; in 1 foot, 1/8-inch.
- H. Where tolerances are not met, the Owner's Representative may require removal and replacement at no cost to the Owner.

3.8 REINFORCEMENT

- A. Design: The reinforcement design shown on drawings shows only the necessary information for detailing the reinforcement and preparing placing and bending details. Prior to starting concrete work, submitted detailed shop drawings shall be approved by the Engineer.
- B. Bending: In accordance with CRSI Manual of Standard Practice, Chapter 7.
- C. Placement: Place reinforcement accurately as shown. Adequately secure metal reinforcement in position by concrete or metal chairs and spacers, in accordance with CRSI Manual of Standard Practice, Chapter 8. Distance between the steel and the surface, as shown; otherwise, in accordance with Chapter 8.
- D. Splices: Locate splices of reinforcement as shown. For any splices not shown, assume Class B splice. Stagger splice in adjacent horizontal bars, with 5-foot stagger distance. Lap adjacent sheets of wire mesh a minimum of 6 inches and wire securely.
- E. Inspection: After reinforcement has been placed, it shall be inspected and approved before placing concrete.
- F. Conditions of Surfaces: At time concrete is placed, notify Engineer 48 hours prior to placement of concrete. Concrete shall not be placed until Engineer has reviewed and approved the placement of all reinforcing steel.
- G. Welding Reinforcement: Do not weld reinforcing steel unless specifically approved by the Engineer. Welding to be in accordance with ASTM A706.

3.9 JOINTS AND EMBEDDED ITEMS

A. Construction Joint

1. Obtain approval for joints not shown and locate them where they least impair the strength of the structure. Unless otherwise shown on the drawings, joints in walls and columns shall be at the underside of floors, slabs or beams, and at the top of footings or floor slabs. Place beams at the same time as slabs. At least two hours shall elapse after depositing concrete in columns or walls before depositing concrete in supported beams or slabs. As the new concrete is placed, vibration in tops of columns and walls is desirable. Make joints perpendicular to the main reinforcement.
2. All horizontal construction joints in walls shall have a continuous wood screed strip at the outer face of joint to form a true line. Screeds shall be removed and the reglet thoroughly cleaned out before pouring the next portion of wall.
3. Continue all reinforcing steel and mesh across construction joints. Lap slices shall be located outside all construction joints.
4. Construction joints shall be made rough and all laitance removed from the surface by chipping the entire surface, sandblasting with coarse silica sand, or hosing the surface 4 to 6 hours after the pour with a fine spray, exposing solidly embedded clean aggregate.
5. Forms and reinforcing shall likewise be cleaned of drippings, debris, etc., by means of compressed air. Surfaces of the hardened concrete shall be cleaned to the satisfaction of the Engineer and wet as required before placing of new concrete. Just before starting the new pour, all free water shall be removed and the horizontal surfaces shall be covered with at least a 4-inch thickness of concrete composed of cement and fine aggregate, omitting the coarse aggregate.

B. Expansion Joints

1. Install expansion joint fillers to ½-inch below slab.
2. Where shown, load transfer dowels shall consist of plain bars with one half coated with an approved antibond coating. The coated half shall be sleeved. No other reinforcement or metal shall extend continuously through the joint.

C. Waterstops

1. The design and location of waterstops shall be as shown on the drawings and in these specifications. Each piece of premolded waterstop shall be of maximum practicable length to minimize the number of end joints.
2. PVC waterstops shall be properly heat spliced at the ends and intersections to ensure continuity. Construct forms for construction joints in such a manner as to prevent injury to waterstops. Allow at least 10 minutes before pulling or straining the new splice in any way. The finished splices shall provide a cross section that is dense and free of porosity with tensile strength of not less than 80% of the unspliced materials.

3. Install waterstops in strict conformance with manufacturers recommendations.
4. Support waterstops securely against displacement using approved adhesives, or methods specifically recommended by the manufacturer. Hold PVC waterstops securely in position in the construction joints by wire ties, continuous bars, and rings as necessary and approved by the Engineer. Install waterstops in construction and expansion joints in hydraulic structures or where shown in the drawings.
5. If joint is not watertight after construction, one or both of the following shall be done to provide a watertight joint:
 - a. Grouting of the joint by drilling grout holes to the center of the structure unit and forcing epoxy grout into the joint under pressure.
 - b. Cutting of a bevel groove on the water side of the joint. The groove shall be ½ to ¾-inch in width and depth and shall be caulked with epoxy joint sealer in accordance with manufacturer's instructions.

D. Other Embedded Items

1. Prior to concreting, place all required sleeves, inserts, anchor bolts and embedded items.
2. Give all trades whose work is related to the concrete ample notice and opportunity to introduce embedded items before concrete is placed.
3. Position expansion joint material, waterstops, and embedded items accurately and support them against displacement. Fill voids in sleeves, inserts, and anchor slots temporarily with readily removable material to prevent the entry of concrete.

E. Pipes and Wall Spools Cast in Concrete

1. Install wall spools (i.e. bell ring inserts), wall flanges, and wall anchors before placing concrete. Do not weld, tie, or otherwise connect the wall spools or anchors to the reinforcing steel.
2. Support pipe and fabricated fittings to be encased in concrete on concrete piers or pedestals. Carry concrete supports to firm foundations so that no settlement will occur during construction.
3. Pipes or spools located below operating water level shall have waterstop ring collars and shall be cast in place. Do not block out such piping and grout after the concrete section is cast. Pipes fitted with thrust rings shall be cast in place.

F. Additional Reinforcement Around Openings: Place additional reinforcement around pipe or openings as indicated in the drawings

3.10 FORM REMOVAL

Carefully remove forms to insure the complete safety of the structure. All supporting forms or

shoring shall remain in place for a minimum of 10 days or until members have acquired the 28-days compressive strength to support their weight and imposed loads safely.

3.11 CONSTRUCTION LOADS ON STRUCTURAL SLABS

No construction materials and equipment shall be allowed on structural slabs until the concrete has reached the 28-day compressive strength.

3.12 REPAIRING AND PATCHING

- A. Clean, thoroughly dampen and patch all tie holes and all repairable defects immediately after form removal.
- B. All honeycombed and other defective concrete shall be removed to sound concrete with edges perpendicular to the surface. Surface imperfections greater than 3/8 inch in any dimension shall be removed and the affected areas neatly patched. Dampen the area to be patched and an area at least 6 inches wide surrounding it to prevent absorption of water from the patching mortar. Mix patching grout to the consistency of thick cream and brush it well into the surface.
- C. Make the patching mortar of the same material and approximately the same proportions as used for the concrete, omitting the coarse aggregate. The resultant mortar shall consist of not more than 1 part cement to 2½ parts sand by damp loose volume.
- D. Do not use more mixing water than necessary for handling and placing. Mix the patching mortar in advance and allow to stand with frequent manipulation with a trowel, without adding water, until it has reached the stiffest consistency that will permit placing.
- E. After surface water has evaporated from the area to be patched, brush the patching grout well into the surface. When the patching grout begins to lose the water sheen, apply the premixed patching mortar. The mortar shall be thoroughly consolidated into place and struck off to leave the patch slightly higher than the surrounding surface. To permit initial shrinkage, leave the patch undisturbed for at least 1 hour before finishing it. Keep the patched area damp for 7 days. Do not use metal tools in finishing a patch in a formed wall which will be exposed.
- F. Tie Holes: Clean thoroughly by mechanical abrading, dampen, then fill solid with patching mortar. Mortar shall match color of concrete. Fill tie holes prior to finishing.

3.13 FINISHES FOR SURFACES

- A. Finish 1: Beams, columns, and exterior walls not exposed to water or view: Repair defective concrete, fill depressions deeper than ½ inch, and fill tie holes.

- B. Finish 2: Exterior and interior walls, beams, and columns exposed to water, unless such items are to be coated: Repair defective concrete, remove fins, fill depressions ¼ inch or deeper, and fill tie holes.
- C. Finish 3: Walls, beams, and columns of structures or buildings exposed to view and to 1 foot below water level or finished grade; underside of formed floors or slabs (EXCEPT - surfaces which are to be coated): In addition to Finish 2, fill depressions and airholes with mortar. Dampen surfaces and then spread a slurry consisting of one part cement and one and one-half parts sand by damp loose volume, over the surface with clean burlap pads or sponge rubber floats. Remove any surplus by scraping and then rubbing with clean burlap.
- D. Finish 4: Exterior and interior surfaces to be coated: Repair defective concrete, remove fins, fill depressions 1/16 inch or deeper, fill tie holes, remove mortar spatter, and remove bulges higher than 1/16 inch. Surface shall be trowelled, sacked, and brush blasted.
- E. Finish 5: Slabs and floors to be covered with concrete or grout: Screed to grade without special finish.
- F. Finish 6: Slabs and floors not water bearing: Repair defective concrete, remove fins, fill depressions ¼ inch or deeper, and fill tie holes.
- G. Finish 7: Slabs and floors which are water bearing; Slab surfaces on which mechanical equipment moves; Slab surfaces to receive hardener: Steel trowel finish, free from trowel marks and all irregularities.
- H. Finish 8: Slabs and floors of structures or buildings exposed to view: Steel trowel finish without local depressions or high points and apply a light hair-broom finish. Do not use stiff bristle brooms or brushes. Leave hair-broom lines parallel to the direction of slab drainage.
- I. Finish 9: Slabs and floors at slopes greater than 10% and stairs: Steel trowel finish without local depressions or high points. Apply a coarse broom finish. Leave broom lines parallel to the direction of slope drainage.
- J. Finish 10: Exposed stairs and landings and slabs designated for non-slip finish: Areas to have non-slip finish shall incorporate 25 pounds per 100 square feet of aluminum oxide grains into the surface. Immediately before floating begins, sprinkle two-thirds of the abrasive evenly over the surface and float. After embedment, sprinkle the remaining one-third at right angles to the previous application. Apply more heavily in areas not sufficiently covered by the first application, and float again immediately. Complete finishing as specified under Trowelled Finish.
- K. Finish 11: Exposed edges (EXCEPT – edges normally covered with earth): Provide chamfer or beveled edges per this Section.

- L. Finish 12: Top of walls, beams, and similar unformed surfaces: Strike smooth and float in accordance with Finish 4.

3.14 SLAB FINISHING

- A. Screeding: After concrete has been thoroughly consolidated, screed slabs to the desired elevation and contours by means of accurately placed edge forms and intermediate screed strips.
- B. Floated Finish
 1. Place, consolidate, strike off, and level concrete, but do not work it further until ready for floating. Begin floating when water sheen has disappeared and when the surface has stiffened sufficiently.
 2. During or after the first floating, check planeness of surface with a 10-foot straightedge applied at not less than two different angles, and then cut down all high spots and fill all low spots to achieve a true plane within ¼-inch in 10 feet.
 3. Refloat slab immediately to a uniform sandy texture.
- C. Troweled Finish: Float finish slab as described above, then steel trowel by machine or by hand. Additional trowellings shall be done by hand after the surface has hardened sufficiently. Final trowelling shall produce a ringing sound from the trowel and the finished surface shall be free of trowel marks, uniform in texture, and appearance shall be planed to the tolerance specified under Floated Finish. Trowelled finish shall occur at tank floors (except where grout topping or fillets will follow), troughs, channels, clear wells, and all building floor slabs.
- D. Coarse Broom Finish: Immediately after floating, give slabs for exterior walkways and exterior stoops a coarse transverse scored texture by drawing a broom across the surface.

3.15 FLOOR HARDENER

- A. All building floors not scheduled for floor covering, Non-slip Floor Finish, or Broom finish shall receive hardener (Finish 7).
- B. Apply hardener after floors have cured, in accordance with the manufacturer's recommendations.
- C. Floors shall receive three applications of hardener, mixed and applied as specified for heavy duty floors as shown on contract drawings.

3.16 CURING AND PROTECTION

- A. General: Beginning immediately after placement, protect concrete from drying, excessively hot and cold temperatures and mechanical injury. Keep moisture loss to a minimum until cement has hydrated and concrete is hard. Keep concrete constantly moist during the curing period. Follow color admixture manufacturer's recommendations for integrally colored concrete.
- B. Curing
 - 1. Formed Surfaces: Keep forms wet. Cool metal forms exposed to the sun with water. If curing compound is used, apply in accordance with manufacturer's instructions. Curing compound shall not be used on any wall/slab scheduled to be coated.
 - 2. Slabs: Immediately after finishing, apply one of the materials specified in Section 2.22 entitled Curing Materials, but use membrane forming liquid only with Engineer's approval.
 - 3. Duration of Curing: 7 days minimum.
- C. Protection
 - 1. In cold weather, maintain the moisture conditions but also, by heating or covering, maintain the temperature of the concrete between 50 degrees F and 70 degrees F for entire curing period.
 - 2. In hot weather take immediate steps to protect newly finished concrete from drying effects of wind and sun, and maintain temperature of the air surrounding the concrete uniform within 5 degrees F in any one hour or 50 degrees F in any 24 hour period.
 - 3. During curing period, protect concrete from mechanical damage, loading, shock and vibration.

3.17 CONSTRUCTION OF CONCRETE FILLETS, TOPPING, AND EQUIPMENT PADS

- A. Concrete fillets, topping and equipment pads shall be placed as soon as possible after completion of the curing period of the tank walls and structural floors. Contact surfaces shall be thoroughly cleaned to the degree recommended by the bonding agent manufacturer.
- B. Bonding agent shall be accurately and thoroughly mixed and applied at the manufacturer's recommended coverage rate. Mix only the amount which can be used prior to expiration of the pot life. Concrete shall be immediately placed over the fresh surface before setting of the agent. Bonding agent which sets up prior to placing concrete shall be recoated with a fresh coat.

- C. Concrete fillets, topping, and equipment pads shall be accurately screeded to the slopes and elevations shown and steel trowel finished. Cure concrete as specified for slabs above. Set equipment anchor bolts in pad to accommodate equipment furnished.

3.18 BACKFILL AGAINST STRUCTURES

- A. Backfill against concrete structures shall be allowed only when the concrete has reached the specified 28-day compressive strength or as approved by the Engineer. Where backfill is to be placed on both sides of the wall, or against more than one wall of a structure, place the backfill uniformly on both sides of the wall or walls.
- B. Do not backfill until structure has passed leakage testing.
- C. Do not backfill the walls of structures that are laterally restrained or supported by suspended slabs or slabs on grade until the slab is poured and the concrete has reached the specified compressive strength.

3.19 NONSHRINK GROUT

Use nonshrink grout to fill sleeves and voids under equipment bases. Grout shall be mixed and used in accordance with manufacturer's recommendations. Exposed edges shall be smooth, straight and even.

3.20 EPOXY GROUT

See Section 03071 for requirements.

3.21 CONCRETE GROUT

Concrete grout shall be used as a filler material to form shapes and profiles over concrete surfaces as shown on the drawings.

3.22 ADHESIVE ANCHORS

Install in strict conformance to manufacturer's printed instructions. Do not cut or damage existing reinforcing bars. Where reinforcing bars are encountered, move anchor location or core hole as approved by the Engineer.

3.23 LEAKAGE TESTING OF HYDRAULIC STRUCTURES

A. General

1. Prior to backfilling the structure and the application of water-proofing coatings, hydrostatically test reinforced concrete structures which will contain water or fluid to determine that they conform to Section B herein and are free of detectable leaks. Do not start leak testing until all of the following conditions are met:
 - a. Structure or structural materials have achieved their maximum specified design strength.
 - b. Cure time, defined above within subsection 3.16, has elapsed
 - c. Do not hydrostatically test walls which are to be restrained or laterally supported by slabs until slab concrete has obtained the specified compressive strength.
 - d. If a water test is desired for sequencing purposes on an incomplete structure, the Contractor shall immediately notify the Engineer. Such a request may not be allowed and is at the discretion of the Engineer. If the request is approved by the Engineer, the test cannot take place until the following conditions are met:
 - 1) a duration of 14 days minimum has elapsed or the cure time has been reached, whichever is greater
 - 2) the structure or structural materials have achieved their maximum specified design strength
 - 3) Engineer's defined site specific requirements, defined during request review.
2. Prior to testing, clean exposed surfaces by thoroughly hosing and removing surface laitance and loose matter from walls and slabs. Remove wash water and debris from the structures by means other than washing through plant piping.

B. Leakage Test Procedure

1. All liquid containing structures (new or modified existing) shall be leak tested. Fill hydraulic structures to be subjected to leakage tests with potable water to the normal operating liquid level line not less than 2 feet below top of walls. Filling shall be at a uniform rate over a 24-hour period with continuous monitoring. For structures with adjacent bays, fill all bays simultaneously. Empty adjacent bays alternately. Repair any running leaks which appear during filling before continuing.
2. After the structure has been kept full for 48 hours, it will be assumed for the purposes of the test that the absorption of moisture by the concrete in the structure is complete. Then close all valves and gates to the structure and measure the change in water surface each day for a five-day period.
3. During the test period, examine exposed portions of the structure, and mark visible leaks or damp spots. A damp spot is defined as an area which seeps sufficient moisture to dampen a paper towel when pressed against it. Repair visible leaks or

damp spots after dewatering. Additionally, if the drop in water surface in the 24-hour period exceeds 1/10 of 1% of the normal volume of liquid contained in the structure, the leakage shall be considered excessive.

4. The determination of surface moisture evaporation shall be aided with a 24-inch deep, white colored, watertight container with not less than 10 square feet of surface area exposure. Position container to experience environmental conditions similar to the structure being tested. Subtract the water loss due to evaporation from the measured water loss in the structure to determine the water loss due to leakage.
5. If the leakage is excessive, drain the structure, repair leaks and damp spots, and refill the structure and again test for leakage. Continue this process until the drop in water surface in a 24-hour period meets the test requirements and visible leaks and damp spots are eliminated.
6. If an underdrain system is present, inspect the manholes of the underdrain system for evidence of leaks in the floor slabs. If leaking is indicated, locate and repair.
7. If the leakage is detected and location is unknown, use the following procedures. All water-bearing structures must be seeded. Seed the floor slab of each hydraulic structure with one sack of cement per 1,000 square foot surface area. Seeding shall take place after the test filling has reached 18 inches in depth. Detect leaks in construction and expansion joints with the aid of a diver. Stir cementitious deposits flowing toward leaks and repair where the defect is located.
8. Repair flowing leaks whether leakage exceeds the allowable leakage or not.
9. Repairs and additional filling and testing shall be made by the Contractor at no additional cost to the Owner.
10. Use Form A, attached to this specification.

C. Repair of Defects

1. Do not repair defects until concrete has been reviewed by the Owner's Representative.
2. Surface Defects: Repair surface defects that are smaller than 1 foot across in any direction and are less than 1/2 inch in depth. Repair by removing the honeycombed and other defective concrete down to sound concrete, make the edges perpendicular to the surface and at least 3/8 inch deep, thoroughly dampen the surface, work into the surface a bonding grout, fill the hole with mortar, match the finish on the adjacent concrete, and cure as specified.
3. Severe Defects: Repair severe defects that are larger than surface defects but do not appear to affect the structural integrity of the structure. Repair by removing the honeycombed and other defective concrete down to sound concrete, make the edges perpendicular to the surface, sandblast the surface, coat the sandblasted surface with an approved epoxy bonding compound, place nonshrink grout as specified herein, match the finish on the adjacent concrete, and cure as specified.

4. Major Defects: If the defects are serious or affect the structural integrity of the structure or if patching does not satisfactorily restore the quality and appearance to the surface, the Engineer may require the concrete to be removed and replaced, complete, in accordance with the provisions of this section at no additional cost to the Owner.

D. Repair of Cracks in Concrete

1. Repair leaking concrete cracks that are 1/10 inch or less in width by epoxy pressure injection.
 - a. Preparation: Insert and anchor a one-way polyethylene valve or pipe nipple in holes drilled into crack. Position them every 6- to 18-inches on center depending on the width of crack. Maintain a slow, steady pressure rather than a rapid buildup of pressure. When grouting material reaches the next tube, stop off the present position and follow the same procedure on the next position.
 - b. Upon completion of the epoxy grouting, remove the epoxy gel used to hold the valve or nipple by applying a direct flame to the epoxy and scraping it off. Fill the holes with the same material as used for patching the surface.
 - c. While the valves or nipples are installed first, the grouting operation shall not commence until after the patch work has been completed and has sufficiently cured.
2. Repair cracks in concrete structures that are wider than 1/10 inch in width by cutting out t square edged and uniformly aligned joining 3/8 inch wide by 3/4 inch deep, preparing exposed surfaces of the joining, priming the join, and applying polyurethane join sealant in accordance with this section.
3. If the cracks are serious or affect the structural integrity or function of the element, the Engineer may require the concrete to be removed and replaced, complete, in accordance with the provisions of this section at no additional cost to the Owner.
4. After repairing visible leaks, damp spots or leaking concrete cracks, retest the structure.

3.24 CONCRETE TESTING

Concrete testing shall be performed by the Owner, at Owner's expense, in accordance with the following:

- A. Test reports shall be sent to the Engineer with copies to the Contractor.
- B. Concrete which fails to meet strength, slump, air or shrinkage requirements may be rejected by the Engineer before, during, or after placement.
- C. One set of four concrete test cylinders shall be taken for every 50 cubic yards or fraction thereof of each concrete mix design placed each day. The Engineer has the option to direct

the required test specimens to be taken as he deems necessary to insure the concrete meets the specification.

- D. Specimens shall be taken, cured, and tested for compressive strength in accordance with ASTM C31, ASTM C39, and ASTM C172, respectively.
- E. Test one cylinder at 7 days for information; test two cylinders at 28 days for acceptance; and hold one cylinder for verification. Strength acceptance will be based on the average of the strengths of the two cylinders tested at 28 days. If one cylinder of a 28-day test manifests evidence of improper sampling, molding, or testing, other than low strength, discard it and use the fourth cylinder for the test result.
- F. Determine the concrete slump by ASTM C143 with each strength test sampling and as required to establish consistency.
- G. Determine air content of the concrete using ASTM C231 to verify the percentage of air in the concrete immediately prior to depositing in the forms.
- H. Determine drying shrinkage in accordance with ASTM C157, as modified by SEAOC, at 7, 14, 21, and 28 days of drying after the wet cure period. A minimum of three sets of three shrinkage bars shall be cast over the project duration. The Engineer has the option to increase or decrease the testing frequency as he deems necessary to insure the concrete meets the specification. Shrinkage bars of 28 days drying age shall not exceed 0.045 percent for laboratory cast and 0.058 percent for field cast.
- I. The average value of concrete strength tests shall be equal to or greater than the specified 28-day strength. No test shall be less than 90% of the specified 28-day strength.
- J. If the 28-day strength tests fail to meet the specified minimum compressive strength, the concrete will be assumed to be defective and one set of three cores from each area may be taken as selected by the Owner and in accordance with ASTM C42. If the average compressive strength of the set of three concrete cores fails to equal 90% of the specified minimum compressive strength or if any single core is less than 75% of the minimum specified compressive strength, the concrete will be considered defective. The Owner may require additional coring, nondestructive load testing, or repair of defective concrete. Costs of coring, testing of cores, load testing, and required repairing pertaining thereto shall be paid by the Contractor at no extra cost to the Owner.

3.25 DAMAGED OR DEFECTIVE CONCRETE

Remove damaged or defective concrete before completion and acceptance of the work and replace with acceptable concrete, at no additional cost to the Owner.

3.26 SAMPLE HYDRAULIC STRUCTURE LEAKAGE LEAK TEST FORM A

Contractor _____ Project _____

Structure: _____ Test # _____

Work to be Performed	Date	Quantity Water (gal)	Visible Leaks (Y/N)	Water Level Height	Pan Evaporation Reading	% loss	Contractor Initial	Construct. Manager Initial

Notes: _____

END OF SECTION

SECTION 03110

CONTROLLED LOW STRENGTH MATERIAL

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Controlled Low Strength Material (CLSM).
- B. Related Sections:
 - 1. Section 03100 - Concrete.

1.2 REFERENCES

American Society of Testing and Materials (ASTM):

- A. C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
- B. C33 - Standard Specification for Concrete Aggregates.
- C. C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- D. C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.
- E. C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
- F. C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
- G. C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
- H. D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³(2,700 kN-m/m³))

1.3 SYSTEM DESCRIPTION

Performance Requirements:

- A. Total Calculated Air Content: Not be less than 8.0 percent nor greater than 12.0 percent.
- B. Minimum Unconfined Compressive Strength: Not less than 50 pounds per square inch measured at 28 days.
- C. Maximum Unconfined Compressive Strength: Not greater than 150 pounds per square inch measured at 28 days.
- D. Wet Density: No greater than 132 pounds per cubic foot.

1.4 SUBMITTALS

- A. Product Data: Submit data completely describing products.
- B. Sieve Analysis: Submit sieve analyses of fine and coarse aggregates being used in triplicate. Resubmit at any time there is a significant change in grading of materials.
- C. Mix: Submit full details, including mix design calculations for mix proposed for use.
- D. Trial Batch Test Data:
 - 1. Submit data for each test cylinder.
 - 2. Submit data that identifies mix and slump for each test cylinder.
- E. Cement Mill Tests: Include alkali content, representative of each shipment of cement for verification of compliance with specified requirements.
- F. Pozzolan Certificate of Compliance: Identify source of pozzolan and certify compliance with requirements of ASTM C 618.

PART 2 MATERIALS

2.1 MATERIALS

- A. Portland Cement: Type II modified portland cement as specified in Section 03100.
- B. Fly Ash: As specified in Section 03100.

- C. Water: As specified in Section 03100.
- D. Admixture: Air entraining admixture in accordance with ASTM C260.
- E. Fine Aggregate: Concrete sand that does not need to be in accordance with ASTM C33. No more than 12 percent of fine aggregate shall pass a No. 200 sieve, and no plastic fines shall be present.
- F. Coarse Aggregate: Pea gravel no larger than 3/8 inch.

2.2 MIXES

Suggested Design Mix

Material	Weight	Specific Gravity	Absolute Volume Cubic Foot
Cement	30 pounds	3.15	0.15
Fly Ash	300 pounds	2.30	2.09
Water	283 pounds	1.00	4.54
Coarse Aggregate	1,465 pounds	2.68	8.76
Fine Aggregate	1,465 pounds	2.68	8.76
Admixture	4-6 ounces		2.70
TOTAL	3,543 pounds		27.00

2.3 SOURCE QUALITY CONTROL

- A. Trial Batch:
 1. After mix design has been accepted by Engineer, have trial batch of the accepted mix design prepared by testing laboratory acceptable to Engineer.
 2. Prepare trial batches using specified cementitious materials and aggregates proposed to be used for the Work.
 3. Prepare trial batch with sufficient quantity to determine slump, workability, consistency, and to provide sufficient test cylinders.
- B. Test Cylinders:
 1. Prepare test cylinders in accordance with ASTM C31 with the following exceptions:
 - a. Fill the concrete test cylinders to overflowing and tap sides lightly to settle the mix.

- b. Do not rod the concrete mix.
 - c. Strike off the excess material.
 - 2. Place test cylinders in a moist curing room. Exercise caution in moving and transporting the cylinders since they are fragile and will withstand only minimal bumping, banging, or jolting without damage. Do not remove the test cylinder from mold until the cylinder is to be capped and tested.
 - 3. Do not remove the test cylinder from mold until the cylinder is to be capped and tested.
 - 4. The test cylinders may be capped with standard sulfur compound or neoprene pads:
 - a. Perform the capping carefully to prevent premature fractures.
 - b. Use neoprene pads a minimum of 1/2 inch thick, and 1/2 inch larger in diameter than the test cylinders.
 - c. Do not perform initial compression test until the cylinders reach a minimum age of 3 days.
- C. Compression Test 8 Test Cylinders: Test 4 test cylinders at 3 days and 4 at 28 days in accordance with ASTM C39 except as modified herein:
 - 1. The compression strength of the 4 test cylinders tested at 28 days shall be equal to or greater than the minimum required compression strength, but shall not exceed maximum compression strength.
- D. If the trial batch tests do not meet the Specifications for strength or density, revise and resubmit the mix design, and prepare additional trial batch and tests. Repeat until an acceptable trial batch is produced that meets the Specifications.
 - 1. All the trial batches and acceptability of materials shall be paid by the Contractor.
 - 2. After acceptance, do not change the mix design without submitting a new mix design, trial batches, and test information.
- E. Determine Slump in Accordance with ASTM C143 with the Following Exceptions:
 - 1. Do not rod the concrete material.
 - 2. Place material in slump cone in one semi-continuous filling operation, slightly overfill, tap lightly, strike off, and then measure and record slump.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Prior to placement, soils located below controlled low strength material placement shall be scarified to a depth of 8 inches, uniform moisture conditioned to or above the optimum

moisture content, and compacted to a minimum of 95 percent relative compaction in accordance with ASTM D1557.

- B. Place controlled low strength material by any method which preserves the quality of the material in terms of compressive strength and density:
 - 1. Limit lift heights of CLSM placed against structures and other facilities that could be damaged due to the pressure from the CLSM, to the lesser of 3 feet or the lift height indicated on the Drawings. Do not place another lift of CLSM until the last lift of CLSM has set and gained sufficient strength to prevent lateral load due to the weight of the next lift of CLSM.
 - 2. The basic requirement for placement equipment and placement methods is the maintenance of its fluid properties.
 - 3. Transport and place material so that it flows easily around, beneath, or through walls, pipes, conduits, or other structures.
 - 4. Use a slump of the placed material greater than 9 inches, and sufficient to allow the material to flow freely during placement:
 - a. After trial batch testing and acceptance, maintain slump developed during testing during construction at all times within plus or minus 1 inch.
 - 5. Use a slump, consistency, workability, flow characteristics, and pumpability (where required) such that when placed, the material is self-compacting, selfdensifying, and has sufficient plasticity that compaction or mechanical vibration is not required.

3.2 FIELD QUALITY CONTROL

- A. General:
 - 1. Make provisions for and furnish all material for the test specimens, and provide manual assistance to assist the Engineer in preparing said specimens.
 - 2. Be responsible for the care of and providing curing condition for the test specimens.
- B. Tests by Owner:
 - 1. During the progress of construction, the Owner will have tests made to determine whether the controlled low strength material, as being produced, complies with the requirements specified hereinbefore. Test cylinders will be made and delivered to the laboratory by the Engineer and the testing expense will be borne by the Owner.
 - 2. Test Cylinders:
 - a. Prepare test cylinders in accordance with ASTM C31 with the following exceptions:
 - 1) Fill the concrete test cylinders to overflowing and tap sides lightly to settle the mix.

- 2) Do not rod the concrete mix.
- 3) Strike off the excess material.
- b. Place the cylinders in a safe location away from the construction activities. Keep the cylinders moist by covering with wet burlap, or equivalent. Do not sprinkle water directly on the cylinders.
- c. After 2 days, place the cylinders in a protective container for transport to the laboratory for testing. The concrete test cylinders are fragile and shall be handled carefully. The container may be a box with a Styrofoam or similar lining that will limit the jarring and bumping of the cylinders.
- d. Place test cylinders in a moist curing room. Exercise caution in moving and transporting the cylinders since they are fragile and will withstand only minimal bumping, banging, or jolting without damage.
- e. Do not remove the test cylinder from mold until the cylinder is to be capped and tested.
- f. The test cylinders may be capped with standard sulfur compound or neoprene pads:
 - 1) Perform the capping carefully to prevent premature fractures.
 - 2) Use neoprene pads a minimum of 1/2 inch thick, and 1/2 inch larger in diameter than the test cylinders.
 - 3) Do not perform initial compression test until the cylinders reach a minimum age of 3 days.
3. Not less than 3 cylinder specimens will be tested for each 150 cubic yards of controlled low strength material and not less than 3 specimens for each half day's placement:
 - a. Test 1 cylinder at 3 days and 2 at 28 days in accordance with ASTM C39 except as modified herein.
 - b. The compression strength of the cylinders tested at 28 days shall be equal to or greater than the minimum required compression strength, but shall not exceed maximum compression strength.
4. The Owner will test the air content of the controlled low strength material. Test will be made immediately after discharge from the mixer in accordance with ASTM C231.

C. Tests by Contractor:

1. Test the slump of controlled low strength material using a slump cone in accordance with ASTM C143 with the following exceptions:
 - a. Do not rod the concrete material.

- b. Place material in slump cone in one semi-continuous filling operation, slightly overfill, tap lightly, strike off, and then measure and record slump.
2. Test the slump at the beginning of each placement, as often as necessary to keep the slump within the specified range, and when requested to do so by the Engineer

END OF SECTION

SECTION 03480

PRECAST UTILITY VAULTS AND CATCH BASINS

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of furnishing and installing precast concrete utility vaults with covers for flow meters, process equipment and other shown services, and also catch basins, all as shown on the contract drawings or specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300: Submittals
- B. Section 01610: Seismic Design Criteria
- C. Section 01615: Wind Design Criteria
- D. Section 02200: Earthwork
- E. Section 02623: Filter Fabric
- F. Section 08310: Access Hatches

1.3 SUBMITTALS

- A. In accordance with Section 01300, submit manufacturer's literature and drawings showing complete layout, dimensions, design loadings, materials of construction, etc.
- B. For all precast items which are manufactured, the Contractor shall also submit a list of the design criteria used by the manufacturer.
- C. The Contractor shall submit approved ICBO reports for all lifting inserts, showing allowable design loads on the inserts.

- D. Verification of compressive strength shall be submitted in accordance with Section 01300. Such verification may be laboratory trial batch test results with a minimum of three test cylinders or a series of production compression tests with a minimum of 20 sets of test data which fall within the evaluation and acceptance criteria specified herein. Such tests must have been made within the previous two years on the identical concrete mix submitted.
- E. For vaults larger than 4'-0" in any dimension, drawings and calculations shall be signed by a Civil or Structural Engineer registered in California. Loads and design criteria shall be as shown on the contract drawings, specification sections 01610 and 01615, and project Geotechnical Reports. Calculations shall be based on the soil pressures provided in the Geotechnical Reports and specification section 01610.

1.4 QUALITY ASSURANCE

Test methods and criteria for evaluation and acceptance of concrete shall be as specified in Section 03100, "Concrete".

PART 2 MATERIALS

2.1 VAULT AND CATCH BASIN DESIGN AND MANUFACTURE

- A. Design Loads: Design loads shall consist of live load, dead load, impact load, hydrostatic load, and other loads that may occur.
 - 1. Live loads shall be for HS20-44, or as required per AASHTO Standard Specifications for Highway Bridges with revisions.
 - 2. Design wheel loads shall be sixteen (16) kips.
 - 3. Earth loads shall include a 2-foot soil surcharge.
- B. Forms: All forms used in placing concrete shall be sufficiently designed and braced to maintain alignment under pressures of concrete placement.
- C. Concrete:
 - 1. Aggregates used in the concrete mix either coarse or fine, excluding light-weight aggregates, shall conform to specifications as outlined by ASTM C33.
 - 2. All light-weight aggregates, fine or coarse, shall conform to specifications as outlined by ASTM C33.
 - 3. Both types of aggregates shall be properly graded and free of any deleterious substances so as to produce a homogeneous concrete mix when blended with cement.

- D. Cement: The cement shall be Type II low alkali portland cement and shall meet ASTM C150 Type II standards.
- E. Compressive Strength: Sufficient cement content per Section 03100 shall be used per batch so as to produce a minimum strength of 4,000 psi at 28 days or other strength by design when required.
- F. Batching: A central batching facility shall be used to assure accurate weighing and mixing of materials to obtain a suitable concrete mix.
- G. Placing: Concrete shall be made by properly proportioned parts of sand, aggregate and cement with sufficient water to produce a concrete mix of uniform quality and slump. Handling from the mixer or the transport vehicle to the forms for deposit will be in a continuous manner, as rapidly as practicable without segregation or loss of ingredients, until the unit or segment pouring is completed. Compaction by either external or internal mechanical vibration shall be used during the placement of the concrete mix.
- H. Curing: Concrete while still in the forms may be steam cured after an initial set has taken place. Steam temperature shall not exceed 160°F, nor raised from normal ambient temperature at a rate exceeding 40°F per hour. Steam curing shall be considered complete after sufficient time has elapsed to produce adequate strength to withstand any structural strain that may be subjected during the form stripping operation. Additional curing may be applied by means of water spraying or membrane curing compound to reach the ultimate strength requirements.
- I. Reinforcing Steel: All reinforcing steel, including welded wire mesh, shall be of the size and in the location required for design loads and conforming to ASTM A185. All reinforcing shall be sufficiently tied to withstand any displacement during the pouring operation. All bars shall be intermediate grade, or as specified, billet steel conforming to ASTM A615.
- J. Preformed Joint Sealant: The joint sealing compound shall be Quik-Seal, a preformed, cold applied, ready to use plastic joint sealing compound as supplied by Quikset Utility Vaults, Santa Ana, California; Ram-Neck by K.T. Syder Company; or approved equal.

2.2 UTILITY VAULTS

- A. Dimensions as shown on the drawings, minimum size shall be 24" x 30". Open bottom or enclosed with drain or without, as shown or required for service intended.
- B. Vault Cover: Designed for HS-20 traffic loading. Unless otherwise noted on the drawings or scheduled in Specification Section 08310, provide galvanized steel, bolt down, drag off, unless shown to be hinged with spring assist, on the drawings or specified.

1. Manufacturers: Brooks Products, Inc., Stockton, CA; Jensen Precast, Sparks, NV; Utility Vault Co.; or equal.
 2. Hinged Spring Assist Vault Cover: Where shown on the drawings, vaults shall be provided with spring or torsion assisted two-piece galvanized steel or aluminum covers. Covers shall be designed for HS-20 traffic loading and equipped with heavy forged brass hinges with stainless steel pins including automatic hold open arm with release handle, compression spring operators for ease of operation and to act as a check in retarding downward motion covers. Hardware shall be zinc plated and chromate sealed. Factory finish shall be a "Mill finish with bituminous coating applied to exterior of the frame". Cover shall be Bilco Model JD-H-20, Halliday Products Series 2HW, or approved equal.
 3. Identification: All covers shall have identification marker detailing the contents with 1" bead weld letters (i.e. "water", "sewer", "electrical", "chemical").
- C. Internal Ladder: The Utility Vault shall be furnished with an internal aluminum ladder to provide easy access. The ladder rungs shall have a non-slip traction surface and internal stainless steel safety bar. The ladder shall meet or exceed OSHA General Industry Standards, Part 1910.27 for "Fixed Ladders". If the ladder depth is over 15' (as shown on the drawings), install a safety rail with harness and pull up access pole. For ladders less than 15' depth, install a head hazard deflector plate. For ladders over 24', install a safety cage and safety rail with harness and pull up access pole. Ladders shall be compliant with OSHA §1910.27 and 1926.1053.

2.3 CATCH BASINS

- A. Unless otherwise noted, catch basins shall be 3' x 3' x 8" wall thickness (minimum) with bottom. Catch basins shall have progressive webbed knock-outs to provide maximum flexibility and permitting pipe of any size shall be neatly and quickly grouted at the job site. All reinforcing steel shall meet ASTM specifications.
- B. Catch Basin Grating: Unless otherwise noted on the drawings provide stainless steel, HS-20 traffic loading.
- C. Manufacturers: Christy Concrete Products, Inc.; Jensen; or equal.

PART 3 EXECUTION

3.1 INSTALLATION

Vaults shall be installed as shown on the Contract Drawings and as recommended by the Manufacturer. Catch basins shall be placed on 6-inch compacted class 2 aggregate base. Vaults deeper than 10 feet below grade shall be placed on 12-inches of crushed rock wrapped in an approved geotextile fabric. Vaults less than 10 feet below grade shall be placed on 12-inches of

compacted class 2 aggregate base. Install level with top at grade in roadways and two to three inches above grade outside of roadways.

3.2 PRECAST VAULT

The above-mentioned precast item shall be installed in accordance with the manufacturer's recommendations, unless otherwise required by the drawings. All joints shall be sealed by the use of preformed sealant and mortar or non-shrink grout so as to be water tight. Interior joints shall be tooled flush.

3.3 CONNECTIONS

Connections to manufactured precast items shall be made by casting sections of pipe into the items using non-shrink grout as shown on the drawings, and/or using an approved resilient connector. All such connections shall be water tight.

END OF SECTION

SECTION 03700

CONCRETE SAW-CUTTING AND CORE-DRILLING

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of saw-cutting and/or core-drilling new openings in existing concrete.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 - Submittals
- B. Section 03100 - Concrete

1.3 QUALITY ASSURANCE

Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of Section 01300.
- B. Submit drawings and commentary showing and describing the proposed cutting procedures and proposed equipment for each type of cut.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

3.1 SAFETY REGULATIONS

- A. Comply with all applicable safety regulations including the requirements of “The Construction Safety Orders” of the State of California and OSHA.
- B. Provide equipment in good and safe working order, adequate to perform the work.
- C. Provide necessary scaffolding, lighting, access, debris removal equipment and devices, and appropriate safety measures.

3.2 CONCRETE CUTTING

- A. Perform concrete cutting as shown on the drawings and as specified herein and in accordance with the approved submittals.
- B. Openings shall be cut to the dimensions shown on the drawings and shall not be over-cut. In straight-cut openings, the face opposite the saw shall be chipped to achieve the opening dimension.

3.3 PATCHING

- A. Where existing reinforcing bars are cut at new opening, burn back the reinforcing bars a minimum of 1-inch below adjacent concrete.
- B. Patch the resulting void at existing reinforcing bars and the surface of chipped opening surfaces with an approved epoxy grout in accordance with Section 03100: Concrete, to achieve a smooth, uniform surface.
- C. Paint the patch exposed surfaces with System K - Epoxy Paint per Section 09900.

3.4 DISPOSAL

- A. Remove cut material and dispose off-site in a safe and orderly manner. Do not allow debris to accumulate on the site exposed to view.
- B. Inside structures, cuttings, chippings and patching grout droppings must be removed completely. No debris shall be washed into the plant's sediment drain system.

- C. Upon completion of the work of this section, the surfaces of all structures shall be clean and free of cuttings, slurry and debris.

END OF SECTION

SECTION 03721

STRUCTURAL REPAIR MORTAR

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section specifies a one component, thioxotropic, rheoplastic, cement-based, fiber reinforced, shrinkage-compensated, sulfate-resistant structural repair mortar.
- B. This Product is designed for repairing concrete or masonry structures and can be applied by low pressure spraying or hand troweling.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 03100: Concrete

1.3 REFERENCES

- A. ASTM C109-90 (Modified) Test Method for Compressive Strength of Hydraulic Cement Mortars.
- B. ASTM A185-85 Specification for Steel Welded Wire Fabric, Plain for Concrete Reinforcement.
- C. ASTM C348-91 Test Method for Flexural Strength of Hydraulic Cement Mortars.
- D. ASTM C469-87 Test Method for Static Modulus of Elasticity and Polsson's Ration of Concrete in Compression.
- E. ASTM C596 (Modified) Test Method for Drying Shrinkage of Mortar Containing Portland Cement.
- F. ASTM C666-91 Test Method for Resistance of Concrete to Rapid Freezing and Thawing.

- | | | |
|----|--------------------------|---|
| G. | ASTM C806-87 | Test Method for Restrained Expansion of Expansive Cement Mortar. |
| H. | ASTM C882-87 (Modified) | Test Method for Bond Strength of Epoxy Resin Systems Used with Concrete. |
| I. | ASTM C1012-89 (Modified) | Test Method for Length of Change of Hydraulic Cement Mortars Exposed to a Sulfate Solution. |
| J. | ASTM C1201-91 | Electrical Indication of Resistance to Chloride Ion Penetration. |

1.4 SUBMITTALS

Submittals are to be in accordance with Section 01300.

PART 2 MATERIALS

2.1 REPAIR MORTAR

- A. Repair mortar shall be Emaco S88 CI, by Master Builders Technologies (MBT) Protection and Repair, a brand of BASF Construction Chemicals, LLC-Building Systems, Shakopee, MN (previously Master Builders, Inc.) - a blend of Portland cement, silica fume, specially graded aggregates, synthetic fibers, and set-control admixtures including shrinkage compensation additives; or approved equal.
- B. System Performance Requirements: Provide a repair mortar that when cured produces the following properties:
1. Compressive Strength (ASTM C109):
 - a. Minimum – 1-day, 4500 psi (31.0 MPa); 28-day, 11,000 psi (69 MPa).
 2. Flexural Strength (ASTM C348):
 - a. Minimum - 1-day, 650 psi (4.5 MPa); 28-day, 1300 psi (9.0 Mpa).
 3. Slant Shear Bond Strength (ASTM C 882-Modified):
 - a. Minimum - 1-day, 1400 psi, (9.7 MPa); 28-day, 3000 psi (20.7 MPa).
 4. Permeability AST C 1202):
 - a. 500 Coulombs, maximum.
 5. Drying Shrinkage (ASTM C590-Modified):
 - a. Maximum - 0.1 percent shrinkage at 28 days.

6. Freeze-Thaw Resistance (ASTM C 666-300 cycles):
 - a. Minimum – RDF, 85 percent.
7. Sulfate Resistance (ASTM C 1012-15 weeks):
 - a. 0.09 expansion (maximum difference between control bars in water and test bars).
8. Module of Elasticity (ASTM C 469):
 - a. 3.5 psi, minimum; 4.0 psi, maximum, at 28 days.

2.2 CORROSION INHIBITING ADMIXTURE

Corrosion inhibiting admixture shall be MCI-2000, a migratory corrosion inhibiting admixture for concrete that protects rebar in concrete, by Cortec Corporation, St. Paul, MN; or approved equal.

2.3 WATER

Water used to mix materials shall be clean, clear and potable, free of oil, soluble salts, chemicals, and other deleterious substances.

2.4 CURING COMPOUND

Curing compound shall be Kure-N-Seal W, by Sonneborn, a brand of BASF Construction Chemicals, LLC-Building Systems, Shakopee, MN (previously Masterkure, Masterkure 100W or 200W, by Master Builders, Inc.); or approved equal.

2.5 EVAPORATION REDUCER AND FINISHING AID

Evaporation reducer and finishing aid shall be Confilm, by Master Builders Technologies (MBT) Protection and Repair, a brand of BASF Construction Chemicals, LLC-Building Systems, Shakopee, MN; or approved equal.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

- A. Mechanically remove unsound concrete as directed by the Engineer.
- B. Remove a minimum of 1/4-inch (6mm) of existing concrete facing and continue removal as required to expose sound aggregate. Substrate should have a minimum amplitude of 1/4-inch (6mm). Limit the size of shipping hammers to 15 lbs to reduce micro fractures.

- C. Saw-cut perimeter of the area to be repaired to a minimum depth of 1/4-inch (6mm). Do not cut existing steel reinforcement.
- D. Where reinforcing steel with active corrosion is encountered, comply with the following:
 - 1. Abrasive blast reinforcing steel to remove rust, scale and contaminants to achieve a white metal finish.
 - 2. If half of the diameter of the reinforcing steel is exposed, chip out behind the reinforcing to a 3/4-inch (19 mm) minimum depth.
- E. Thoroughly clean the roughened surface and exposed reinforcement of rust, dirt, loose chips, and dust using high-pressure water. Maintain substrate in a saturated, surface dry condition.
- F. Coat exposed reinforcing steel with corrosion resistant rebar coating prior to patching, per Section 03731.

3.2 PROJECT CONDITIONS

- A. Weather Conditions: Apply repair mortar only when ambient and surface temperatures are 50 degrees F (10 degrees C) and rising. Do not make the repair if the ambient temperature is expected to fall below 40 degrees F (5 degrees C) within 24 hours after placement. Do not apply repair mortar when ambient and surface temperatures are 100 degrees F (39 degrees C) and above.
- B. Follow manufacturer's recommendations regarding additional installation information (hot weather or cold weather installation).

3.3 MIXING

- A. Comply with mortar manufacturer's recommendations for water quantity and mixing procedures.
- B. Comply with admixture manufacturer's dosage recommendations.

3.4 APPLICATION

- A. Maintain substrate in a saturated, surface-dry condition.
- B. For hand applications, a bond scrub coat is required.
- C. Apply repair mortar by low pressure wet spraying over hand troweling on vertical surfaces in depths ranging from 3/8-inch (10 mm) to 2 inches (51 mm).

1. Vertical Applications: Repair mortar can be applied on vertical applications up to a 2 inches (51 mm) depth in one lift.
2. Multiple Passes: Place succeeding lifts after repair mortar has developed initial set. Scarify the surface of the first lift to ensure integral bond between successive layers.

3.5 FINISHING

- A. Level surface of repair mortar using a float or screed.
- B. Apply final finish when mortar has begun to stiffen using a wooden, plastic, or synthetic sponge float or trowel.
- C. Spray apply undiluted "Confilm" evaporation reducer lightly to aid in finishing, especially in windy, hot conditions.

3.6 CURING

Protect fresh mortar from premature evaporation. Cure finished repair mortar by one of the following methods:

- A. Preferred Method: Keep area continuously moist with water as mortar surface has hardened (thumb print hard) for a minimum of seven days.
- B. Acceptable Method: Apply two coats of curing compound, Master Builders "MasterKure", or "Masterkure 100 W or 200 W". Apply the first coat immediately after completing finishing operations. Apply the second coat about 24 hours later.

END OF SECTION

SECTION 05120

STRUCTURAL STEEL

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of furnishing, fabricating, and erecting of Structural Steel, as defined in AISC 303 Code of Standard Practice for Steel Buildings and Bridges, latest edition.

Except as otherwise provided herein, the design, fabrication and erection shall be in accordance with the applicable provisions of the AISC 360 "Specification for Structural Steel Buildings", latest edition.

1.2 RELATED SECTIONS

- A. Section 01300 - Submittals
- B. Section 01640 - Product Handling
- C. Section 05500 - Metal Fabrications
- D. Section 05530 - Gratings, Stair Treads & Floor Plates
- E. Section 09900 - Painting

1.3 GOVERNING CODES AND STANDARDS

Furnishing and installing structural steel shall conform to the following:

- A. 2019 California Building Code (CBC).
- B. AISC - Steel Construction Manual, 14th edition.
- C. AISC 303-16 - Code of Standard Practices for Steel Buildings and Bridges.
- D. AISC 360-16 - Specification for Structural Steel for Buildings.

- E. ASTM - Applicable Standards
- F. AWS D1.1 - Structural Welding Code Standard

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- B. Qualify welding processes and welding operators in accordance with AWS “Standard Qualification Procedures.”

1.5 SUBMITTALS

- A. Comply with pertinent provisions of Section 01300.
- B. Product data to be submitted:
 - 1. Producers' or manufacturers' specifications and installation recommendations for the following products, including laboratory test reports and other data required to prove compliance with the specified requirements.
 - a. Structural steel, including certified copies of mill test reports covering chemical and physical properties;
 - b. High strength bolts, including nuts and washers;
 - c. Finished bolts and nuts;
 - d. Structural steel primer paint.
 - 2. Shop Drawings including complete details and schedules for fabrication, shop assembly of members, erection procedure, including sequence of erection and temporary staying and bracing.
 - a. Include details of cuts, connections, camber, holes, and other pertinent data;
 - b. Indicate welds, both shop and field, by AWS symbols, and show size, type, and length of weld;
 - c. Provide setting drawings, templates, and directions for installing anchor bolts and other required anchors;
 - d. Identify details by reference to sheet and detail number of the Drawings.

1.6 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01640.
- B. Delivery and Storage:
 - 1. Deliver materials to the job site properly marked to identify the location for which they are intended.
 - 2. Use markings corresponding to markings shown on the approved Shop Drawings.
 - 3. Store in a manner to maintain identification and to prevent damage.

PART 2 MATERIALS

2.1 MATERIALS

- A. Rolled shapes, steel plates and bars:
 - 1. Rolled W, WT shapes: Comply with ASTM A992, Grade 50
 - 2. Miscellaneous Steel: Comply with ASTM A36
- B. Steel Joists: Conform to SJI and AISI "Standard Specifications for Steel Joists J Series and H Series"
- C. Steel Pipe: Comply with ASTM A53, Standard Weight (Schedule 40), type E or S, grade B and, where applicable, API-5L, grade B.
- D. Square and Rectangular Steel tube: Comply with ASTM A500, Grade B.
- E. Anchor bolts: Comply with ASTM A307, non-headed type with heavy hexagonal nuts unless otherwise indicated.
- F. Finished threaded fasteners:
 - 1. Comply with ASTM A307, grade A, regular low carbon steel bolts and nuts.
 - 2. Provide either hexagonal or square heads and nuts; except use only hexagonal units for exposed connections. Exposed assemblies shall be zinc phosphate coated.
- G. High strength threaded fasteners: Provide heavy hexagonal structural bolts, heavy hexagonal nuts, and hardened washers, all from quenched and tempered medium carbon steel complying with ASTM A325, zinc phosphate coating.
- H. Stainless steel fasteners: For wet or submerged service, all bolts, nuts, and flat washers, Type 316 stainless steel, ASTM F593 and F594, Group 2.

- I. Wedge Anchors (WA): Type 303 or 304 stainless steel ITW Redhead Trubolt Wedge or Hilti Kwikbolt-TZ or equal and meeting 2019 CBC cracked section requirements.
- J. Expansion Anchors (EA): Similar to wedge anchors.
- K. Adhesive Anchors: Type 303 or 304 stainless steel with Hilti RE 500-V3 system, Simpson SET-XP, or equal and meeting 2019 CBC cracked section requirements.
- L. Stud Anchors: Shall be H4L mild steel concrete anchors, as manufactured by TRW Inc., Nelson Division, Lorain, Ohio 44055, or equal. Stud anchors shall be of a design suitable for arc welding to steel with automatically timed stud welding equipment.
- M. Filler Metal for Welding:
 - 1. ASTM A36 and ASTM A500, Grade B: AWS A5.1 or A5.5 E70XX low hydrogen electrodes for shielded metal arc welding.
 - 2. Stainless Steel Type 316L: ER316L.
- N. Nonshrink Grout: As specified in Section 03100.
- O. Primer: As specified in Section 09900.
- P. All stainless-steel parts, after its fabrication, shall undergo a passivation (pickling) process to ensure maximum resistance to corrosion. All stainless-steel components and structures shall be submersed in a chemical bath of nitric acid and hydrofluoric acid to remove any residues that may be present on the material as a result of forming, manufacture, or handling. After removal from the pickling bath, the equipment must be washed with a high-pressure wash of cold water to remove any remaining surface debris and promote the formation of an oxidized passive layer which is critical to the long life of the stainless steel. Submergence insures complete coverage. Spray on chemical treatments and glass bead blasting are specifically not acceptable due to their inability to provide complete and uniform corrosion protection. All field welds shall be cleaned and passivated to remove iron (and prevent corrosion) in accordance with ASTM A380.

2.2 FABRICATION

- A. Shop Fabrication and Assembly:
 - 1. Fabricate items of structural steel in accordance with AISC specifications, and as indicated on the approved Shop Drawings. Structural material shall be fabricated and assembled in the shop to the greatest extent possible.
 - 2. Properly mark and match-mark materials for field assembly and for identification as to location for which intended.

3. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
 4. Where finishing is required, complete the assembly, including welding of units, before start of finishing operations.
 5. Provide finish surfaces of members exposed in the final structure free from markings, burrs, and other defects.
- B. Bolted Connections:
1. Provide bolts and washers of types and sizes required for completion of field erection.
 2. High strength bolted construction:
 - a. Install high strength threaded fasteners in accordance with AISC "Specifications for Structural Joints Using ASTM A325 or A490 Bolts."
 - b. Use A325F bolts unless noted otherwise.
- C. Holes for Other Work:
1. Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on the approved Shop Drawings.
 2. Provide threaded nuts welded to framing, and other specialty items as shown, to receive other work.
 3. Cut, drill, or punch holes perpendicular to metal surfaces.
 4. Do not flame cut holes or enlarge holes by burning.
 5. Drill holes in bearing plates.

2.3 WELDING

- A. General: Members of structural steel and metalwork which are to be joined by welding shall be cut accurately to size, and where required, shall be rolled or pressed to the proper curvature in accordance with dimensions shown on the drawings. The edges of these members shall be sheared, flame-cut or machined to suit the required type of welding and to allow thorough penetration. The cut surface shall expose sound metal free from laminations, surface defects caused by shearing or flame-cutting operations, or other injurious defects.

The surface of plates to be welded shall be free from rust, grease, and other foreign matter for a distance of at least one-half inch back from the edge of the weld. All welding shall be performed by the electric-arc method, by a process which will exclude the atmosphere from the molten metal. Shop welding shall be performed where practicable, under procedure control using automatic machines. Particular care shall be taken in aligning and separating

the edges of members to be jointed by butt welding, so that complete penetration and fusion at the bottom of the joint will be assured. Where fillet welds are used, the members shall fit closely and shall be held together during welding.

- B. Codes: All welding shall be in conformance with AWS D1.1, latest edition, and the steel fabricator's specific recommendations.
- C. Workmanship and Visual Quality Requirements: In addition to conformance with the procedural and quality requirements set forth in the applicable code and/or the Contract, all manual welding shall meet the following requirements for workmanship and visual quality.
 - 1. Each weld shall be uniform in width and size throughout its full length and each layer of welding shall be smooth, free of slag, cracks, pinholes and undercut, and shall be completely fused to the adjacent weld bead and base metal. In addition, the cover pass shall be free of coarse ripples, irregular surfaces, non-uniform bead pattern, high crown, deep ridges or valleys between beads, and shall blend smoothly and gradually into the surface of the base metal.
 - 2. Butt welds shall be slightly convex, of uniform height, and shall have full penetration.
 - 3. Fillet welds shall be of specified size, with full throat and with legs of equal length.
 - 4. Repair, chipping or grinding of welds shall be done in such a manner as not to gouge, groove, or reduce the base metal thickness.
- D. Qualification of Welders and Welding Operators: All welders and welding operators assigned to the work shall have passed the qualification test for welding operators as specified in AWS D1.1. If, in the opinion of the Engineer, the work of any welder appears questionable, such welder will be required to pass additional qualification tests to determine his ability to perform the type of work on which he is engaged. Such additional qualification test for welders and the physical tests of the welded specimens shall be made in the presence of the Engineer. The test plates shall be of the same material as that to be used in the work. The welding electrodes shall be of the same size, type and brand as those to be used in the work. If required, the Contractor shall furnish to the Engineer a certified copy of reports of the results of physical tests of specimens welded in the qualification tests. All expense in connection with making the qualification tests for welders and welding operators shall be borne by the Contractor.

2.4 SHOP PAINTING

- A. General:
 - 1. Shop paint structural steel work, except those members or portions of members to be embedded in concrete or mortar.
 - 2. Paint embedded steel, which is partially exposed, on the exposed portions, and the initial 2" of embedded areas only.

3. Do not paint surfaces which are to be welded or high-strength bolted with friction type connections.
 4. Apply two coats of paint to surfaces which are inaccessible after assembly or erection. Change color of the second coat to distinguish it from the first.
- B. Surface Preparation:
1. After inspection and before shipping, clean steelwork to be painted.
 2. Remove loose rust, loose mill scale, and spatter, slag, and flux deposits.
 3. Prepare the steel surface in accordance with the requirements of Section 09900. If not specified, clean steel in accordance with Steel Structures Painting Council (SSPC) SP-3, "Power Tool Cleaning."
- C. Painting:
1. Immediately after surface preparation, apply structural steel primer paint in accordance with the manufacturer's recommendations and at a rate to provide a uniform dry film thickness.
 2. Use painting methods which will result in full coverage of joints, corners, edges, and exposed surfaces.
 3. The Contractor shall be responsible for providing the required coating system per Section 09900. The Contractor shall remove shop coatings not in conformance with Section 09900. Additionally, the Contractor shall prepare any shop applied coating, which, while meeting the requirements of Section 09900, requires additional surface preparation in order to obtain a mechanical bond between coatings.
- D. All stainless-steel parts, after its fabrication, shall undergo a passivation (pickling) process to ensure maximum resistance to corrosion. All stainless-steel components and structures shall be submersed in a chemical bath of nitric acid and hydrofluoric acid to remove any residues that may be present on the material as a result of forming, manufacture, or handling. After removal from the pickling bath, the equipment must be washed with a high-pressure wash of cold water to remove any remaining surface debris and promote the formation of an oxidized passive layer which is critical to the long life of the stainless steel. Submergence insures complete coverage. Spray on chemical treatments and glass bead blasting are specifically not acceptable due to their inability to provide complete and uniform corrosion protection. All field welds shall be cleaned and passivated to remove iron (and prevent corrosion) in accordance with ASTM A380.

2.5 GALVANIZING

- A. Structural steel to be galvanized after fabrication is shown on the drawings.
- B. Structural steel to be galvanized after fabrication shall be hot-dip processed in accordance with ASTM A123, A152, A386, and A525.

- C. For repair of galvanizing, use a high zinc-dust content paint complying with MIL-P-21035.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 ERECTION

- A. Comply with AISC specifications and "Code of Standard Practice," except as may be modified herein.
- B. Anchor Bolts:
 - 1. Provide anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.
 - 2. Provide templates and other devices necessary for presetting bolts and anchors to accurate locations.
- C. Stud Welding: Stud anchors shall be automatically end welded with suitable stud welding equipment in the shop on spacings as shown. All welds shall be made in accordance with Section 4, Part F of the AWS D1.1 Structural Welding Code and with the stud anchor manufacturer.
- D. Bases and Bearing Plates: Shop weld to columns and members attached to concrete.
- E. Splicing:
 - 1. Splice members only where indicated unless, with the Engineer's approval, splices not indicated would result in lower costs due to reduced shipping expense.
 - 2. For splices not indicated, submit structural calculations prepared and stamped by a civil or structural engineer licensed to practice in California.
- F. Gas Cutting:
 - 1. Do not use gas cutting torches for correcting fabricating errors in the structural framing.
 - 2. Cutting will be permitted only in secondary members as acceptable to the Engineer.

3. When gas cutting is permitted, finish the gas cut section to a sheared appearance acceptable to the Engineer.

G. Surveys:

1. Establish permanent benchmarks necessary for accurate erection of structural steel.
2. Check elevations of concrete surfaces, and locations of anchor bolts and similar items, before erection proceeds.

H. Temporary Shoring and Bracing:

1. Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads.
2. Provide temporary guy lines to achieve proper alignments of the structure as erection proceeds.
3. Remove temporary connections and members when permanent members are in place and the final connections have been made.

I. Setting Bases and Bearing Plates:

1. Clean concrete bearing surfaces free from bond-reducing materials, and then roughen to improve bond to the surface.
2. Clean the bottom surface of base and bearing plates.
3. Set loose and attached base plates and bearing plates for structural members in wedges or other adjusting devices.
4. Tighten anchor bolts after the supported members have been positioned and plumbed.
5. Do not remove wedges or shims but, if protruding, cut off flush with the edge of the base or bearing plate prior to packing with grout.
6. Pack grout solidly between bearing surfaces and bases or plates to assure that no voids remain.
7. Finish exposed surfaces, protect installed materials, and allow to cure in strict compliance with the manufacturers' recommendations as approved by the Engineer.
8. Refer to Section 05500 3.3.A.6 for steel plates in contact with dissimilar materials.

J. Field Assembly:

1. Set structural frames accurately to the lines and elevations indicated.
2. Align and adjust members forming part of a complete frame or structure before fastening permanently.
3. Clean the bearing surface, and other surfaces which will be in permanent contact, before assembly.

4. Adjust as required to compensate for discrepancies in elevation and alignment.
5. Level and plumb individual members of the structure within specified AISC tolerances.
6. Establish required leveling and plumbing measurements on the mean operating temperature of the structure, making allowances for the difference between temperature at time of erection and the mean temperature at which the structure will be when completed and in service.
7. Comply with AISC specifications for bearing, adequacy of temporary connections, alignment, and the removal of paint on surfaces adjacent to welds.

3.3 TESTING AND INSPECTING

A. Testing:

1. The Owner's selected testing laboratory will pick up specimens and make required tests.
2. Cost of procuring test specimens at locations more than 50 miles from the job site will be paid by the Owner and backcharged to the Contractor.
3. Costs of tests of identified stock will be paid by the Owner; except that if a test fails to comply with the specified requirements, the cost of testing will be paid by the Owner and backcharged to the Contractor.
4. Costs of tests of unidentified stock will be paid by the Owner and backcharged to the Contractor.

B. Test Specimens:

1. Test specimens shall be furnished by the steel fabricator, and shall be taken under the direction of the Owner's selected testing laboratory.
2. Each specimen shall be machined by the Owner's selected testing laboratory to dimensions required by ASTM A370.
3. Cost of procuring, making, and machining test specimens shall be considered test costs as defined above.

C. Identification and Tests:

1. If structural steel can be identified by heat or melt numbers, and if accompanied by mill analysis and test reports, not less than one tension and one bend test will be made for each ten tons or fractional part thereof.
2. If structural steel cannot be identified, or if its source is questionable, not less than one tension test and one bend test will be made for each five tons or fractional part thereof.

3. If steel pipe can be identified by heat or melt numbers, or manufacturer's name, not less than one tension test and one bend test will be made for each ten tons or fractional part thereof.
4. Additional tests may be required when deemed necessary by the Engineer.

D. Inspecting:

1. A complete four sided inspection of steel will be made when required by the Engineer.
2. Cost of inspecting will be paid by the Owner subject to the same provisions made above for tests.
3. If, after fabrication and inspection, the work of this section is found to be defective and to require reinspection, cost of such reinspection will be paid by the Owner and backcharged to the Contractor.
4. Provide labor, equipment, and facilities needed to move and handle the materials to be inspected.

E. Welding Inspection:

1. Unless otherwise specified, perform welding under observation of a qualified inspector from a testing laboratory approved by the Engineer.
2. Inspect every layer of weld for quality, penetration, and conformity with design requirements.
3. Require the welding inspector to submit a signed report to the Engineer, verifying that:
 - a. The welding is adequate and was performed in conformity with the specified requirements.
 - b. Adequate methods have been used to determine the quality of the welding.
4. The welding inspector may use gamma ray, magnaflux, trepanning, or any other aid to visual inspection considered necessary to assure adequacy of welding, or may use ultrasonic testing performed in accordance with pertinent requirements of governmental agencies having jurisdiction.
5. Cost of welding inspection will be paid by the Owner.

F. Access: Provide access for the testing agencies and inspectors to places where structural steel work is being fabricated or produced, so that required testing and inspecting may be accomplished.

G. Erection Inspecting:

1. The Owner will test and inspect high strength bolted connections, will visually inspect field welded connections, will perform such additional tests and inspections

of field work as required by the Engineer, and will prepare test reports for the Engineer's review.

2. The testing Owner will conduct and interpret the tests, and will state in each report whether the inspected work complies with the requirements, specifically stating all deviations there from.

H. Corrections:

1. Correct deficiencies in structural steel work which inspections and test reports indicate to be not in compliance with the specified requirements.
2. Perform additional tests required to reconfirm noncompliance of the original work and to show compliance of corrected work, all at no additional cost to the Owner.

3.4 FIELD PAINTING

A. General:

1. Prepare surfaces in compliance with Section 09900, Painting, and in a manner appropriate to the condition, and as approved by the Engineer.
2. Clean surfaces where primer coats have been removed, damaged, or burned off, and clean field bolts and other field connections not concealed in the finished work.
3. Remove dirt, oil, and grease, and prepare surface in accordance with the requirements of Section 09900.
4. Apply a spot coat of the approved primer coat in accordance with Section 09900.
5. Do not apply paint to wet, damp, oily, or improperly prepared surfaces.

B. Notify the Engineer when the work of this section is ready to receive field painting.

1. Secure inspection and approval by the Engineer prior to field painting.
2. Using spray or brush, as recommended by the manufacturer of the approved paint material, fill all joints and corners and cover the surfaces to be protected with a smooth unbroken film of at least 1.5 dry mils thickness.

3.5 FIELD TOUCH-UP OF GALVANIZED SURFACES

- A. After installation, clean damaged surfaces of galvanized metals and touch-up with zinc dust-zinc oxide coating conforming to Military Specification MIL-P-211035.
- B. Field work shall not be permitted on galvanized items.

END OF SECTION

SECTION 05140

STRUCTURAL ALUMINUM

PART 1 GENERAL

1.1 SUMMARY

Section includes structural aluminum products, including sheet, pipe, extrusions, and associated accessories.

1.2 RELATED SECTIONS

- A. Section 01300 - Submittals
- B. Section 05120 - Structural Steel
- C. Section 05500 - Metal Fabrications
- D. Section 09900 - Painting

1.3 REFERENCES

- A. 2019 California Building Code (CBC).
- B. American Society for Testing and Materials (ASTM):
 - 1. B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 2. B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
 - 3. B308/B308M - Standard Specification for Aluminum-Alloy 6061 -T6 Standard Structural Shapes.
- C. American Welding Society (AWS):
 - 1. A 5.10 - Specification for Bare Aluminum and Aluminum-Alloy Welding Electrodes and Rods.

2. D 1.2 - Structural Welding Code - Aluminum.

- D. "Aluminum Structures - A Guide to Their Specifications and Design" by Aluminum Association, Inc.

1.4 SUBMITTALS

Quality Control Submittals:

A. Design Data:

1. Test Reports: Certified copies of mill tests or reports from a recognized commercial laboratory including chemical and tensile properties of each shipment of structural metal or part thereof having common properties. Tests and analyses shall be made in accordance with applicable ASTM Standards.

1.5 QUALITY ASSURANCE

Qualifications:

- A. Perform welding of structural metals with welders who have current American Welding Society certificate for the type of welding to be performed.
- B. Notify Engineer 24 hours minimum before starting shop or field welding.
- C. Engineer may check materials, equipment, and qualifications of welders.
- D. Remove welders performing unsatisfactory work, or require to requalify.
- E. Engineer may use gamma ray, magnetic particle dye penetrant, or other aids to visual inspection to examine any part of welds or all welds.
- F. Contactor shall bear costs of retests on defective welds.
- G. Contractor shall also bear costs in connection with qualifying welders.

PART 2 MATERIALS

2.1 MATERIALS

- A. Structural Sheet Aluminum: ASTM B209, Alloy 6061-T6.

- B. Structural Aluminum: ASTM B308, Alloy 6061-T6.
- C. Extruded Aluminum: ASTM B221, Alloy 6063-T42.
- D. Miscellaneous Materials:
 - 1. Furnish supplementary parts necessary to complete each item even where such work is neither definitely indicated on the Drawings nor specified.
 - 2. Size, form, attachment, and location shall conform to the best of current practice.
 - 3. Conform to applicable ASTM Standards for materials not otherwise specified.

2.2 FABRICATION

- A. Aluminum Layout:
 - 1. Center punch hole centers, and punch or scribe cutoff lines, except where marks would remain on fabricated material.
 - 2. Apply temperature correction where necessary in layout of critical dimensions. Use a coefficient of expansion of 0.000013 per degree of Fahrenheit.
- B. Cutting Aluminum:
 - 1. Material 2 Inch Thick or Less: Shear, saw, or cut with a router.
 - 2. Material More than 2 Inch Thick: Saw or rout.
 - 3. Make cut edges true and smooth, free from excessive burrs or ragged breaks.
 - 4. Avoid reentrant cuts wherever possible. Where used, fillet by drilling prior to cutting.
 - 5. Do not flame cut aluminum alloys.
 - 6. Punch or drill rivet or bolt holes to finished size before assembly.
 - a. Make finished diameter of holes for bolts 1/16 inch maximum larger than nominal bolt diameter.
 - b. Make holes cylindrical and perpendicular to principal surface.
 - c. Do not permit holes to drift in a manner to distort metal.
- C. Aluminum Forming and Assembly:
 - 1. Do Not Heat Structural Aluminum, Except as Follows:
 - a. Heat aluminum to 400 degrees Fahrenheit for 30 minutes maximum, to facilitate bending or welding.

- b. Heat only when proper temperature controls and supervision can ensure that limitations on temperature and time are observed.
- c. Before assembly, remove chips lodged between contacting surfaces.

D. Welding Aluminum:

- 1. Perform welding of aluminum in accordance with AWS D1.2, "Structural Welding Code - Aluminum."
- 2. Weld Aluminum in Accordance with the following:
 - a. Preparation:
 - 1) Remove dirt, grease, forming or machining lubricants, and organic materials from areas to be welded by cleaning with a suitable solvent or by vapor degreasing.
 - 2) Additionally, etch or scratch brush to remove oxide coating just prior to welding when inert gas tungsten arc welding method is used.
 - 3) Oxide coating may not need to be removed if welding is performed by automatic or semi-automatic inert gas shielded metal arc.
 - 4) Suitably prepare edges to assure 100 percent penetration in butt welds by sawing, chipping, machining, or shearing. Do not cut with oxygen.
 - b. Filler Metal: Aluminum alloys conforming to the requirements of AWS A5.10 and AWS classification ER 4043, ER 5654, ER 5554, ER 5183, ER 5356, or ER 5556.
 - c. Perform welding of structures which are to be anodized using filler alloys which will not discolor when anodized, AWS ER 5654, ER 5554, ER 5183, ER 5356, or ER 5556.
 - d. Perform welding by using a nonconsumable tungsten electrode with filler metal in an inert gas atmosphere (TIG) or using a consumable filler metal electrode in an inert gas atmosphere (MIG).
 - e. Do not use welding process that requires use of a welding flux.
 - f. Neatly make welded closures.
 - g. Where weld material interferes with fit or is unsightly in appearance, grind it smooth.
 - h. Make welds full penetration welds unless otherwise indicated on the Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

Verification of Conditions: Examine Work in place to verify that it is satisfactory to receive the Work of this Section. If unsatisfactory conditions exist, do not begin this Work until such conditions have been corrected.

3.2 INSTALLATION

- A. Install structural aluminum products as indicated on the Drawings and specified.
- B. Install structural aluminum products accurately and securely, true to level, plumb, in correct alignment and grade, with all parts bearing or fitting structure or equipment for which intended.
- C. Do not cock out of alignment, redrill, reshape, or force fit fabricated items.
- D. Place anchor bolts or other anchoring devices accurately and make surfaces which bear against structural items smooth and true to level.
- E. Rigidly support and brace structural products needing special alignment to preserve straight, level, even, smooth lines, and keep braced until concrete, grout, or dry pack mortar has hardened for a minimum 48 hour period.
- F. Interface with Other Products:
 - 1. Where aluminum comes in contact with dissimilar metals bolt it with stainless steel bolts and separate or isolate it from dissimilar metals as specified in Section 05500 3.3.
 - 2. Coat those parts of aluminum which will be cast into concrete with bituminous paint.

END OF SECTION

SECTION 05500

METAL FABRICATIONS

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of providing miscellaneous metal work shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

1.2 RELATED SECTIONS

- A. Section 01300 - Submittals
- B. Section 05120 -Structural Steel
- C. Section 05140 – Structural Aluminum
- D. Section 09900 - Painting

1.3 GOVERNING COVER AND STANDARDS

- A. 2019 California Building Code (CBC)
- B. AA - The Aluminum Association “Specifications and Guidelines for Aluminum Structures”

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- B. Perform shop and/or field welding required in connection with the work of this section in strict accordance with pertinent recommendations of the American Welding Society.

1.5 SUBMITTALS

- A. In accordance with Section 01300.
- B. Product data to be submitted:
 - 1. Materials list of items proposed to be provided under this Section;
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
 - 3. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades;
 - 4. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the work.

PART 2 MATERIALS

2.1 MATERIALS

- A. In fabricating items which will be exposed to view, limit materials to those which are free from surface blemishes, pitting, rolled trade names, and roughness.
- B. Unless noted otherwise, comply with the following standards, as pertinent.
 - 1. Steel plates, shapes, and bars: ASTM A36.
 - 2. Rolled W and WT shapes: ASTM A992, Grade 50.
 - 3. Steel plates to be bent or cold-formed: ASTM A283, grade C.
 - 4. Steel tubing (hot-formed, welded, or seamless): ASTM A501.
 - 5. Steel bars and bar-size shapes: ASTM A306, grade 65, or ASTM A36.
 - 6. Cold-finished steel bars: ASTM A108.
 - 7. Cold-rolled carbon steel sheets: ASTM A336.
 - 8. Galvanized carbon steel sheets: ASTM A526, with G90 zinc coating in accordance with ASTM A525.
 - 9. Stainless steel bars, plates, structural shapes, ASTM A276, Type 304.
 - 10. Stainless steel sheets: AISI type 302 or 304, 24 gauge, with Number 4 finish.
 - 11. Aluminum plates, shapes, and bars, 6061-T6 or 6063-T6 alloy, mill finish unless otherwise specified.

12. Grey iron castings: ASTM A48, Class 40.
13. Malleable iron castings: ASTM A47.
14. Steel pipe: ASTM A120, schedule 40, black finish unless otherwise noted.
15. Concrete inserts:
 - a. Threaded or wedge type galvanized ferrous castings of malleable iron complying with ASTM A27.
 - b. Provide required bolts, shims, and washers, hot-dip galvanized in accordance with ASTM A153.

2.2 FABRICATION

- A. Except as otherwise shown on the Drawings or the approved Shop Drawings, use materials of size, thickness, and type in accordance with this Section.
- B. Fabricate with accurate angles and surfaces which are true to the required lines and levels, grinding exposed welds smooth and flush, forming exposed connections with hairline joints, and using concealed fasteners wherever possible.
- C. Prior to shop painting or priming, properly clean metal surfaces as required for the applied finish and for the proposed use of the item.
- D. On surfaces inaccessible after assembly or erection, apply two coats of the specified primer. Change color of second coat to distinguish it from the first.
- E. Properly mark and match-mark materials for field assembly and for identification as to location for which intended.
- F. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
- G. Where finishing is required, complete the assembly, including welding of units, before start of finishing operations.
- H. Provide finish surfaces of members exposed in the final structure free from markings, burrs, and other defects.

2.3 CASTINGS

- A. All castings shall be sound and free from shrinkage crack, blow holes, and other defects. All fins and burnt sand must be removed. Excessive porosity and spongy surfaces will

constitute causes for rejection. The Engineer shall be final judge as to whether the defects present are sufficient to cause rejection.

- B. No welding or patching of defects in castings will be permitted unless authorized by the Engineer. Any such welding or patching done without the Engineer's consent shall be cause for rejection.
- C. All castings shall be true to form and dimensions shown on the Drawings. After inspection and prior to shipping, all machined surfaces shall be coated with a blue rust inhibitive lacquer, or other approved material which can be easily removed, unless otherwise specified.
- D. The dimensions of the finished castings shall not be less than the specified dimensions. Castings shall not be more than seven and one-half (7-1/2) percent overweight. Large castings shall be suspended and hammered over their entire area. No cracks, flaws, or other defects shall appear after such hammering.
- E. Castings shall be provided with adequate continuous fillets cast in place in all re-entrant angles. The radius of curvature of the exposed surface of a fillet shall define the size of the fillet. The size of fillets shall not be less than one-half (1/2) of the thickness of the thinnest adjoining member nor less than one-half (1/2) inch.
- F. Iron castings shall be dipped or painted with asphalt which will form a tough, tenacious, non-scaling coating which does not have a tendency to become brittle when cold or sticky when hot.
- G. The covers and seats shall be machined so that the cover sits evenly and firmly in the frame.

2.4 CONNECTIONS

- A. Provide bolts and washers of types and sizes required for completion of field erection.
- B. Welded Construction: Comply with AWS Code for procedures, appearance, and quality of welds, and methods used in correcting welded work.
- C. Assemble and weld built-up sections by methods which will produce true alignment of axes without warp.

2.5 FASTENERS

- A. General:

1. For exterior use and where built into exterior walls, provide zinc-coated fasteners, for damp locations provide stainless steel fasteners.
 2. Provide fasteners of type, grade, and class required for the particular use.
- B. Comply with the following standards as pertinent:
1. Bolts and Nuts: Provide hexagon-head regular type complying with ASTM A307, Grade A (Steel); ASTM A320 and A194, Grade B8 (Stainless Steel).
 2. Lag bolts: Provide square-head type complying with Fed. Spec. FF-B-561.
 3. Machine Screws: Provide cadmium plated steel type complying with Fed. Spec. FF-S-111; except use stainless steel for damp locations or with aluminum.
 4. Washers:
 - a. Plain washers: Comply with Fed Spec FF-W-92, round, carbon steel.
 - b. Lock washers: Comply with Fed. Spec FF-W-84, helical spring type carbon steel.
 5. Toggle bolts: Provide type, class, and style needed but complying with Fed. Spec. FF-B-588.
 6. Anchorage devices: Provide expansion shield complying with Fed Spec FF-S-325.

2.6 HOLES FOR OTHER WORK

- A. Provide holes required for securing other work to metalwork and for passage of other work as shown on the approved Shop Drawings.
- B. Provide threaded nuts welded to framing and other specialty items as shown, to receive other work.
- C. Cut, drill, or punch holes perpendicular to metal surfaces.
- D. Do not flame cut holes or enlarge holes by burning.
- E. Drill holes in bearing plates.

2.7 OTHER MATERIALS

Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

2.8 GALVANIZING

- A. Shall be double hot-dip processed after fabrication, ASTM A123, A153, A386, and A525. Double dip shall be required, if necessary, to achieve required coating weight.
- B. For repair of galvanizing, use galvaloy stick applied as recommended by the manufacturer.

2.9 SHOP PRIMING and FINISHES

- A. General:
 - 1. Shop prime un-galvanized steel work, except those members or portions of members to be embedded in concrete or mortar.
 - 2. Paint embedded steel which is partially exposed on the exposed portions, and the initial 2" of embedded areas only.
- B. Surface Preparation:
 - 1. After inspection and before shipping, clean steelwork to be painted.
 - 2. Remove loose rust, loose mill scale, and spatter, slag, and flux deposits.
 - 3. Prepare steel in accordance Section 09900. If not specified, prepare steel in accordance with Steel Structures Painting Council SP-3, "Power Tool Cleaning."
- C. Primer Painting:
 - 1. Immediately after surface preparation, apply structural steel primer paint in accordance with Section 09900 and the manufacturer's recommendations and at a rate to provide a uniform dry film thickness.
 - 2. Use painting methods which will result in full coverage of joints, corners, edges, and exposed surfaces.
 - 3. The Contractor shall be responsible for providing the required coating system per Section 09900. The Contractor shall remove shop coatings not in conformance with Section 09900. Additionally, the Contractor shall prepare any shop applied coating, which, while meeting the requirements of Section 09900, requires additional surface preparation in order to obtain a mechanical bond between coatings.
- D. All stainless-steel parts, after its fabrication, shall undergo a passivation (pickling) process to ensure maximum resistance to corrosion. All stainless-steel components and structures shall be submersed in a chemical bath of nitric acid and hydrofluoric acid to remove any residues that may be present on the material as a result of forming, manufacture, or handling. After removal from the pickling bath, the equipment must be washed with a high-pressure wash of cold water to remove any remaining surface debris and promote the formation of an oxidized passive layer which is critical to the long life of the stainless steel. Submergence insures complete coverage. Spray on chemical treatments and glass bead blasting are specifically not acceptable due to their inability to provide complete and

uniform corrosion protection. All field welds shall be cleaned and passivated to remove iron (and prevent corrosion) in accordance with ASTM A380.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 COORDINATION

Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.3 INSTALLATION

A. General:

1. Set work accurately into position, plumb, level, true, and free from rack.
2. Anchor firmly into position.
3. Where field welding is required, comply with AWS recommended procedures of manual-shielded metal-arc-welding for appearance and quality of weld and for methods to be used in correcting welding work.
4. Grind exposed welds smooth, and touch-up shop prime coats.
5. Do not cut, weld, or abrade surfaces which have been hot-dip galvanized after fabrication and which are intended for bolted or screwed field connections.
6. Dissimilar Materials: Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of bituminous paint conforming to MIL-C-18480 or to TT-V-51 or a coat of zinc chromate primer conforming to TT-P-645 to prevent galvanic or corrosive action.
7. Materials and parts necessary to complete each item, even though such work is not definitely shown or specified, shall be included. All bolts, anchors, supports, braces, connection and other items necessary for completion of the miscellaneous metalwork shall be provided.

B. Immediately after erection, clean the field welds, bolted connections, and abraded areas of shop priming. Paint the exposed areas with same material used for shop priming.

END OF SECTION

SECTION 05530

GRATINGS, STAIR TREADS, AND FLOOR PLATES

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of furnishing and installing gratings, stair treads and floor plates.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 - Submittals
- B. Section 03100 - Concrete
- C. Section 05120 - Structural Steel
- D. Section 05500 - Metal Fabrications

1.3 QUALITY ASSURANCE

Standards:

- A. AA - Aluminum Association
- B. AISC - American Institute of Steel Construction
- C. ASTM - American Society for Testing and Materials
- D. AWS - American Welding Society
- E. NAAMM - National Association of Architectural Metal Manufacturers

1.4 SUBMITTALS

- A. In accordance with Section 01300.
- B. Submit shop drawings prior to fabrication. Include information necessary for fabrication and erection of component parts and arrangement of gratings, frames, stair treads and floor plates. Indicate size and weight of members, type and location of shop and field connections, type, size and extent of all welds and welding sequence. Use AWS welding symbols. Approval of shop drawings will be for size and arrangement of principal and auxiliary members and strength of connections. Any errors in dimensions and quantities shown will be the responsibility of the Contractor.
- C. Certificate: Furnish manufacturer's certificate that grating materials meet or exceed the requirements of this specification.

1.5 HANDLING AND STORING MATERIALS

Material to be stored shall be placed on skids above the ground. It shall be kept clean and properly drained. To avoid delays, deliver timely all loose items to be built into the concrete.

PART 2 MATERIALS

2.1 ALUMINUM GRATING

- A. Open Mesh Grating (Type A)
 - 1. Swage locked rectangular design (spaced approximately 1-3/16 x 4-inches on center).
 - 2. Main bars to be 3/16-inches thick, depth as indicated in the Schedule in Part 3.02A1 of these Specifications or as indicated on the Drawings. Cross bars shall be secured to the main bars by a swaging process to prevent turning, twisting or coming loose.
 - 3. Banding strips of the same thickness and 1/4 -inch less depth as main bars shall be welded to each main bar at ends of grating sections and at openings.
 - 4. Grating shall be IKG Borden swaged lock type "BS", 31266 Avenue 12, Madera, CA 93639; Seidelhuber No. 19S4, or equal.
- B. Unpunched Plank (Type B)
 - 1. Anti-skid surface, continuous raised longitudinal ridges.
 - 2. Integral I-beam ribs with welded banding strips at ends of grating sections and at openings.
 - 3. Each panel shall be provided with a recessed handle for removal.
 - 4. For grating size, see Schedule in Part 3.02A2 of these Specifications, or as indicated on the Drawings.

5. As manufactured by IKG Borden; Seidelhuber, or equal.

2.2 GALVANIZED STEEL (OPEN MESH) GRATING (TYPE C)

- A. Weldforged rectangular design (spaced approximately 1-3/16 x 4-inches on center).
- B. Main bars to be 3/16-inches thick, depth as indicated in the Schedule in Part 3.02A3 of these Specifications, or as indicated on the Drawings. Cross bars to be twisted square steel and resistance welded at right angles to the main bars. No notching or cutting of bearing bars before welding is permissible.
- C. Banding strips of the same depth and thickness as main bars shall be welded to each main bar at ends of grating sections and at openings.
- D. Grating shall be IKG Borden, weldforged type "WB", 31266 Avenue 12, Madera, CA 94623; Seidelhuber No. 19W4, or equal.

2.3 FIBERGLASS GRATING (TYPE D)

- A. N/A

2.4 STAINLESS STEEL (OPEN MESH) GRATING (TYPE E)

- A. Weld forged rectangular design (spaced approximately 1-3/16 x 4-inches on center).
- B. Main bars to be 3/16-inches thick, depth as indicated in the schedule in Part 3.02.A.3 of these specifications or as indicated on the Drawings.
- C. Banding strips of the same depth and thickness as main bars shall be welded to each main bar at ends of grating sections and at openings.
- D. Grating shall be IKG Borden, weld forged type stainless type 316 "WB", 31266 Avenue 12, Madera, CA 94623 or equal.
- E. Furnish with a clean welded stainless appearance by electropolish, chemical cleaning or beadblast the finished product as needed.

2.5 GRATING FRAMES

Type 304 Stainless Steel or Fiberglass in areas exposed to chemicals and corrosive materials.

- A. Embedded by welding continuous vertical bar same height as grating, to edge of 2-inch horizontal leg of 2-inch x 1½-inch structural angle, thereby providing 1-5/8-inch wide bearing area. Thickness of frame shall be ¼ -inch minimum. Provide welded-on anchors at 18-inch centers, minimum two per side, as detailed on the Drawings. 1½ -inch vertical leg of frame below grating shall have a 5/16-inch diameter hole 24-inches on center for temporary nailing to formwork.
- B. Surface Mounted Frame shall be a 2½ x 2 x ¼ -inch structural angle. Frame shall be attached as shown on the Drawings with a 5/8-inch diameter Type 304 stainless steel bolts at 15-inch centers maximum, minimum two per side.

2.6 STAIR TREADS

- A. Aluminum construction, 0.065-inch thick "I-bar" webs with ¼-inch wide grooved top and bottom flanges. Cross bars shall be secured to main bars by a swaging process to prevent turning, twisting, or coming loose. Main bearing bar size shall be 1½ x 3/16-inch "I-bar" for tread lengths up to 26-inches.
- B. Nosing shall be extruded corrugated aluminum, 1¼-inches wide.
- C. Carrier bar shall be 3 x 3/16-inch aluminum full width of tread with one round and one slotted 7/16 -inch opening for bolts. Bolts shall be 3/8-inch diameter, galvanized steel for dry locations, stainless steel for moist locations.
- D. Irving Borden type "IB" Bar, Seidelhuber type 19SI4, or equal.

2.7 SAFETY NOSING FOR CONCRETE STAIRS

- A. Cast aluminum with cross-hatched and non-slip abrasive surfaces, or IKG Borden MEBAC aluminum nosings.
- B. Cast aluminum exposed wearing surface to contain not less than 2 oz. per square foot of abrasive granules embedded in the top metal surface not less than 1/16" while the matrix is in a molten state. Size of non-slip granules shall range from No. 16 to No. 24.
- C. Nosing shall be 4-inches wide and 5/16-inches thick minimum, with ¼-inch diameter by 1-inch long cast-on bolt anchors. Length shall be as required to terminate not more than 4-inches from each end of treads and as indicated for platforms and landings. Nosing shall be flush with the top of the traffic surfaces.
- D. IKG Borden MEBAC aluminum type C-4E; American Abrasive Metals Co. "Alumalun" Style A; Wooster Products Inc. "Alumogrit" Type 101, or equal.

2.8 CHECKER PLATES

- A. Aluminum diamond tread, 6061-T4 or T6 alloy. Raised pattern on one-inch centers.
- B. Galvanized steel angle frame as detailed on Drawings.
- C. Checker plates as manufactured by Ryerson, Emeryville, CA 94608; Aluminum Co. of America, Pittsburgh, PA 15219, or equal.

PART 3 EXECUTION

3.1 FIELD MEASUREMENTS

Before fabrication or installation, verify all dimensions of areas, spaces, spans and configurations. Provide openings for passage of pipes or other penetrations.

3.2 GRATING INSTALLATION

- A. Grating sizing (Unless otherwise called out on the drawings)

- 1. Open Mesh Aluminum Grating (Type A)

Span	Bearing Bar Size	Wt. Lbs. Sq. Ft.
2'-6" and less	1" x 3/16"	2.6
3'-0" to 3'-6"	1¼" x 3/16"	3.2
Over 3'-6" to 4'-0"	1½" x 3/16"	3.9
Over 4'-0" to 4'-6"	1¾" x 3/16"	4.5
Over 4'-6" to 5'-0"	2" x 3/16"	5.1

- 2. Unpunched Aluminum Plank (Type B)

Span	Bearing Bar Size	Wt. Lbs. Sq. Ft.
2'-6" and less	1"	2.65
3'-0" to 3'-6"	1¼"	3.25
Over 3'-6" to 4'-0"	1½"	3.95
Over 4'-0" to 4'-6"	1¾"	4.55
Over 4'-6" to 5'-0"	2"	5.55
Over 5'-0" to 5'-6"	2¼"	6.25

- 3. Open Mesh Galvanized Steel Grating (Type C)

Span	Bearing Bar Size	Wt. Lbs. Sq. Ft.
2'-6" and less	¾" x 3/16"	5.8
3'-0" to 3'-6"	1" x 3/16"	7.5
Over 3'-6" to 4'-6"	1¼" x 3/16"	9.1
Over 4'-6" to 5'-6"	1½" x 3/16"	10.8
Over 5'-6" to 6'-0"	1¾" x 3/16"	12.5

B. Grating Sections:

1. Overall physical size of grating sections may be shown or indicated on Drawings where ease of removing an individual section has been considered. Otherwise, if not indicated on Drawings specifically, size of sections shall be such that no panel weighs more than 60 pounds.
2. Provide ¼-inch space between grating sections and frame and adjacent grating sections. Edge of grating at openings shall be banded with same size bar as bearing bar.

C. Grating Fasteners:

1. Open mesh grating.
 - a. Secure each grating section to frame with galvanized saddle clips for galvanized steel grating, aluminum saddle clips for aluminum grating, Type 316 stainless steel saddle clips for stainless and fiberglass grating; at least four per grating section. Saddle clips shall be placed over two main bearing bars.
2. Plank grating.
 - a. As detailed on Drawings or as recommended by Manufacturer.

D. Grating Frames and Supports

1. All gratings shall be set into angle frames set and anchored into the concrete, supported by surface mounted frames, or as detailed on the Drawings.
 - a. Provide similar metals between grating and frames (galvanized steel frames for steel gratings, aluminum frames for aluminum grating , or 316 SST frames for stainless or fiberglass gratings.)
2. The top surfaces of all bars and panels of gratings shall be flush with the adjacent surfacings, around perimeter of grating sections and at openings.

3.3 Design and provide support beams for gratings at openings as needed. If additional support beams are needed due to geometrical constraints, they are designed and provided at no cost to Owner.
WORKMANSHIP

- A. All fabrication shall be done to the dimensions shown or as approved. All items shall be free from any defects which mar appearance or impair strength.
- B. All panels shall be absolutely flat and true to provide even, uniform, non-rattling bearing on the supports. Supports for all grating shall be provided as shown on the Drawings.

END OF SECTION

SECTION 05570

METAL SUPPORT FRAMING

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of furnishing and installing metal support framing for piping and other equipment as shown on the drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 - Submittals
- B. Section 05500 - Metal Fabrications
- C. Section 15094 - Hangers and Supports
- D. Division 16 - Electrical

1.3 QUALITY ASSURANCE

Standards

- A. AA - Aluminum Association
- B. AISC - American Institute of Steel Construction
- C. ASTM - American Society for Testing and Materials
- D. AWS - American Welding Society

1.4 SUBMITTALS

- A. In accordance with Section 01300.

- B. Submit shop drawings prior to fabrication. Include information necessary for fabrication and erection of component parts and arrangement of frames. Indicate size and weight of members; type and location of shop connections. Approval of shop drawings will be for size and arrangement of principal and auxiliary members and strength of members. Any errors in dimensions and quantities shown will be the responsibility of the Contractor.
- C. Certificate: Furnish manufacturer's certificate that framing materials meet or exceed the requirements of this specification.

1.5 HANDLING AND STORAGE OF MATERIALS

Materials to be stored shall be placed on skids above the ground. It shall be kept clean and properly drained. To avoid delays, deliver all loose items to be built into the concrete in a timely fashion.

PART 2 MATERIALS

2.1 GENERAL

- A. All parts shall be manufactured by Unistrut Corporation, Wayne, Michigan; B-Line Systems, Inc., Highland, Illinois, or equal.
- B. All parts of the system shall be of one manufacturer. Parts shall be stamped with manufacturer's part number for identification.
- C. The load capacities of parts, connections and assemblies shall meet or exceed those published in the latest framing manufacturer's engineering catalog and supplementary bulletins.
- D. Dimensions, tolerances and physical design shall be so that the parts within the system will be interchangeable and conform to the designs set forth in the latest framing manufacturer's engineering catalog and supplementary bulletins.
- E. Channels, continuous concrete inserts, and closure strips shall be 12-gauge, cold-formed from mild steel conforming to ASTM A1011, Grade C specifications.
- F. Fittings shall be press formed from hot rolled, pickled and oiled steel plate conforming to ASTM A575 or steel strip conforming to ASTM A1011 Grade C specifications.
- G. Gripping nuts shall be stainless steel spring mounted with serrated nuts.
- H. Screws and bolts shall be stainless steel. All threads shall be Unified National Coarse, Class A.

- I. Unless noted otherwise, framing channels shall be galvanized.
- J. Use stainless steel or fiberglass materials in wet or corrosive areas, or as shown on the drawings.

PART 3 EXECUTION

3.1 GENERAL

See Contract Drawings for configuration and member model numbers (if shown). Supply all components to result in a complete system, whether shown, specified or not. The minimum design basis shall be Unistrut model P1000, or equal.

3.2 FIELD MEASUREMENTS

Before installation, verify all dimensions of areas, spaces, spans and configurations.

3.3 INSTALLATION

- A. All frameworks and assemblies of the system shall be true, plumb, square and level and accurately located according to the Contract and Shop Drawings.
- B. Cut ends of fiberglass channels shall be sealed per manufacturer's recommendations.
- C. All installations shall be coordinated with other trades as required.
- D. All bolted connections shall be tightened to the following torque values.
 - 1. ¼-inch bolts 4 foot-pounds torque
 - 2. 3/8-inch bolts 30 foot-pounds torque
 - 3. ½-inch bolts 50 foot-pounds torque

3.4 WORKMANSHIP

All fabrication shall be done to the dimensions shown or as approved. All items shall be free from any defects which mar appearance or impair strength.

END OF SECTION

SECTION 07110

WATERPROOFING

PART 1 GENERAL

1.1 DESCRIPTION

The work of this Section consists of furnishing and installing below grade waterproofing required for this work as indicated on the Drawings or specified herein and includes, but is not necessarily limited to, below grade waterproofing.

1.2 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 01300: Submittals
- B. Section 02225: Structure Excavation and Backfill
- C. Section 09900: Painting

1.3 QUALITY ASSURANCE

- A. **Qualifications of Installers:** Provide at least one person who shall be present at all times during execution of this portion of the work and who shall be thoroughly experienced in the application of the specified products and shall direct all work performed under this Section.
- B. **Manufacturer's Certification:** Prior to start of installation of the work of this Section, secure a visit to the job site by a representative of the manufacturer of the waterproofing materials used, who shall inspect and shall certify that the surfaces to which waterproofing is to be applied are in a condition suitable for that application.

1.4 SUBMITTALS

Materials List: Before any waterproofing materials are delivered to the job site, submit a complete list of all materials proposed to be furnished and installed under this portion of the work, making the submittal in accordance with the provisions of Section 01300 of these Specifications.

1.5 PRODUCT HANDLING, STORAGE, AND DELIVERY

- A. Use all means necessary to protect waterproofing materials before, during, and after installation and to protect the installed work and materials of all other trades.
- B. In the event of damage, immediately make all repairs and replacements necessary at no additional cost to the Owner.
- C. Deliver materials in manufacturer's original, unopened containers and rolls with labels intact and legible.
- D. Deliver materials in sufficient quantity to allow continuity of work.
- E. Handle rolled goods so as to prevent damage to edge of ends.
- F. Select and operate material handling equipment so as not to damage existing construction.
- G. Store materials on clean raised platforms with weather protective covering when stored outdoors.
- H. Provide continuous protection of materials against wetting and moisture absorption.
- I. Protect materials against damage by construction traffic.
- J. Remove wet materials for project site.
- K. Comply with fire and safety regulations.
- L. Store emulsions in temperature above 45°F.

PART 2 MATERIALS

2.1 WATERPROOFING

- A. General: All waterproofing shall be the specified products of the W. R. Meadows Co., MEL-ROL LM, Karnak Corp., or equal.
- B. Below Grade Waterproofing: All below grade waterproofing shall be non-solvent type waterproofing, or equal, applied to at least 60-mil thickness (2 coats of 30 mils each, DFT).
- C. Primer: Per manufacturer's requirements.

2.2 PROTECTION

Protect all waterproofing, horizontal and vertical, with 8-mil thickness double wrapped polyethylene encasement. The thickness shall not be less than 10 percent of the nominal thickness and shall be in sheet form. Use 10 mil vinyl tape to secure and seal the polyethylene sheet.

2.3 OTHER MATERIALS

All other materials, not specifically described but required for a complete and proper installation of waterproofing, shall be as recommended by the material supplier.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection

1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
2. Verify that waterproofing may be installed in strict accordance with the original design and the manufacturer's recommendations.

B. Discrepancies

1. In the event of discrepancy, immediately notify the Engineer.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 INSTALLATION

A. Waterproof coating shall be applied below grade on outside of concrete structures listed in Section 09900 Finish Schedule and below.

B. Waterproof coating shall also be applied to the following:

1. Below grade unit masonry surfaces.
2. Backfilled side of retaining walls and planters, which occur above adjacent grade.
3. Backside of metal flashings.

- C. Surface Preparation: Examine surfaces for foreign material, moisture, and unevenness, which would prevent the execution and quality of application of system as specified. Remove any paraffin or wax base non-bonding compounds. Fill all cracks, voids, joints, depressions and places around projections with cement grout to provide smooth and flush surface. Proceed with waterproofing application only after surface defects are corrected. Application of material will be considered as evidence of installer's acceptance of substrate as a proper base for waterproofing.
- D. Application: Install materials in accordance with requirements of waterproofing system manufacturer. Maintain neat line at upper edge. Mask as required to prevent overrun of materials onto surfaces. Install the required protective covering over the waterproofing to prevent damage during backfill operation.

3.3 COORDINATION WITH SEALANTS

- A. Where feasible, delay application of waterproof coatings until installation of sealants has been completed in joints adjoining surfaces to be coated.
- B. Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of waterproof coatings. Cover adjoining and nearby surfaces of aluminum and glass where there is possibility of waterproof coatings being deposited on surfaces. Cover live plant materials with drop cloths. Clean waterproof coatings from adjoining surfaces immediately after spillage. Comply with manufacturer's recommendations for cleaning.

3.4 CODES, ORDINANCES AND LAWS COMPLIANCE

In addition to the specific requirements described herein, the total scope of work required by this section includes all means, methods, labor and material required to conform to all applicable Federal, State and local codes, ordinances, laws and any other requirements applicable to the construction process, materials and the finished, completed work.

3.5 PROTECTION OF SYSTEM

Score the fiber board to mold around the round surface of the structure so that all voids are eliminated. Tape the joints with duct tape to prevent the entrance of stones and dirt during backfill operations.

END OF SECTION

SECTION 07900

JOINT SEALERS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Provide joint sealer (caulking) at all intersections of installed, fixed-in place dissimilar materials on both interior and exterior of the buildings.
- B. Joint sealer (caulking) shall be provided at all locations where penetration of one surface by another material and where assembled components of a particular system would be subjected to intrusion by moisture, dirt or insects.
- C. Joint sealer colors will be selected or painted to match adjacent surfaces as available; colors to be selected by Engineer. Joint sealers will be used to achieve a smooth and consistent finished paint installation. All areas where gaps or open areas may be evident will be caulked as needed and as may be directed by the Architect to achieve a consistent painted finish.
- D. All joint sealers will be installed prior to application of work specified in Section 09900.

1.2 RELATED WORK

- A. Section 01300 - Submittals
- B. Section 09900 - Painting and Finish Schedule

1.3 QUALITY ASSURANCE

- A. Pre-construction Joint Sealer-Substrate Tests: Submit substrate materials representative of actual joint surfaces to joint sealer manufacturer for laboratory testing of joint sealers for adhesion to primed and unprimed substrates and for compatibility with secondary seals, if required.
- B. Pre-construction Field Tests: Prior to installation of joint sealers, field-test their adhesion to joint substrates as recommended in ASTM C962.

1.4 SUBMITTALS

In accordance with Section 01300, submit the following:

- A. Samples of each type and color of joint sealer required.
- B. Certified test reports for joint sealers evidencing compliance with requirements.

PART 2 MATERIALS

2.1 PRODUCTS

- A. **Compatibility:** Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under service and application conditions, as demonstrated by testing and field experience. Match optimum sealer with area to be sealed per manufacturer's recommendations. Provide paintable sealants at surfaces to be painted. Sealants specified herein may be used per manufacturer's recommendations for surfaces to be sealed. Installer may select type of material to be used within manufacturer's requirements.
- B. **Colors:** Provide color of exposed joint sealers indicated or, if not otherwise indicated, as selected by Engineer from manufacturer's standard colors.
- C. **Building Exterior, High Movement:**
 - 1. **One-Part Non-Acid-Curing Silicone Sealant:** Type S; Grade NS; Class 25; and complying with the following requirements:
 - a. **Medium-Modulus:** Tensile strength of not less than 45 not more than 75 PSI or less at 100% elongation when tested after 14 days at 77 degree F (22 degree C) and 50% relative humidity per ASTM D412.
 - b. Additional capability to withstand the following percentage increase and decrease of joint width as measured at time of application and remain in compliance with other requirements of ASTM C920.
- D. **Building Exterior, Standard Movement:**
 - 1. **Butyl Sealant:** Manufacturer's standard one-part, non-sag, solvent-release-curing, polymerized butyl sealant complying with FS TT-S-001657 for Type I and formulated with minimum of 75% solids to be non-staining, paintable, and have a tack-free time of 24 hours or less.
- E. **Building Interior:**

1. Acrylic Latex Sealant: Manufacturer's standard one-part non-sag, solvent-release-curing, acrylic terpolymer sealant complying with ASTM C920 for Type S; Grade NS; Uses NT, M, G, A and O; except for selected test properties which are revised as follows:
 - a. Heat-aged hardness: 40-50
 - b. Weight loss: 15%
 - c. Max. cyclic movement capability (Class): +/- 7-1/2%
2. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, non-hardening, non-skinning, non-staining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.
3. Density: Manufacturer's standard.
4. Backing: Pressure sensitive adhesive, factory-applied to one side, with protective wrapping.
5. Accessory Materials for Fire-Stopping Sealants: Forming, joint fillers, packing and other accessory materials as required for installation of fire-stopping sealants.

F. Concrete Structures:

1. Sealants:
 - a. Types 1 to 3 Sealants: Polyurethane sealants conforming to Federal Specification A-A-1556 Type II & ANSI A116.1.
 - b. Type 1 Sealant: Two part, 35-45 Shore A, self-leveling.
 - c. Type 2 Sealant: Two part, 20-35 Shore A, self-leveling.
 - d. Type 3 Sealant: Two part, 20-35 Shore A, non-sag.
 - e. Type 4 Sealant: Butyl polymer based sealant conforming to Federal Specification A-A-272, Type 1.
2. Accessories:
 - a. Primers: As specified by sealant manufacturer.
 - b. Backup Materials: Closed cell polyethylene foam.
 - c. Bond Breaker: Polyethylene film.
3. Locations:
 - a. Type 1 Sealant: Except as hereinafter specified, use for all interior and exterior horizontal joints subject to foot traffic.
 - b. Type 2 Sealant: Except as hereinafter specified, or where Type 1 sealant is required, use for all exterior horizontal joint.

- c. Type 3 Sealant: Use for all exterior vertical surfaces.
- d. Type 4 Sealant: Use for all interior work except where Type 1 is required.
- e. Caulk and seal all open joints, both interior and exterior; at junction of metal frames and walls; at other locations as noted on drawings.
- f. Generally, expansion joints in exterior concrete flatwork on grade, curbs and gutters for sitework, etc., joint fillers will not require a joint sealant. Where sealant is noted on drawings for such joints, sealant shall be Type 1, and a bond breaker shall be installed along top of joint filler, full width of joint, to present contact between sealant and joint filler.

PART 3 EXECUTION

3.1 GENERAL

- A. Comply with joint sealer manufacturers' printed installation instructions applicable to products and applications indicated.
- B. Carefully and thoroughly clean surfaces with cleaner, and in manner recommended by sealant manufacturer.
- C. Apply sealants smoothly and uniformly. Mask surfaces each side of joints to protect adjacent surface and to form straight even edges.

3.2 FIRE-STOPPING SEALANT

Install sealant, including forming, packing and other accessory materials to fill openings around mechanical and electrical services penetrating floors and walls to provide fire-stops with fire resistance ratings indicated.

3.3 SEALANT JOINT DETAILS FOR CONCRETE STRUCTURES

- A. Joint Sizes:
 - 1. Types 1, 2, and 3 Sealants:
 - a. Minimum joint size: 1/4" x 1/4".
 - b. Depth to width ratio of joint shall be as recommended by sealant manufacturer.
 - c. Maximum width: Sealant manufacturer's recommended maximum.
 - 2. Type 4 Sealant: Maximum joint size shall be 3/8-inch x 1/2-inch.

- B. Joints deeper than above shall have backup material installed to maintain specified depth.
- C. With Types 1, 2, and 3 sealants, a bond breaker shall be installed, unless backup material is used, so that sealant bonds only to sides of joints.

3.4 CODES, ORDINANCES AND LAWS COMPLIANCE:

In addition to the specific requirements described herein, the total scope of work required by this section includes all means, methods, labor and material required to conform to all applicable Federal, State and local codes, ordinances, laws and any other requirements applicable to the construction process, materials and the finished, completed work.

END OF SECTION

SECTION 08310

ACCESS HATCHES

PART 1 GENERAL

1.1 SUMMARY

Section includes furnishing and installing access hatches.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 - Submittals Product Data
- B. Section 11302 - Submersible Pumps

1.3 SUBMITTALS

- A. Product Data
- B. Shop Drawings:
 - 1. Show profiles, accessories, and dimensions.
 - 2. Show locations of access doors.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Identify type and size of each door in way not to damage finish prior to delivery.
- B. Deliver products only after proper facilities are available.
- C. Deliver and store packaged products in original containers with seals unbroken and labels intact until time of use.
- D. Handle carefully to prevent damage and store on clean concrete surface or raised platform in safe, dry area. Do not dump onto ground.

- E. Protect access doors during shipment and storage to prevent warping, bending, and corrosion.

1.5 QUALITY ASSURANCE

- A. Hatch for the Primary Pump Station FRP basin shall be supplied by the FRP basin manufacturer and coordinated with the submersible pump manufacturer. All other hatches located over submersible pumps with guide rails shall be supplied by the same manufacturer as the submersible pump for coordination.
- B. All hatches not located over a submersible pump shall be supplied by the same manufacturer and as specified herein.

PART 2 MATERIALS

2.1 FLOOR ACCESS HATCH (H-20 Loading)

- A. Manufacturers:
 - 1. One of the following or equal:
 - a. The Bilco Co., Type JD-AL-H20 or JAL-H20.
 - b. Babcock-Davis Associates, Inc.
 - c. US Foundry
 - d. Syracuse Castings
 - e. Halliday Products
- B. Style: Single or double leaf, 316SST or aluminum, capable of withstanding H20 loading, channel frame, with drainage couplings. Hatches with openings greater than 36-inches in the long dimension shall be double leaf type.
- C. Door Leaf: Minimum ¼ -inch 316SST or aluminum diamond pattern plate.
- D. Frame: ¼ -inch extended 316SST or aluminum channel with bend down anchor tabs around perimeter. A continuous EPDM gasket shall be mechanically attached to the frame.
- E. Hardware:
 - 1. Hinges: Equipped with 316SST or heavy forged aluminum hinges with 1/4-inch diameter stainless steel pins.
 - 2. Lock: Snap lock with removable handle mounted on door leaf.

3. Grip Handle: Provide vinyl grip handle designed to release cover for closing.
 4. Operating Mechanism: Compression spring tubes designed for ease of operation and automatic hold-open arm with release handle.
 5. Provide 1 ½ -inch drainage coupling located in front right corner of channel frame where drainage is not allowed within structure as scheduled.
 6. Provide fall protection as scheduled.
- F. Minimum access hatch size and style are shown on the drawings (nominal clear opening shown, provide additional length/width as necessary to form a complete frame).

2.2 FLOOR ACCESS HATCH (300 PSF Loading)

A. Manufacturers:

1. One of the following or equal:
 - a. The Bilco Co., Type JD-AL or J-AL.
 - b. Babcock-Davis Associates, Inc., Model GT.
 - c. US Foundry

B. Style: Single or double leaf, 316SST or aluminum, capable of withstanding minimum live load of 300 pounds per square foot, channel frame, with drainage couplings.

C. Door Leaf: Minimum ¼ -inch 316SST or aluminum diamond pattern plate capable of withstanding a live load of 300 pounds per square foot.

D. Frame: ¼ -inch 316SST or aluminum channel with benddown anchor tabs around perimeter. A continuous EPDM gasket shall be mechanically attached to the 316SST or aluminum frame.

E. Hardware:

1. Hinges: Equipped with a minimum of two 316SST or heavy forged aluminum hinges with stainless steel pins.
2. Lock: Snap lock with removable handle mounted on door leaf.
3. Grip Handle: Provide vinyl grip handle designed to release cover for closing.
4. Operating Mechanism: Spring operators designed for ease of operation and automatic hold-open arm with release handle.
5. Provide 1 ½ -inch drainage coupling located in front right corner of channel frame where drainage is not allowed within structure as scheduled
6. Provide fall protection as scheduled.

- F. Minimum access hatch size and style are shown on the drawings (nominal clear opening shown, provide additional length/width as necessary to form a complete frame).

2.3 FALL PROTECTION

- A. Saf-T-Grate (install grating style fall protection on all access hatches, unless shown otherwise):
 1. Grating panel(s) shall be fiberglass, molded in one piece, with load bearing bars in both directions to allow for use without continuous side support.
 2. Panel shall be designed to support a 300 PSF (1464 kg/m²) live load and be high visibility safety yellow in color.
 3. Torsion rod lift assistance shall be provided for ease of operation and a hold open arm shall be included to automatically lock the panel in the fully open 90 degree position.
 4. A release handle shall be provided to close the grating panel and there shall be a provision to lock the panel to prevent unauthorized access.
 5. Hold open arm shall be 316SST or aluminum with a stainless steel release handle.
 6. All other hardware, including mounting brackets, hinges, torsion rod, padlock loop, and fasteners, shall be type 316 stainless steel.
 7. Manufacturer shall provide a twenty-five year warranty against defects in material and workmanship.

- B. Netting with hooks (only install where shown in table or on drawings, otherwise install grating style fall protection):
 1. A safety net manufactured from high strength polyester netting that has been tested and certified to meet the current OSHA standard 1926.502 (c) (4) (i) drop test.
 2. All stainless steel 316 hardware, hooks and anchors.
 3. A permanently attached metal tag with the following information: net manufacturer's name, identification of net material, date of manufacture, date of prototype test, name of testing agency, and serial number.
 4. Manufacturer shall provide a twenty-five year warranty against defects in material and workmanship.

2.4 WARRANTY

Hatch manufacturer shall provide 25 year warranty against defects in materials and workmanship.

2.5 FINISHES

Floor Access Door Types:

- A. Aluminum: Manufacturer's standard mill finish.

- B. Aluminum in contact with dissimilar metals and concrete: Manufacturers standard bituminous coating.
- C. 316SST: standard finish.
- D. All hardware shall be 316 stainless steel.

PART 3 EXECUTION

3.1 EXAMINATION

Examine construction to receive access door and verify correctness of dimensions and other supporting or adjoining conditions.

3.2 PREPARATION

- A. Coordinate details with other work supporting, adjoining, or requiring access doors.
- B. Verify dimensions, profiles, and fire-resistive rating for each opening.
- C. Verify that location will serve portion of work to which access is required. Where proposed functional location conflicts with other work, notify the Engineer before installation.
- D. Apply bituminous coating to aluminum surfaces that will be in contact with dissimilar metals or concrete.

3.3 INSTALLATION

- A. Install access doors in accordance with manufacturer's instructions.
- B. Ensure correct types and adequate sizes at proper locations.
- C. Securely attach frames to supporting work and ensure doors, frames, and hardware operate smoothly and are free from warp, twist, and distortion.
- D. Coat all aluminum in contact with concrete.

3.4 ADJUSTING

Adjust doors, frames, and hardware to operate smoothly, freely, and properly, without binding.

3.5 CLEANING

Thoroughly clean surfaces of grease, oil, or other impurities, touch-up abraded prime coat.

3.6 HATCH SCHEDULE

Location	Loading	Material	Comments
Primary Pump Station	300 psf	Aluminum	(a) (d)
Storage Flow Meter Vault	300 psf	Aluminum	-
San Justo Road Pig Receiving/Launching Station	ASTM Load Level 6(e)	Galvanized	(c)
Freitas Road Pig Receiving/Launching Station	ASTM Load Level 6(e)	Galvanized	(c)

- (a) Fall Protection: Saf-T-Grate Style.
- (b) Fall Protection: Netting with hooks.
- (c) Provide ladder and safety extension pole.
- (d) Provide drainage collection coupling.
- (e) Traffic rated H2O Loading

END OF SECTION

SECTION 09900

PAINTING AND FINISH SCHEDULE

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of furnishing and applying paint for architectural, structural, mechanical and miscellaneous work.

The work comprises the painting of all exposed surfaces of concrete, sheet metal, iron and steel, process equipment, electrical equipment, process piping ducts and other miscellaneous items.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300: Submittals
- B. Section 02961: Cementitious Manhole Rehabilitation
- C. Section 05500: Metal Fabrication
- D. Section 07110: Waterproofing
- E. Section 10400: Identifying Devices

1.3 SUBMITTALS

A materials list and samples shall be submitted as required by Section 01300 and as follows:

- A. Materials list naming each product to be used identified by manufacturer and type number.
- B. Volatile organic compound (VOC) level (gm/l) and manufacturer's certification of compliance with applicable air quality limits for each coating.
- C. Manufacturer's application recommendations for each product submitted.
- D. The Contractor shall submit a current chart of the Manufacturer's available colors for selection by the Engineer, forty five (45) days prior to the start of coating and painting.

Samples, when reviewed and accepted by the Engineer, shall establish the quality of the painted surface where these applications are indicated.

- E. The owner shall select colors from the submittal information presented. Mechanical and piping systems may include multiple color selections in order to properly identify process facilities.

1.4 DEFINITION

The term "paint" as used herein includes enamels, paints, sealers, emulsions and other coatings used as prime intermediate or finish coats for protection or decoration.

1.5 COMPLIANCE WITH VOLATILE ORGANIC COMPOUND (VOC) LIMITS

All paint and coating products shall comply with the applicable limits on volatile organic compounds (VOC) as established by the United States Environmental Protection Agency and by State and local air quality regulating agencies. It shall be the Contractor's responsibility to verify compliance of all paints and coatings. In the event that any paint or coating listed herein is found to be non-compliant, the Contractor shall notify the Engineer and the Engineer will select a substitute coating or paint.

1.6 QUALITY ASSURANCE

- A. General: Quality assurance procedures and practices shall be utilized to monitor all phases of surface preparation, application and inspection throughout the duration of the project. Procedures or practices not specifically defined herein may be utilized provided they meet recognized and accepted professional standards and are approved by the Engineer.
- B. Workmen: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- C. Paint Coordination:
 - 1. Review other Sections of these Specifications as required, verifying the prime coats to be used and assuring compatibility of the total coating system for the various substrata.
 - 2. Upon request, furnish information on the characteristics of the specific finish materials to assure that compatible prime coats are used.
 - 3. Provide barrier coats over non-compatible primers, or remove the primer and re-prime as required.
 - 4. Notify the Engineer in writing of anticipated problems in using the specified coating systems over prime-coatings supplied under other Sections.

1.7 DELIVERY AND STORAGE

- A. All materials shall be brought to the job site in original sealed containers. Each container shall bear the manufacturer's name, coating type, batch number, date of manufacture, storage life, and special directions. They shall not be used until the Engineer has inspected contents and obtained data from information on containers or label. Materials exceeding storage life recommended by the manufacturer shall be rejected.
- B. All coatings and paints shall be stored in enclosed structures to protect them from weather and excessive heat or cold. Flammable coatings or paints must be stored to conform to City, County, State and Federal safety codes for flammable coatings or paint materials. At all times coatings or paints shall be protected from freezing.

1.8 REFERENCED SPECIFICATIONS AND STANDARDS

- A. Without limiting the general aspects of other requirements of these specifications, all surface preparation, coating and painting of surfaces shall conform to the applicable requirements of the National Association of Corrosion Engineers, the Society for Protective Coatings, the American Concrete Institute, the Forest Products Research Society and the Manufacturer's printed instructions.
- B. The Engineer's decision shall be final as to interpretation and/or conflict between any on the reference specifications and standards contained herein.

1.9 AS COATED SUMMARY SHEET

Contractor shall supply a list of all coating products used on the Project, including the exact stock number and the file numbers for the color tints added and amounts for each. The Summary Sheet should also list the local paint supply location for the particular brand of coating including the Name, address, phone number, and website for each product.

PART 2 MATERIALS

2.1 PAINT AND FINISH PRODUCTS

- A. Paint and coating products shall be fresh and well ground; shall not settle readily, cake, or thicken in the container; shall be broken up readily with paddle to a smooth consistency; and shall have easy application properties. Other painting materials such as linseed oil, turpentine, mineral spirits, miscellaneous thinners, varnish, and shellac shall be of the highest quality.
- B. All paints and coatings shall be specifically manufactured for use on projects of this type, and shall be used on surfaces intended by the paint manufacturer. Paints and coatings shall

be Tnemec, Carboline or equal. All paint and coatings shall be delivered in original containers, with seals unbroken.

- C. To establish a standard of quality, several specific paint and coating products are listed in the coating System Index under 2.5, this section.

2.2 COMPATIBILITY OF SHOP AND FIELD PAINTS

To ensure a satisfactory painting job it is essential that the paints applied in the shop and in the field be mutually compatible. Where prime coats are shop applied, the Contractor shall instruct suppliers to provide compatible primers with the finish coats selected by the Contractor. In no case will primers be allowed that are not manufactured by the suppliers of the finish coats unless approved by the Engineer.

2.3 COLORS

- A. Color for the various surfaces to be painted shall be selected by the Engineer. Use of different colors for the various structures or for surfaces of a single structure may be directed by the Engineer.
- B. Piping, ductwork and adjacent equipment colors shall be as specified in Section 10400, identifying devices.
- C. Equipment/Piping colors shall be as scheduled below:
 1. All exposed equipment and piping coated, as defined below, shall be tan for all process fluids, purple for reclaimed water, green for sewer, orange for chemical, and blue for all potable water.
 2. Provide color chart for engineers approval.

2.4 SYSTEMS INDEX

- A. System A
 1. Type of Coating: Polymidoamine or Amine Cured Epoxy
 2. Surface: Ferrous metals and concrete submerged or subject to submersion in non-potable water.
 3. Surface Preparation: Ferrous Metals: SSPC-SP-10 Concrete: SSPC-SP-13.
 4. Coatings and Dry Film Thickness (DFT):

Minimum No. of Coats	DFT per Coat	Tnemec Series	Carboline
1	4.0 to 5.0 mils	66HS-1211 Red	Carboguard 890

2

6.0 mils

66HS

Carboguard 890

B. System B

1. Type of Coating: Protective Coal Tar
2. Surface: Buried ferrous metals and Concrete
3. Surface Preparation: Steel - SSPC-SP6; Concrete - SSPC-SP-13
4. Coatings and Dry Film Thickness (DFT):

Minimum No. of Coats	DFT per Coat	Tnemec Series	Carboline
2	10.0 mils	46H-413	Bitumastic 300M

C. System C

1. Type of Coating: 100% Solids Epoxy (Hydropox or Plasite 4500S)
2. Surface: Concrete
3. Surface Preparation: SSPC-SP-7 (for new concrete) or SSPC-SP-13 (for existing modified structures)
4. Epoxy lining shall be manufactured by Con-Tech of California, Inc. and consist of a prime and finish coat. The prime coat shall be a two component, low viscosity 100% solids, deep penetrating primer. The prime coat shall be designed for use on properly prepared porous substrates, such as concrete. The finish coat shall be a non-polluting, solvent free, two-component, 100% solids epoxy system designed as a chemical coating barrier against potable water, salt water, and raw wastewater. The finish coat shall cure at a low minimum temperature of 40°F, have a potlife of 35 minutes at room temperature, be tack free in 4 hours and cured in 3 days.
 - a. Prime coat (at 150 square feet per gallon), Hydro-Prime 251 + HYDROTHIX
 - b. Finish coat (DFT = 80 mils), Hydro-Pox Ct. 04-204 UHB
5. Concrete curing compound is not allowed as specified in Section 03100. Forms shall remain for a minimum of 7 days or more depending on ambient temperatures as approved by the Engineer.
6. A wet cure method for a minimum of 7 days may also be allowed as approved by the Engineer.
7. Coating shall be applied during periods of stable to declining temperatures to minimize pinholing.
8. If sacking and brush blast is required prior to the prime coat, only a grout consisting of sand and cement is allowed. Additives that may produce a surface film compromising adhesion are prohibited.

D. System D

1. Type of Coating: Polyamidoamine or Amine Cured Epoxy, Polyurethane
2. Surface: Exterior, non-submerged metals and plastic piping, mild or severe chemical or corrosion exposure.
3. Surface Preparation: Ferrous metals: SSPC-SP-6
4. Plastic Piping and Non-Ferrous Metals: SSPC-SP-1
5. Galvanized Metal: SSPC-SP-7 (Take care not to remove Galvanized Coating)
6. Coatings and Dry Film Thickness (DFT):

Minimum No. of Coats	DFT per Coat	Tnemec Series	Carboline
2	5.0 mils (metals) 3.0 mils (plastics)	66HS	Carboguard 890
1	4.0 mils(metals) 3.0 mils(plastics)	1074 or 1075	Carbothane 134VOC

E. System E

1. Type of Coating: Polyamidoamine or Amine Cured Epoxy
2. Surface: Interior non-submerged metals, plastic piping, concrete, mild or severe chemical or corrosion exposure.
3. Surface Preparation: Ferrous Metals: SSPC-SP-6
4. Plastic Piping and Nonferrous Metals: SSPC-SP-1
5. Galvanized Metal: SSPC-SP-7
6. Concrete: SSPC-SP-13
7. Coatings and Dry Film Thickness (DFT):

Minimum No. of Coats	DFT per Coat	Tnemec Series	Carboline
2	5.0 mils (metals and concrete)	66HS	Carboguard 890
2	3.0 mils (plastics)	66HS	Carboguard 890

F. System F

1. Type of Coating: Acrylic Epoxy
2. Surface: Interior plaster and gypsum wallboard.
3. Surface Preparation: In accordance with the general surface preparation specifications in this Section.

4. Coatings and Dry Film Thickness (DFT):

Minimum No. of Coats	DFT per Coat	Tnemec Series	Carboline
1	1.5 mils	151-1051	Sanitile 120
2	4.0 mils	113 or 114	Sanitile 255

G. System G

1. Type of Coating: Modified Aliphatic Amine Epoxy
2. Surface: Interior masonry and concrete walls.
3. Surface Preparation: SSPC-SP-13
4. Filler: Apply filler per manufacturer's requirements to provide a "pin-hole" free surface.
5. Coatings and Dry Film Thickness (DFT):

Minimum No. of Coats	DFT per Coat	Tnemec Series	Carboline
1	60 to 80 ft ² /gal.	130	Sanitile 600
2	8.0 mils	84	Carboguard 890

H. System H

1. Type of Coating: Aliphatic polyurethane.
2. Surface: Overhead rolling doors (both sides).
3. Surface Preparation: SSPC-SP-1.
4. Coatings and Dry Film Thickness (DFT):

Minimum No. of Coats	DFT per Coat	Tnemec Series	Carboline
1	3.0 mils	530	Carboguard 890
1	2.0 mils	1075	Carbothane 134VOC

I. System I

1. Type of Coating: Acrylic, Semi-Gloss.
2. Surface: Interior concrete, masonry, wood, plaster, gypsum drywall, and exterior wood surfaces.
3. Surface Preparation: Clean and Dry, see sections 3.02, 3.03, 3.04.
4. Coatings and Dry Film Thickness (DFT):

Minimum No. of Coats	DFT per Coat	Coating Type	Sherwin Williams (or equal)
1	2.0 mils (1.5 mils for wood)	Interior Primer	Preprite Problock

1	3.0	Interior Coating	Duration Interior
1	1.5 – 2.0	Exterior Primer	A-100 Latex Primer
2	2.5 – 3.0	Exterior Coating	Duration or Resilience Exterior

J. System J

1. Type of Coating: Resinous Flooring
2. Surface: Concrete subject to mild chemical service.
3. Surface Preparation: Acid etch or shot blast to create profile/anchor pattern.
4. Coatings And Dry Film Thickness (DFT):

Minimum No. of Coats	DFT per Coat	Tnemec Series	Carboline
1	4.0 mils	203	Carboseal 780
2	12.0 mils	280	Carboseal 745
1	3.0 mils	290*	Carboseal 835

* As noted on the drawings, areas of the deck floors of the UV system shall be coated with the above system except Tnemec Series 290 shall be replaced with Series 295.

NOTE: On floor surface, broadcast clean silica sand per paint manufacturer's recommendations to form non-slip surface.

K. System K

1. Type of Coating: Polyurea Elastomer
2. Surface: Exterior Concrete
3. Surface Preparation: SSPC-SP-13
4. Coatings and Dry Film Thickness (DFT):

Minimum No. of Coats	DFT per Coat	Tnemec Series	Carboline
1	4.0 mils	203	Carboguard 1340WB
2	40.0 mils	400	Reactamine ET

L. System L

1. Type of Coating: High build acrylic.

2. Surface: Exterior concrete block.
3. Surface Preparation: SSPC-SP7
4. Coatings and Dry Film Thickness (DFT):

Minimum No. of Coats	Total DFT	Tnemec Series	Carboline
2	8.0 mils	180	3359DTM Series

M. System M

1. Type of Coating: Heat resistant aluminum coatings.
2. Surface: High heat (to 750°F) equipment and piping.
3. Surface Preparation: SSPC-SP-10.
4. Coatings and Dry Film Thickness (DFT):

Minimum No. of Coats	DFT per Coat	Tnemec Series	Carboline
1	2.5 mils	90E92	Thermaline 4700VOC

N. System N: Emulsified Asphalt Coating (See Section 07110).

O. System O

1. Type of Coating: Aromatic elastomeric polyurethane, or epoxy.
2. Surface: Submerged ferrous metals subject to abrasion.
3. Surface Preparation: SSPC-SP-10
4. Coatings and Dry Film Thickness (DFT):

Minimum No. of Coats	DFT per Coat	Tnemec Series	Carboline
1	4.0 to 5.0 mils	66HS -1211	N/A
2	8.0 to 12.0 mils	164	Reactamine 760

P. System P

1. Type of Coating: Polyamide Epoxy / Acrylic
2. Surface: Exterior of steel structures and tanks previously coated with alkyd enamel.
3. Surface Preparation: All surfaces damaged by construction SSPC-SP-6; all other surfaces SSPC-SP-7.
4. Coatings and Dry Film Thickness (DFT):

Minimum No. of Coats	DFT per Coat	Tnemec Series	Carboline
1	4.0 to 6.0 mils	66HS	Rustbond
1	2.5 to 3.0 mils	30	Carbocrylic 3359DTM

Q. System Q

1. Type of Coating: Vinyl Ester
2. Surface: Concrete and masonry subject to severe chemical service (Chemical pump areas and secondary containment areas).
3. Surface Preparation: SSPC-SP-13.
4. Surface shall be smooth to obtain a “pin hole” free surface after coating. Block filler shall be used on masonry, trowel smooth. Concrete shall be trowelled or sacked prior to coating. Filler shall be Tnemec Series 201+ Carbosil, Semstone 800 Primer + Cabosil, or equal.
5. Coatings and Dry Film Thickness (DFT):

Minimum No. of Coats	DFT per Coat	Tnemec Series	Carboline
1	6.0 mils	201	Semstone 800
1	30 mils	275	Semstone 870
1	15 mils	120	Semstone 870

NOTE: On floor surface, broadcast clean silca sand into prime coat per paint manufacturer’s recommendations to form non-slip surface.

R. System R

1. Type of Lining: Epoxy.
2. Surface: Interior of welded steel potable water storage tanks. Lining shall be NSF-61 approved for potable water service.
3. Surface Preparation: Ferrous metals: SSPC-SP-10
4. Coatings and Dry Film Thickness (DFT):

Minimum No. of Coats	DFT per Coat	Tnemec Series	Carboline
1	6-8 mils (primer)	V140F	Carboguard 891VOC
1	6-8 mils	V140F	Carboguard 891VOC

NOTE: Field prime all remaining unprimed, abraded or rusted areas after re-blast cleaning per SSPC-SP-10.

S. System S

1. Type of Coating: Zinc-Rich Aromatic Urethane/Polyamidoamine Epoxy.
2. Surface: Exterior of welded steel potable water storage tanks.
3. Surface Preparation: Ferrous metals: SSPC-SP-10
4. Coatings and Dry Film Thickness (DFT):

Minimum No. of Coats	DFT per Coat	Tnemec Series	Carboline
1	2.5-3.5 mils (primer)	94-H2O	Carbozinc 859
1	4-6 mils	166	Carboguard 890
1	3-5 mils	1075	Carbothane 134VOC

NOTE: Field prime all remaining unprimed, abraded or rusted areas after re-blast cleaning per SSPC-SP-10.

T. System T

1. Type of Coating: Flexible Polyurethane
2. Surface: Concrete subject to mild chemical service.
3. Surface Preparation: SSPC-SP-13.
4. Surface shall be smooth to obtain a “pin hole” free surface after coating. Concrete shall be trowelled or sacked, and abrasive blasted prior to coating.
5. Coatings and Dry Film Thickness (DFT):

Minimum No. of Coats	DFT per Coat	Tnemec Series	Carboline
1	2.0-4.0 mils	203	N/A
1	50-60 mils	400	Reactamine 760

U. System U

1. Type of Coating: Fiber-reinforced modified polyamine epoxy.
2. Surface: Concrete and steel subject to hydrogen sulfide exposure.
3. Surface Preparation:
 - a. Concrete: SSPC-SP-13 plus finish 4 to obtain a “pin hole” free surface after coating
 - b. Steel: SSPC-SP-5

4. Coatings and Dry Film Thickness (DFT):

Minimum No. of Coats	Total DFT	Tnemec Series	Carboline
1	50 mils	436 (steel)	Plasite 4500S
1	8 mils	201 (concrete)	*
1	70 MILS	436 FR (concrete)	Plasite 4500S

* Engineer knows of no equal.

V. System V: Fusion Epoxy (See Section 15051, 2.8).

1. Type of Coating: Fusion Epoxy – Fluidized Bed Grade
2. Surface: Fabricated steel piping manifolds and above ground welded steel piping
3. Surface Preparation: SSPC-SP10
4. Coatings and Dry Film Thickness (DFT):

Minimum No. of Coats	Total DFT	3M Scotchkote
Shop Coat 1	16 mils	206N (steel)
Field Coat* 1	10 mils	312

* Field welds, connections and damaged areas

W. System W:

1. Type of Coating: Self-crosslinking Acrylic
2. Surface: Primed Structural Steel Members.
3. Surface Preparation: SSPC-SP-11
4. Coatings and Dry Film Thickness (DFT):

Minimum No. of Coats	DFT per Coat	Tnemec Series	Carboline
1	4 mil	115	Carbocrylic 3359DTM

X. System X:

1. Type of Coating: Semi Gloss Silicone Trim Enamel
2. Surface: Exterior Ferrous Metals.
3. Surface Preparation: SSPC-SP-6
4. Coatings and Dry Film Thickness (DFT):

Minimum No. of Coats	DFT per Coat	Coating Name	Manufacturers
1(Zinc primed metal)	4 mil	Zinc Oxide Dust Primer ("SW Galvanized Iron Primer")	ICI Paint Stores Deero-Frazee Pioneer Paint Co.

			PPG Industries Sherwin Williams Dunn Edwards
1 (unprimed metal)	4 mil	Zinc Chromate Alkyd Primer ("Zinc Chromate Primer")	ICI Paint Stores Deero-Frazee Pioneer Paint Co. PPG Industries Sherwin Williams Dunn Edwards
2	4 mil	Semi Gloss Silicone Alkyd Enamel	ICI Paint Stores Deero-Frazee Pioneer Paint Co. PPG Industries Sherwin Williams Dunn Edwards

NOTE: Delete Primer at Factory primed items. Provide painted finish to match adjacent surfaces at exposed roof top equipment as directed by architect. This system to cover painting of switchgear, and roof top HVAC equipment

Y. System Y:

1. Type of Coating: Semi Gloss Alkyd Enamel
2. Surface: Building Interior Including Toilet Area, Kitchens, and Paint Grade Doors.
3. Surface Preparation: In accordance with the general surface preparation specifications in this Section.
4. Coatings and Dry Film Thickness (DFT):

Minimum No. of Coats	DFT per Coat	Manufacturer
Per MFG	Per MFG	Devoe: 50801 Wonder –Tones Latex Primer and Sealer Glidden: Y-3416 Spred Primer Sealer Moore: Moore's Latex Quick Dry Prime Seal Pittsburg: 6-2 PPG Quick Drying Interior Latex Primer
Per MFG	Per MFG	Devoe: 26XX Velour Alkyd Semi-Gloss Enamel Glidden: Y-4600 Line – Spred Lustre Semi Gloss Moore: Moore's Satin Impervo Enamel

Z. System Z

1. Type of Coating: Low Solids Acrylic
2. Surface: Exterior concrete block.
3. Surface Preparation: SSPC-SP7
4. Coatings and Dry Film Thickness (DFT).

AA. System AA

1. Type of Coating: Polyamidoamine Epoxy
2. Surface: Ductile Iron Pipe (as defined in specification section 15062).
3. Surface Preparation: as defined in specification section 15062
4. Coatings and Dry Film Thickness (DFT) (see Section 15062)

PART 3 EXECUTION

3.1 GENERAL

- A. During scheduled coating periods, daily whether reporting is required (including, but not limited to, air and surface temperature, dew point, relative humidity, rain, snow, mist, fog, and wind. Further, daily report shall include conditions that have the potential to cause dust, insects, or debris adhere to coating.) Contractor is required to obtain preauthorization from Owner's representative and Engineer prior to coating and painting; authorization shall be whether dependant. At all times, Contractor shall comply with paint manufacturer's published recommendation for environmental conditions in which paint materials can be applied and as approved by the Engineer. Additionally, see section 3.5.
- B. All surface preparation, coating and painting shall conform to applicable standards of the National Association of Corrosion Engineers, the Steel Structures Painting Council, the American Concrete Institute, the Forest Products Research Society and the Manufacturer's printed instructions. Material applied prior to approval of surface by the Engineer shall be removed and re-applied to the satisfaction of the Engineer at the expense of the Contractor.
- C. All work shall be performed by skilled craftsmen qualified to perform the required work in a manner comparable with the best standards of practice.
- D. The Contractor shall provide a supervisor at the work site during cleaning and application operations. The supervisor shall have the authority to sign any change orders, coordinate work and make decisions pertaining to the fulfillment of the contract.
- E. Dust, dirt, oil, grease or any foreign matter that will affect the adhesion or durability of the finish must be removed by washing with clean rags dipped in an approved cleaning solvent and wiped dry with clean rags.
- F. Coatings and painting systems include surface preparation, prime coating and finish coatings. Unless otherwise specified, prime coatings shall be field applied. Where prime coatings are shop applied, the Contractor shall instruct suppliers to provide the prime coat compatible with the finish coat specified. Any off-site work which does not conform to the specification is subject to rejection by the Engineer.

Shop applied prime coatings which are damaged during transportation, construction or installation shall be thoroughly cleaned and touched up in the field as directed by the Engineer. The Contractor shall use repair procedures which insure the complete protection of all adjacent primer.

The specified repair method and equipment may include wire-brushing, hand or power tool cleaning or dry air blast cleaning. In order to prevent injury to surrounding painted areas blast cleaning may require use of lower air pressure, smaller nozzle and abrasive particle sizes, short blast nozzle distance from surface, shielding and masking. If damage is too extensive, the item shall be re-cleaned and coated or painted as directed by the Engineer.

- G. Previously painted surfaces: Repair surface defects. Remove grease, oil and other contaminants as specified for steel surfaces. Scrape carefully to remove deteriorated coatings. Glossy or very hard coatings should be sanded lightly to promote maximum adhesion of the subsequent coating. Surface must be thoroughly dry before coating.
- H. The Contractor's coating and painting equipment shall be designed for application of materials and shall be maintained in first class working condition. Compressors shall have suitable traps and filters to remove water and oils from the air. Contractor's equipment shall be subject to approval by the Engineer.
- I. Application of the first coat shall follow immediately after surface preparation and cleaning and within an eight hour working day. Any cleaned areas not receiving first coat within eight-hour period shall be re-cleaned prior to application of first coat. This may include re-blasting.
- J. Prior to assembly, all surfaces made inaccessible after assembly shall be prepared as specified herein and shall receive the coating or paint system specified.

3.2 SURFACE PREPARATION, METALLIC SURFACES

- A. Surface preparation will be based on comparison with: ASTM D2200 "Pictorial Surface Preparation Standards for Painting Steel Surfaces", SSPC-Vis 1,; ASTM D610 "Standard Methods of Evaluating Degree of Rusting on Painted Steel Surfaces", SSPC-Vis 2,; and as described below. Anchor profile for prepared surfaces shall be measured by use of a non-destructive instrument such as a Keane-Tator Surface Profile Comparator or Testex Press-O-Film System.

To facilitate inspection the Contractor shall, on the first day of abrasive blast cleaning operations, blast clean metal panels to the standard specified. These panels shall be equivalent to the supplied plate stock which is to be coated or painted and shall have minimum measurements of 8-½-inches by 11-inches. After agreeing a specific panel meets the requirements of the specification, it shall be initialed by the Contractor and Engineer and coated with a clear non-changing finish. Panels shall be utilized for inspection purposes throughout the duration of blast cleaning operations.

- B. Heavy deposits of grease or oil shall be removed with solvent oil cleaner and any chemical contamination shall be neutralized and/or flushed off prior to any other surface preparation.
- C. Surfaces scheduled for Near White or Commercial Blast Cleaning shall have all welds, edges, and sharp corners ground to a 1/16-inch radius and all weld splatter removed, and sandblasted in accordance with Steel Structures Painting Council Specifications, removing mill scale, rust, dirt, paint, or other foreign matter, and shall be slightly roughened to form a suitable anchor pattern for the coating application. Do not leave blasted surfaces overnight before coating. Remove all sand from the surface by brush or industrial vacuum.
- D. All other steel not scheduled for blast cleaning shall have all weld splatter removed, and rough edges and rough welds ground, and shall be cleaned by means of hand or power tools, in accordance with Steel Structures Painting Council Specification No. 2 or No. 3, removing all loose mill scale rust, dirt, paint, or other contaminants. Blast cleaning may be used if practical. The remaining mill scale, rust, and paint must be sufficiently abraded to provide for good bonding of the coating.
- E. Field blast cleaning for all surfaces shall be dry method unless otherwise directed.
- F. Particle size of abrasives used in blast cleaning shall be that which will produce a 2 mil (50.0 microns) surface profile or in accordance with recommendations of the manufacturer of the specified coating or paint system to be applied.
- G. Abrasive used in blast cleaning operations shall be new, washed, graded and free of contaminants that would interfere with adhesion of coating or paint and shall not be reused unless specifically approved by the Engineer.
- H. During blast cleaning operations, caution shall be exercised to insure that existing coatings or paints are not exposed to abrasion from blast cleaning.
- I. The Contractor shall keep the area of his work in a clean condition and shall not permit blasting materials to accumulate as to constitute a nuisance or hazard to performance of work or operation of existing facilities.
- J. Blast cleaned surfaces shall be cleaned prior to application of specified coatings or paints by a combination of blowing with clean dry air, brushing/brooming and/or vacuuming as directed by the Engineer.
- K. All welds shall be cleaned with a suitable chemical compatible with the specified coating materials.
- L. Specific Surface Preparation: Surface preparation for the specific system shall be as designated in the Systems Index, Part 2.05 of these specifications.
- M. Application SSPC specifications are as follows:

1. Solvent Cleaning (SSPC-SP1): Removal of oil, grease, soil and other contaminants by use of solvents, emulsions, cleaning compounds, steam cleaning or similar materials and methods which involve a solvent or cleaning action.
2. Hand Tool Cleaning (SSPC-SP2): Removal of loose rust, loose mill scale and other detrimental foreign matter to degree specified by hand chipping, scraping, sanding, and wire-brushing.
3. Power Tool Cleaning (SSPC-SP3): Removal of loose rust, loose mill scale and other detrimental foreign matter to degree specified by power wire-brushing, power impact tools or power sanders.
4. White Metal Blast Cleaning (SSPC-SP5): Blast cleaning to a gray-white uniform metallic color until each element of surface is free of all visible residues.
5. Commercial Blast Cleaning (SSPC-SP6): Blast cleaning until at least two-thirds of each element of surface area is free of all visible residues.
6. Brush-Off Blast Cleaning (SSPC-SP7): Blast cleaning to remove loose rust, loose mill scale and other detrimental foreign matter to degree specified.
7. Near White Blast Cleaning (SSPC-SP10): Blast cleaning to nearly white metal cleanliness, until at least 95 percent of each element of surface area is free of all visible residues.

3.3 SURFACE PREPARATION, CONCRETE AND MASONRY

- A. Concrete and masonry shall cure at least 28 days and have a moisture content prior to coating or painting below 8 percent as measured by an instrument such as a Delmhorst Model DP, unless recommended otherwise by the paint manufacturer.
- B. All surfaces shall be thoroughly cleaned by abrasive blasting, wire-brushing or other approved methods, removing all traces of foreign materials. Remove all loose concrete and masonry by chipping or other approved methods to leave only a sound, firmly bonded substrate. Cracks and voids shall be repaired or filled as directed by the Engineer with approved suitable materials, mixed and applied in strict accordance with the Manufacturer's printed instructions. In general, final surface shall be smooth and free of voids, cavities, dirt, dust, oils, grease, or other contaminants.
- C. Where oil or grease deposits are present, prior to above surface preparation, clean surfaces by scrubbing with a solution of one and one-half ounces (44.4 ml) tri-sodium phosphate (TSP) and one and one-half ounces (44.4 ml) of non-sudsing detergent mixed into one gallon (3.785 liters) of warm water. Surfaces shall then be flushed clean with fresh water.
- D. Specific Surface Preparation: Surface preparation for the specific system shall be as designated in the Systems Index, Part 2.05 of these specifications.

3.4 SURFACE PREPARATION, WOOD AND COMPOSITION MATERIALS

- A. Wood and composite materials shall have a moisture content prior to coating or painting below 15 percent as measured by an instrument such as a Delmhorst Model BD-7, unless recommended otherwise by the paint manufacturer.
- B. All surfaces shall be thoroughly cleaned by use of mineral spirits, scrapers, and sandpaper or wire brushes to remove all dirt, oil, grease or other foreign substances. Finished surfaces exposed to view shall, if necessary, be made smooth by planing or sandpapering. Small, dry, seasoned knots shall be scraped, sandpapered, and thoroughly cleaned, and shall be given a thin coat of WP-578 Western Pine Association knot sealer before application of the priming coat. Large, open unseasoned knots, and all beads or streaks of pitch shall be scraped off, or if the pitch is still soft, it shall be removed with mineral spirits and the resinous area shall be thinly coated with knot sealer. After priming, all holes and imperfections shall be filled with putty or plastic wood (colored to match the finish wood), allowed to dry, and sandpapered smooth. Painting of interior wood and composite materials shall proceed insofar as practicable, only after masonry work has dried. Existing surfaces shall be cleaned of all loose or flaking paint and sandpapered as required.
- C. Specific Surface Preparation: Surface preparation for the specific system shall be as designated in the Systems Index, Part 2.5 of this section.

3.5 COATING APPLICATION

- A. Coating and paint application shall conform to the requirements of the Steel Structures Painting Council Paint Application Specifications SSPC-PA1, latest revision, for "Shop, Field and Maintenance Painting", and recommended practices of the National Association of Corrosion Engineers, the American Concrete Institute, the Forest Products Research Society and the Manufacturer of the paint and coating materials.
- B. Before applying any paint or finish, all surfaces shall be thoroughly cleaned and prepared for painting as herein specified. All cleaned metal shall be primed or painted, as specified, immediately after cleaning to prevent new rusting or oxidation of cleaned surfaces.
- C. Protective coverings or drop cloths shall be use to protect floors, fixtures, and equipment. Care shall be exercised to avoid lapping on glass or hardware. Coatings and paints shall be sharply cut to lines. Finished surfaces shall be free from defects or blemishes.
- D. Application – Environmental Conditions
 - 1. Do not paint surfaces that exceed manufacturer specified moisture contents or when none, the following moisture contents:
 - a. Plaster and Gypsum Wallboard: 12 percent.
 - b. Masonry, Concrete and Concrete Block: 8 percent.
 - c. Interior Located Wood: 15 percent.
 - d. Concrete Floors: 7 percent.

2. Do not paint or coat:
 - a. Under dusty conditions.
 - b. When light on surface measures less than 15 foot-candles.
 - c. When ambient or surface temperature is less than 40 degrees Fahrenheit.
 - d. When relative humidity is higher than 85 percent.
 - e. When surface temperature is less than 5 degrees Fahrenheit above dew point.
 - f. When surface temperature exceeds the manufacturer's recommendation.
 - g. When ambient temperature exceeds 90 degrees Fahrenheit, unless manufacturer allows a higher temperature.
 3. No coating work shall be done under unfavorable weather conditions to wet or damp surfaces or in rain, snow, fog or mist.
 4. When it is expected the air temperature will drop below 40 degrees F or less than 5 degrees F above the dewpoint within eight hours after application of coating or paint.

Dewpoint shall be measured by use of an instrument such as a Sling Psychrometer in conjunction with the US Department of Commerce Weather Bureau Psychrometric Tables.

If above conditions are prevalent, coating or painting shall be delayed or postponed until conditions are favorable, unless conditions are acceptable to the paint manufacturer for any given coating. The days coating or painting shall be completed in time to permit the film sufficient drying time to prevent damage by atmospheric conditions.
 5. Provide fans, heating devices, or other means recommended by coating manufacturer to prevent formation of condensation or dew on surface of substrate, coating between coats and within curing time following application of last coat.
 6. Provide adequate continuous ventilation and sufficient heating facilities to maintain minimum 45 degrees Fahrenheit for 24 hours before, during and 48 hours after application of finishes.
- E. All painting shall be well applied, leaving no sags, laps, brush, or other defects. Each coat must thoroughly dry before applying next coat, and all work must be carefully cut into a true line and left smooth and clean. Hardware trim and other items shall be removed as required for proper application of coatings.

All painting shall conform to the following general conditions:

1. Thickness of coating in mils shall mean the dry film thickness. The number of coats specified shall mean the minimum number of coats to be used. Additional coatings shall be required if necessary to obtain the specified film thickness.
2. No coating work shall be done under unfavorable weather conditions.

3. Prime coats shall be provided where called for as a part of the painting system. Shop prime coats shall conform to the specified painting system for the given item. It shall be the responsibility of the Contractor to coordinate work so that factory prime items are primed or painted with a coating compatible with the specified finish painting system.
4. Particular attention shall be given to all welds, edges, and corners so as to get full and adequate coverage. Damaged shop prime coats or field applied prime coats shall be carefully replaced before finish painting. Surface preparation for replacement of damaged coats shall be such as to give a clean surface for proper bonding of prime coat. Finish coatings shall not be applied until touch-up prime coat has completely dried.
5. Minimum between-coat drying items, as stated in the printed instructions of the coating manufacturer will be carefully observed.
6. Thinning shall be done only if necessary for workability of the coating material in accordance with the manufacturer's printed instructions. Use only the appropriate thinner.
7. Each coat shall be applied in a similar but different color from the preceding coat, the finish coat to be color selected by the Engineer.

3.6 SPECIAL REQUIREMENTS FOR GALVANIZED AND NON-FERROUS METALS

Where galvanized or non-ferrous metals are scheduled to be painted, the surface shall be brush blasted in accordance with SSPC-SP7 before finish is applied. Do not remove the galvanized coating. Damaged areas should be repaired with an appropriate zinc-rich primer, such as Tnemec Series 90-97.

3.7 INSPECTION

A. Inspection - General:

Concrete, plastic and wood surfaces shall be visually inspected to insure specified coverage has been attained. Where destructive testing is deemed necessary, an instrument such as a Tooke Gage shall be used. Thickness of coatings and paints on metal surfaces shall be checked with a non-destructive type thickness gauge. Coating integrity shall be tested with an approved inspection device. Holiday detection shall be performed prior to the application of aluminum or metallic finish coats. Holiday detectors shall not exceed the voltage recommended by the manufacturer of the coating system. For film thickness between 10 and 20 mils, a non-sudsing type wetting agent such as Kodak Photo-Flo shall be added to the water prior to wetting the detector sponge. All pinholes shall be marked, repaired in accordance with the manufacturer's recommendations and retested. No pinholes or other irregularities will be permitted in the final coating.

In cases of dispute concerning film thickness or holidays, the Engineer's calibrated instruments and measurements shall predominate. Wide film thickness discrepancies shall be measured and verified with a micrometer or other approved measuring instrument.

B. Inspection Devices:

The Contractor shall furnish, until final acceptance of coating and painting, inspection devices in good working condition for detection of holidays and measurement of dry-film thickness of coating and paint. The Contractor shall also furnish US Department of Commerce; National Bureau of Standards certified thickness calibration plates to test accuracy of dry-film thickness gauge and certified instrumentation to test accuracy of holiday detectors.

Dry-film thickness gauges and holiday detectors shall be made available for the Engineer's use at all times until final acceptance of application. Holiday detection devices shall be operated in the presence of the Engineer.

Acceptable devices for ferrous metal surfaces include, but are not limited to Tinker-Razor Model M-1 holiday detector for coatings to 20 mils dry film thickness, Tinker-Razor Models AP and AP-W holiday detectors for coatings in excess of 20 mils dry-film thickness, and Mikrotest or Positest unit for dry-film thickness gauging. Non-ferrous metal surfaces shall be checked with an instrument such as an Elcometer "Eddy Current" Tester or De Felsko Model 252. Inspection devices shall be operated in accordance with the manufacturer's instructions.

3.8 SAFETY AND HEALTH REQUIREMENTS

- A. General: In accordance with requirements set forth by regulatory agencies applicable to the construction industry and Manufacturer's printed instructions and appropriate technical bulletins and manuals, the Contractor shall provide and require use of personnel protective lifesaving equipment for persons working in or about the project site.
- B. Head and Face Protection and Respiratory Devices: Equipment shall include protective helmets which shall be worn by all persons in the vicinity of the work. In addition, workers engaged in or near the work during abrasive blasting shall wear eye and face protection devices and air purifying, half-mask or mouthpiece respirator with appropriate filter. Barrier creams shall be used on any exposed areas of skin.
- C. Ventilation: Where ventilation is used to control hazardous exposure, all equipment shall be explosion-proof. Ventilation shall reduce the concentration of air contaminant to the degree a hazard does not exist. Air circulation and exhausting of solvent vapors shall be continued until coatings have fully cured.

- D. Sound Levels: Whenever the occupational noise exposure exceeds maximum allowable sound levels, the Contractor shall provide and require the use of approved ear protective devices.
- E. Illumination: Adequate illumination shall be provided while work is in progress, including explosion-proof lights and electrical equipment. Whenever required by the Engineer, the Contractor shall provide additional illumination and necessary supports to cover all areas to be inspected. The level of illumination for inspection purposes shall be determined by the Engineer.
- F. Temporary Ladders and Scaffolding: All temporary ladders and scaffolding shall conform to applicable safety requirements. They shall be erected where requested by the Engineer to facilitate inspection and be removed by the Contractor to locations requested by the Engineer.

3.9 PRESERVATION

During construction, painter shall assume the preservation of all his work against damage by accident or otherwise, and shall leave the work clean and whole. The work will not be accepted until all of the work has been completed and all retouching has been done. All work which is rejected, or for any reason has to be done over, will be done by the Contractor at his expense.

3.10 CLEANING

During the progress of the work, all other work shall be covered and fully protected from injury or painter's finish, and care shall be exercised not to splatter paint, enamel, etc., on adjacent work. Upon completion of the work, all staging, scaffolding and containers shall be removed from the site or destroyed in a manner approved by the Engineer. Name and data plates on equipment shall not be painted and shall be left clean and legible upon completion of the project. All damage to surfaces resulting from the work of this section shall be cleaned, repaired, or refinished to the satisfaction of the Engineer at no expense to the Agency.

3.11 SURFACES REQUIRING PAINTING

In general, the following surfaces are to be coated or painted:

- A. All exposed metal surfaces and piping, interior and exterior.
- B. All submerged or buried metal and some submerged concrete and masonry surfaces, as scheduled.
- C. All structural and fabricated steel, including tanks and equipment and galvanized structural steel.

- D. The interior of certain tanks and wet wells as specified in the schedule.
- E. Exterior aboveground concrete and masonry, as scheduled.
- F. The interior of certain structures as specified in the Schedule.
- G. Equipment furnished without factory finish surfaces.
- H. Equipment furnished with factory finished surfaces to match pipe service color.
- I. Fusion epoxy lined and coated steel piping and equipment to match pipe service color.
- J. Dissimilar Materials: Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of bituminous paint conforming to MIL-C-18480 or to TT-V-51 or a coat of zinc chromate primer conforming to TT-P-645 to prevent galvanic or corrosive action.

3.12 SURFACES NOT REQUIRING PAINTING

- A. Unless otherwise indicated, painting is not required on surfaces in concealed areas and inaccessible areas such as furred spaces, foundation spaces, utility tunnels, pipe spaces, and on buried piping.
- B. Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze, and similar finished materials will not require painting under this Section except as scheduled and defined below.
 - 1. All stainless-steel parts/equipment, after its fabrication, shall undergo a passivation (pickling) process to ensure maximum resistance to corrosion. All stainless-steel components and structures shall be submersed in a chemical bath of nitric acid and hydrofluoric acid to remove any residues that may be present on the material as a result of forming, manufacture, or handling. After removal from the pickling bath, the equipment must be washed with a high-pressure wash of cold water to remove any remaining surface debris and promote the formation of an oxidized passive layer which is critical to the long life of the stainless steel. Submergence insures complete coverage. Spray on chemical treatments and glass bead blasting are specifically not acceptable due to their inability to provide complete and uniform corrosion protection. All field welds shall be cleaned and passivated to remove iron (and prevent corrosion) in accordance with ASTM A380.
- C. Portions of metal embedded in concrete, except for aluminum surfaces.
- D. Electrical equipment with factory applied finish.

- E. Do not paint moving parts of operating units; mechanical or electrical parts such as valve operators; linkages; sensing devices; and motor shafts, unless otherwise indicated.
- F. Do not paint over required labels or equipment identification, performance rating, name, or nomenclature plates.

3.13 FINISH SCHEDULE

The following is a partial schedule and does not including industrial coatings and architectural coatings, it does not include all surfaces that require coatings. Coat unlisted surfaces with the same coating system as similar listed surfaces. Additional coating requirements are included with the architect's drawings and specifications for the buildings. Color selection shall be made by the Owner and provided in returned Contractor's Paint Submittal.

- A. System "A" Polymidoamine or Amine Cured Epoxy:
 - 1. Exterior of all submerged piping and valves except for stainless steel piping.
 - 2. Submerged pipe supports and hangers except for stainless steel.
 - 3. Exterior of submerged pumps, mixers, motors and other equipment.
 - 4. Bell rings and underside of manholes covers and frames.
 - 5. Sump pumps including the underside of base plates.
 - 6. Field priming of ferrous metals surfaces with defective shop prime coating or where no other prime coating is specified.
 - 7. Interior and exterior of exposed casing pipes used for the San Juan Highway/First Street canal crossing and the Prescott Road canal crossing.
 - 8. All other submerged iron and steel metal unless specified otherwise.
- B. System "B" Protective Coal Tar: Underground pipe flanges, corrugated metal pipe couplings, flexible pipe couplings, and miscellaneous underground metals not specified to receive another protective coating system.
- C. System "C" 100% Solids Epoxy: Not used.
- D. System "D" Polyamidoamine or Amine Cured Epoxy, Polyurethane:
 - 1. Grating and exposed sheet metal.
 - 2. Exterior piping, valves, pipe hangers and supports, electrical conduit, and other supports except for stainless steel (except for the exposed casing pipes used for the San Juan Highway/First Street canal crossing and the Prescott Road canal crossing, which shall be System "A").
 - 3. Valve and gate operators and stands.

4. Structural steel including galvanized steel.
 5. Process equipment (not submerged) including pumps, motors, equipment guards, equipment supports and other miscellaneous metals at the Primary Pump Station, Storage Pump Station, headworks, and Chemical Feed System except for stainless steel and aluminum.
 6. Cranes.
 7. Exposed PVC piping and valves.
 8. Electrical antenna masts and supports.
 9. Exterior electrical cabinets, boxes, and exposed conduits that are not factory painted.
 10. All primed structural steel members
 11. All other miscellaneous exposed metals and plastics unless specified otherwise.
- E. System "E" Polyamidoamine Epoxy: Interior non-submerged piping (except for the exposed casing pipes used for the San Juan Highway/First Street canal crossing and the Prescott Road canal crossing, which shall be System "A"), valves, pipe hangers and supports, and exposed interior electrical conduits, and other supports at all process areas except for stainless steel and aluminum.
- F. System "F" Acrylic Epoxy: Not used.
- G. System "G" Modified Aliphatic Amine Epoxy: Not used.
- H. System "H" Aliphatic Polyurethane: Not used.
- I. System "I" Acrylic, Semi-Gloss: Not used.
- J. System "J" Resinous Flooring: Not used.
- K. System "K" Polyurea Elastomer: Not used.
- L. System "L" High Build Acrylic: Not used.
- M. System "M" Heat Resistant Aluminum Coatings: Not used.
- N. System "N" Emulsified Asphalt Coating (see Section 07110): Exterior buried walls for waterproofing and exterior of buried walls for damp proofing of all below grade structures that require coating as defined within this specification, including the structures identified under System "C", manhole exteriors, and valve and meter vaults exteriors, and pigging station vault exteriors.

- O. System "O" Aromatic Elastomeric Polyurethane, or Epoxy: Submerged ferrous metals subject to abrasion.
- P. System "P" Polyamide Epoxy/Acrylic: Not used.
- Q. System "Q" Vinyl Ester: Not used.
- R. System "R" Epoxy (Interior): Not used.
- S. System "S" Zinc-Rich Aromatic Urethane/Polyamidoamine Epoxy (Exterior): Not used.
- T. System "T" Flexible Polyurethane: Not used.
- U. System "U" Fiber-reinforced Modified Polyamine Epoxy: Not used.
- V. System "V" Fusion Epoxy: Not used.
- W. System "W" Self-Crosslinking Acrylic: Primed primary and secondary structural steel members. For exterior buildings, top coat with system "D".
- X. System "X" Semi Gloss Silicone Trim Enamel: Primed and unprimed exterior switchgear.
- Y. System "Y" Semi Gloss Alkyd Enamel: Not used. System "Z" Low Solids Acrylic: Not used.
- Z. System "AA" Polyamidoamine Epoxy: Ductile Iron Piping as defined in specification section 15062.
- AA. System "AB" Cementitious Manhole Rehabilitation. See Specification 02961. Apply to the existing Hollister Domestic WWTP Manhole B10-1 (upstream of influent pump station), and the Storage Pump Station wet well, influent channels and valve vault.

END OF SECTION

SECTION 10400

IDENTIFYING DEVICES

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of providing safety signs, identifying devices for structures, piping, valves, and underground warning tapes for buried utilities.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 - Submittals
- B. Section 02229 – Utility Line marking
- C. Section 15010 - General Process and Onsite Utility Piping Provisions
- D. Section 16010 - General Electrical

1.3 SUBMITTALS

- A. In accordance with Section 01300.
- B. Samples of sign materials, colors and exterior letters, along with manufacturer's literature and shop drawings.
- C. Submit a complete schedule of all signs, including sign label, type, location and support.

PART 2 MATERIALS

2.1 SIGNS - GENERAL

- A. Colors, legends, and layout shall conform to OSHA 1910.145 requirements.
- B. Overall size of signs 10 inches X 14 inches.

- C. Material: 1/8-inch thick high performance plastic with over-laminate or rigid fiberglass with printed message and background sealed within a fiberglass resin, suitable for outdoor weather conditions. Seton Name Plate Corporation, New Haven, CT 06505; W.H. Brady Company, Milwaukee, WI 53201, or equal.

2.2 "DANGER" SIGNS

Two-inch high white letters "Danger" in red oval surrounded by a rectangular black field. Text wording 1½-inch high black capital letters on white field.

No. of Signs Required	Text Wording	Placement
3	"HIGH VOLTAGE"	1 Per Electrical Area
3	"EQUIPMENT STARTS AUTOMATICALLY"	Determined Later
4	"CONFINED SPACE, ENTER BY PERMIT ONLY"	Primary Pump Station, Storage Pump Station and Headworks, and Pig Receiving/Launching Stations
1	"NO SMOKING, MATCHES OR OPEN LIGHTS"	Generator Area
1	"DIESEL"	Generator Area
2	"WATER MAY FLOW AT ANYTIME"	2 at Emergency Storage Basin Inlets

2.3 "CAUTION" SIGNS

Two-inch high yellow letters "Caution" on black field. Text wording 1½-inch high black capital letters on yellow field.

No. of Signs Required	Text Wording	Placement
1	"EYE PROTECTION REQUIRED"	Chemical Feed Area
1	"CHEMICALS CAUSE BURNS - WASH EYES OR BODY IMMEDIATELY"	Chemical Feed Area
1	"IF SPILL OCCURS - SPRAY OFF TIRES & FLOOR TO DRAIN"	Generator Area

2.4 CHEMICAL PRECAUTIONARY SIGNS

- A. In accordance with ANSI Z129.1.
- B. 7-inch x 10-inch minimum size.
- C. Made to withstand most chemicals. Ultraviolet inhibitors and clear face coating for resisting fading and scratching. Semi-rigid linear polyethylene. Provide Seton Ultra Tuff material MO759 or equal.

- D. As manufactured by Seton name Plate Corporation, Brady Company, or equal.
- E. Background color shall be the same as chemical piping and print color is white.
- F. Provide the following signs:

No. of Signs Required	Text Wording	Placement
2	"CALCIUM NITRATE"	Chemical Feed Area; Fill Area
1	"DIESEL"	Generator Area

2.5 "SAFETY" SIGNS

Two-inch high red letters on white field. Text wording 1-½-inch high black capital letters on red field.

No. of Signs Required	Text Wording	Placement
1	"EYEWASH STATION"	Control Building
2	"EYEWASH STATION TEMPORARY POST"	Chemical Fill Station and Chemical Feed Area

2.6 STRUCTURE IDENTIFICATION SIGNS

- A. 3-ply melamine plastic, F.S. L-P-387A, Type NDB, 1/8-inch thick, Best Manufacturing Company, Kansas City, MO 64109; Architectural Graphic Systems, San Francisco, CA 94105, or equal.
- B. Overall Size: 2-inches high by 24-inches wide minimum; all edges and corners square.
- C. Lettering: engraved 1-inch high; similar to "Helvetica Medium" capital letters.
- D. Colors: as selected by Engineer.
- E. Location: for outdoor weather conditions. Specific location determined later.

F. Provide the following signs:

No. of Signs Required	Text Wording
1	"CHEMICAL FEED SYSTEM"
1	"PRIMARY PUMP STATION"
1	"STORAGE PUMP STATION"
1	"PIG LAUNCH STATION 1"
1	"PIG RECIVING/LAUNCH STATION 2"
1	"PIG RECEIVING/LAUNCH STATION 3"
1	"PIG RECEIVING STATION 4"

2.7 IDENTIFICATION OF PIPING AND VALVES

A. Piping:

1. Plastic markers for coding pipe shall conform to ANSI A13.1 and shall be as manufactured by W.H. Brady Company, Seton Name Plate Corporation, or equal. Markers shall be the mechanically attached type that are easily removable; they shall not be the adhesive applied type. Markers shall consist of pressure sensitive legends applied to plastic backing which is strapped or otherwise mechanically attached to the pipe.
2. Plastic zip ties shall not be allowed for fastening.
3. Legend and backing shall be resistant to petroleum based oils and grease shall meet criteria for humidity, solar radiation, rain, salt, fog and leakage fungus, as specified by MIL-STD-810C. Markers shall withstand a continuous operating temperature range of -40°F to +180°F, for aeration piping provide temperature rating up to 300°F. Plastic coding markers shall not be the individual letter type but shall be manufactured and applied in one continuous length of plastic.

Markers shall be provided in the following letter heights:

Outside Pipe Diameter (inches*)	Letter Height (inches)
Less than 1.5	1/2
1.5 through 6	1/2 - 1
Greater than 6	1 - 2

* Outside pipe diameter shall include insulation and jacketing.

4. In addition, pipe markers shall include uni- and bi-directional arrows in the same sizes as the legend.
5. Colors of identification and letters shall comply with the legend below and with ANSI A13.1. See Section 15010 for color code usage.

Pipe Identification Color	Background Color	Color of Lettering/Arrows
1	Yellow	Black
2	Green	White
3	Blue	White

6. All exposed pipes shall have a color indicator band around the circumference of the pipe, placed every 10-feet (width to be same as shown in paragraph 2.7.A.3). Colors bands shall comply with the following legend:

Process Pipe	Color Band	Ameron Paint #	Tnemec Paint #	Carboline Paint #
Potable Water	Safety Blue			S150
Non-Potable Water	Open Sky			5141
Chemical	Safety Orange	OR-2	SC-03	4444
Chemical Conduit	Safety Orange	OR-2	SC-03	4444
Chemical Drain	Safety Orange	OR-2	SC-03	4444
Drains	Gray	ANSI-70		2758
Overflow	Gray	ANSI-70		2758
Raw Sewage	Green			9218
Vent	Gray	ANSI-70		2758
Bollards	Safety Yellow	YE-3		6666
Other Process Pipes	Tan	RT-8205		

B. Gate and Valves:

- Gate and valve tags shall be 2½ inches by 2½ inches (or 4” long by 1.5” wide), custom engraved (one side) plastic for interior labels and anodized aluminum for exterior. Provide three lines engraving, up to eight characters per line. Background colors shall be red, blue, yellow, or green, as specified. Wording to be specified at a later date. Valve tag colors to correspond to piping identification colors, identified above, and conform to ANSI A13.1. For all exterior aluminum labels, provide engraving and gray/silver color background.
- Gate and valve tags shall be as manufactured by Seton Nameplate Corporation, New Haven, Connecticut; Emed Company, Buffalo, NY; or equal.

C. Equipment and Electrical Tags:

- Electrical conduits, equipment, and devices shall be identified in accordance with specification section 16010 and 11010.

2.8 UNDERGROUND WARNING TAPE

- A. Underground warning tape shall be installed for all buried pipelines and utility services.
- B. Warning tape shall conform to the materials specifications provided in section 02229.

PART 3 EXECUTION

3.1 MOUNTING SAFETY AND CHEMICAL SIGNS

- A. Install the signs at the locations designated by the Engineer.
- B. Mount signs with top of the sign 5'-6" above the floor.
- C. Secure with No. 10 stainless steel screws, providing expansion shields for concrete.
- D. Plastic ties shall not be used for fastening.
- E. Mounting holes in signs shall be oversized to allow signs to "float" free.

3.2 MOUNTING STRUCTURE IDENTIFICATION SIGNS

- A. Where no door, wall or post is present, a post shall be installed in accordance with typical detail C540 and located as directed by the engineer and the sign mounted thereto. Signs shall be anchored to post as described in typical detail C520.
- B. Allow for posts, per typical detail C540, to support signage identified in the above tables.

3.3 IDENTIFYING DEVICES FOR PIPING AND VALVES

- A. Piping: Identify all piping at approximately 10-foot centers and in general, at each valve and piece of equipment, but not less than once in each room whether or not concealed.
- B. Install valve tags on all process and main utility valves. Tags are not required on hose bibs, faucets, and similar applications. Attach tags to handwheel or stem using stainless steel cable and SST end crimps; submit for approval.

3.4 UNDERGROUND WARNING TAPE

Underground warning tape shall be installed in accordance with the details provided in section 02229.

END OF SECTION

SECTION 11010

GENERAL MECHANICAL EQUIPMENT PROVISIONS

PART 1 GENERAL

1.1 DESCRIPTION

This section contains items that pertain to all mechanical work.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01610 – Seismic Design Criteria
- B. Section 01010 - General Construction Information and Requirements
- C. Section 01020 - Modifications to Existing Facilities and Order of Work
- D. Section 01300 - Submittals
- E. Section 03100 - Concrete
- F. Section 09900 - Painting
- G. Section 15080 - Piping Accessories and Appurtenances
- H. Section 16010 - Electrical

1.3 WORK INCLUDED

The work consists of completely installing the mechanical systems as shown on the drawings and specified in other sections.

1.4 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies: Comply with all applicable codes, rules, and regulations.

- B. References: Comply with referenced standards as listed in the individual sections.
- C. Fees and Permits: Obtain required permits necessary to execute the work under this division.
- D. All pressure vessels, safety devices and appurtenances shall comply with standards of and bear stamp of ASME.
- E. All electrical devices and wiring shall comply with standards of NEC. All devices shall be UL listed and so identified.
- F. Testing: All mechanical equipment shall undergo the minimum factory and field testing as specified herein and Section 01010. Additional testing requirements over and above those specified herein may be included in the individual equipment specifications. These requirements shall be considered complimentary to the minimum requirements specified herein.

1.5 DRAWINGS

Drawings are diagrammatic and show the general design, arrangement and extent of the systems. Do not scale drawings for roughing in measurements, nor use as shop drawings. Make field measurements and prepare shop drawings as required. Coordinate work with shop drawings of other specification divisions.

1.6 SUBMITTALS: IN ACCORDANCE WITH SECTION 01300

- A. Detailed submittal requirements are given in the individual sections.
- B. Contractor shall investigate the capacity and space requirements of the proposed equipment before submitting shop drawings.
- C. Factory test reports shall be submitted for acceptance prior to shipment of the equipment to the job site. Field test reports shall be submitted for acceptance prior to final acceptance of the equipment.
- D. Factory test procedures shall be submitted to the engineer for approval prior to commencement of any factory testing.
- E. Seismic and structural anchoring calculations shall be submitted to the engineer for approval prior to installation of equipment.
- F. Operation and Maintenance manuals shall be submitted to the engineer for approval prior to acceptance of equipment, in accordance with specification section 01680.

1.7 WARRANTY

A supplier's written warranty shall be provided for the equipment specified in this section. The warranty shall be for a minimum period of one (1) year for start-up or 18 months from time of equipment shipment, whichever comes first, unless stated otherwise in the specific equipment specification.

1.8 PRODUCT HANDLING

Protect material, equipment, and apparatus provided under this section from damage, water and dust, both in storage and installed, until final acceptance. Provide temporary storage facilities for material and equipment. Material, equipment, or apparatus damaged because of improper storage or protection will be rejected. See Section 01640.

1.9 JOB CONDITIONS

A. Special Requirements:

1. Maintain emergency and service entrances usable to pedestrian and vehicle traffic at all times. Where trenches are cut, provide adequate bridging for traffic.
2. Coordinate shutdown of water, wastewater, or heating systems.

B. Schedule of Work: Arrange work to comply with schedule of construction. In scheduling, anticipate means of installing equipment through available openings in structure. See Section 01020.

C. Protection:

1. Completely cover motors and other moving machinery to protect from dirt, dust, and water during construction.
2. Cap all openings in pipe and ductwork to protect against entry of foreign matter.
3. Protect premises and work of other divisions from damage arising out of installation of work of this division.
4. Perform work in manner precluding unnecessary fire hazard.

1.10 SPECIAL TOOLS

At completion of project, provide one set of special tools required to operate, adjust, dismantle, or repair any equipment of this division, as specified in the individual sections for specific pieces of equipment. Special tools mean those not normally found in possession of mechanics or maintenance personnel.

PART 2 MATERIALS

2.1 GENERAL

- A. All the mechanical equipment to be shipped disassembled shall be assembled in the manufacturer's shop to insure proper fitting of parts, then match-marked for erection, and disassembled for shipment.
- B. Contractor shall be responsible for locating and installing sleeves, inserts, and supports as required during the stages of construction.
- C. Contractor shall be responsible for making minor changes in the piping, and equipment locations due to structural obstructions or conflicts with work specified in other divisions.

2.2 FABRICATED STEEL

- A. All steel members used in the fabrication of the equipment shall conform to the requirements or "Specifications for Structural Steel". ASTM A36. All stainless steel shall be Type 316 unless otherwise specified.
- B. Design and fabrication of Structural Steel Members shall be in accordance with the latest edition of AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel Plates, Bars and Strip," Designation A-123, or of the ASTM Standard Specifications for Zinc Coating (Hot Dip) or Iron and Steel Hardware, Designation A153067, as appropriate for Buildings. All welding shall conform to the latest standards of the American Welding Society.
- C. All parts shall be amply proportioned for all stresses which may occur during fabrication, erection, and operation.
- D. All stainless-steel parts/equipment, after its fabrication, shall undergo a passivation (pickling) process to ensure maximum resistance to corrosion. All stainless-steel components and structures shall be submersed in a chemical bath of nitric acid and hydrofluoric acid to remove any residues that may be present on the material as a result of forming, manufacture, or handling. After removal from the pickling bath, the equipment must be washed with a high-pressure wash of cold water to remove any remaining surface debris and promote the formation of an oxidized passive layer which is critical to the long life of the stainless steel. Submergence insures complete coverage. Spray on chemical treatments and glass bead blasting are specifically not acceptable due to their inability to provide complete and uniform corrosion protection.

2.3 BOLTS, NUTS, AND WASHERS

Bolts for the equipment assembly shall be hexagonal, refined bar iron, except where the equipment body is stainless steel, aluminum, or bronze alloy, the bolts shall be the same corrosion resistant material. Nuts shall be hexagonal, of the same metal as the bolts. All threads shall be clean cut and shall conform to US Standard B1.1 for Unified Screw Threads.

2.4 NAMEPLATES

Equipment nameplates shall be engraved or stamped on stainless steel and fastened to the equipment in an accessible location with oval head stainless steel screws or drive pins. Nameplates to have ¼-inch letters with Equipment Name and number as shown on "I Series" Contract Drawings.

2.5 EQUIPMENT MOUNTS, GROUTING, AND VIBRATION ISOLATION

- A. Where a steel or cast base is shown between the equipment and a concrete pedestal, it shall be painted after fabrication in conformance with applicable provisions of Section 09900. It also shall be equipped with drain pans and drain connections, where applicable.
- B. All concrete plan dimensions for bases or pedestals shall be at least 6 inches larger in each dimension than the steel or cast base so that the distance between the anchor bolt and edge of concrete is at least 3 inches. Conduits, piping connections, drains, etc., shall be installed as shown on the Drawings, and/or standard mechanical details.
- C. Where specified or noted in the Drawings, the equipment including the base, shall be mounted on or suspended from vibration isolators to prevent the transmission of vibration and mechanically transmitted sound to the supporting structure. Vibration isolation available internally in the equipment unit is not equivalent and shall not be provided when vibration isolation as specified herein is required. Normally provided internal vibration isolators need be replaced with rigid supports in such cases.
- D. Details of the vibration isolators where required by certain units of mechanical equipment are included in the Specifications for furnishing and installing those units.
- E. Furnish all necessary materials and construct suitable raised concrete foundations for all equipment installed, even though such foundations may not be indicated on the Drawings. The tops of foundations shall be at such elevations as will permit grouting as specified below.
- F. In setting pumps, motors, and other items of equipment customarily grouted, make an allowance of at least one inch for grout under the equipment bases. All shims shall be removed. Unless otherwise approved, all grout shall be an approved non-shrink grout.
- G. Grout shall be mixed and placed in accordance with the Manufacturer's installation instructions and/or Section 03100, whichever is more stringent. Where practicable, the grout shall be placed through the grout holes in the base and worked outward and under the

edges of the base and across the rough top of the concrete foundation to a peripheral form so constructed as to provide a suitable chamfer around the top edge of the finished foundation.

- H. Where such procedure is impracticable, the method of placing grout shall be as approved. After the grout has hardened sufficiently, all forms, hoppers and excess grout shall be removed, and all exposed grout surfaces shall be patched in an approved manner, if necessary, given a burlap-rubbed finish, and painted with at least two coats of an approved paint.
- I. Equipment control panels and electrical devices and instrumentation mountings shall be provided as shown and as referenced in Division 17.

2.6 ANCHOR BOLTS

- A. Anchor bolts for all equipment and appurtenances shall be furnished and installed as specified herein and/or as shown on the Drawings. Anchor bolt holes in equipment support frames shall not exceed the bolt diameters by more than 25 percent, up to a limiting maximum over-sizing of 1/4-inch. Minimum anchor bolt diameter shall be 1/2 inch. All anchor bolts shall be furnished with leveling nuts, the faces of which shall be tightened against flat surfaces as shown to not less than 10 percent of the bolt's safe tensile stress.
- B. See Specification Section 01610 for anchor bolt design.
 - 1. All equipment inside water bearing structures shall also be designed to withstand sloshing, in accordance with ACI 350.3 and Specification Section 01610. Contractor shall provide stamped and signed calculations to verify compliance.
- C. It shall be the responsibility of the equipment manufacturer to determine the number, size, and location of all anchor bolts to be set in concrete. Unless indicated otherwise on the drawings, anchor bolts, nuts, and washers shall be galvanized steel, except in wet or corrosive locations they shall be Type 316 stainless steel.
- D. Obtain anchor bolt templates from the equipment manufacturer to aid in locating anchor bolts in the concrete pad.
- E. No equipment shall be anchored to vertical or overhead structural elements without written approval of the Engineer.

2.7 SEISMIC CONSIDERATIONS

- A. Vibration-isolated equipment shall be provided with snubbers capable of retaining the equipment in its designated locations without any material failure or deformation of the snubbers when exposed to a vertical or horizontal force at the contact surface equal to 100

percent of the operating weight of the equipment. Air gaps between retainer and equipment base shall not exceed 1/4 inch.

- B. Inasmuch as most anchorage of equipment is to be made of poured-in-place concrete elements, it is imperative that types of anchorage be coordinated with the Contractor so that anchorage may be installed at time of pouring. If calculations and anchorage details are not submitted prior to pouring of concrete, the Contractor will become responsible for any strengthening of concrete elements because of superimposed seismic loading.
- C. All piping, raceways, ductwork, accessories, appurtenances, etc., furnished with equipment shall be anchored to resist a lateral seismic force of 40 percent of its operating weight without excessive deflection. This force shall be considered acting at the center of gravity of the piece under consideration.
- D. Piping with flexible connection and/or expansion joints shall be anchored such that the intended uses of these joints are maintained in the piping system.

2.8 BELT DRIVES

- A. V-belt with cast iron sheaves rated not less than 1-1/2 times motor horsepower.
- B. Multiple V-belts shall be matched sets.

2.9 SHAFT COUPLINGS

- A. Shaft couplings for direct connected electric motor driven equipment 1/2 horsepower or larger shall be non-lubricated type, designed for not less than 50,000 hours of operating life. Where requirements of the equipment dictate specialized features, the manufacturer may substitute the coupling normally supplied for the service.
- B. Coupling sizes shall be as recommended by the manufacturer for the specific application, considering horsepower, speed of rotation, and type of service. The use of couplings as specified herein shall not relieve the Contractor of his responsibility for precision alignment of all driver-driven units as specified by the equipment manufacturer.
- C. Couplings shall be of the pin and pre-loaded neoprene cylinder type, designed to accommodate shock loading, vibration and shaft misalignment or offset. Stub shafts shall be connected through collars or round flanges firmly keyed to their shafts, to neoprene cylinders held to individual flanges by through pins. Couplings with cylinders pinned to both coupling flanges will not be acceptable.

2.10 BEARINGS

- A. Unless otherwise specified all equipment bearings shall be oil or grease lubricated, ball or roller anti-friction type of standard manufacturer. Bearings shall be conservatively designed to withstand all stresses of the service specified and shall be selected on the basis of a 60 degrees C ambient temperature. Each bearing, except when otherwise noted, shall be rated in accordance with the latest revisions of AFBMA Methods of Evaluating Load Ratings of Ball and Roller Bearings for one of the following classes of B-10 rating life:

Class M1	8,000 hours of operation
Class M2	20,000 hours of operation
Class M3	50,000 hours of operation
Class M4	100,000 hours of operation
Class M5	200,000 hours of operation

- B. Unless otherwise noted, all process-associated equipment, including motors, drivers and driven units shall have, as a minimum, bearings for Class M3 life.
- C. All grease lubricated bearings, except those specified to be factory sealed and lubricated, shall be fitted with easily accessible grease supply, flush drain and relief fittings. Extension tubes shall be used when necessary. Grease supply fittings shall be standard hydraulic type designed for use with quick hydraulic couplings attached to grease guns. All equipment shall be equipped with an identical type of grease fittings, Alemite, Zerk, or equal.
- D. Oil lubricated bearings shall be equipped with either a pressure lubricating system or a separate oil reservoir type system. Each oil lubrication system shall be of sufficient size to safely absorb the heat energy normally generated in the bearing under a maximum ambient temperature of 60 degrees C and shall be equipped with a filler pipe and an external level indicator gauge. To avoid work hardening or "brinelling" damage from vibration, bearings shall be removed and shipped separately, or rotors shall be locked in place to prevent movement during transport.

2.11 GUARDS

- A. All exposed moving parts shall be protected with guards in accordance with the requirements of the State Division of Safety Standards.
- B. Belt guards shall be fabricated of 16 gauge, expanded metal or wire screen with 70 percent free area and steel frame, covered both sides. Provide visual inspection of moving parts and insertion of tachometer without removal of guard. Provide access door in guard to permit checking of belt tension. Guards shall be galvanized after fabrication and shall be designed to be readily removable to facilitate maintenance of moving parts.
- C. Shaft guards shall be solid 16 gauge galvanized steel, inverted "U" shape trough cover over entire length of exposed horizontal shafts, and tubular shape for vertical shafts. Extend cover to below bottom of shaft and couplings. Provide for lubrication of bearings without requiring removal of cover.

- D. All equipment with exposed moving parts which operates automatically or by remote control shall be identified by signs reading "CAUTION - AUTOMATIC EQUIPMENT - MAY START AT ANY TIME". Signs shall be 10 inches by 14 inches in size and shall be constructed of corrosion-proof material with a heavy-duty porcelain enamel finish or 1/8" thick butyrate or fiberglass. Letters shall be white in a red oval on a black background. Signs shall be installed near exposed moving parts.

2.12 ELECTRIC MOTORS

- A. Standards: Motors shall be built in accordance with IEEE Standards, NEMA Standard MGI, latest revision, and to the requirements specified herein. Where a conflict may exist, these specifications take precedence.
- B. Type: Motors specified herein are three-phase squirrel cage for 1/2 HP and above; or single-phase types for less than 1/2 HP; or D.C. for D.C. Variable Speed Drives.
- C. Rating: Each motor shall develop ample torque for its required service throughout its acceleration range at a voltage 10 percent below nameplate rating. Where detailed on the Electrical Drawings to be operated on a reduced voltage starters, the motor shall develop ample torque under the conditions imposed by the reduced voltage starting method. Each VFD shall be one horse power size larger than required motor size.
- D. The motor shall not be required to deliver more than its rated nameplate horsepower, at unity (1.0) service factor, under any condition of mechanical or hydraulic loading.
- E. All motors shall be continuous time rated suitable for operation in a 40 degrees C ambient unless noted otherwise.
- F. Specific motor data such as HP, Service Factor, RPM, enclosure type etc., is specified under the detailed specification for the mechanical equipment with which the motor is supplied.
- G. Single Phase Motors: Single phase 120, 208, or 230 volt motors shall have integral thermal overload protection or shall be inherently current limited.
- H. Thermostats: Where indicated or specified, winding thermostats shall be snap action, bi-metallic, temperature-actuated switch. Thermostats shall be provided with one normally closed contact. The thermostat switch point shall be pre-calibrated by the manufacturer. All inverter duty motors shall be provided with winding thermostats, unless RTDs are specified. All explosion-proof motors shall be provided with winding thermostats.
- I. See electrical specifications for additional details.

2.13 NAMEPLATES

The motor manufacturer's nameplates shall be engraved or stamped on stainless steel and fastened to the motor frame with stainless steel screws or drive pins. Nameplates shall indicate clearly all of the items of information enumerated in NEMA Standard MG1-10.38 or MG1-20.60, as applicable.

2.14 SUBMITTAL DATA

Submittal of motor data for acceptance shall include complete nameplate data in accordance with NEMA Standards cited above and, in addition, the following for motors 3 hp or larger:

- A. Ambient temperature rating.
- B. Service factor.
- C. Efficiency at 1/2, 3/4 and full load.
- D. Power factor at 1/2, 3/4 and full load.
- E. Motor outline, dimensions and weight.
- F. Descriptive bulletins, including full description of insulation system.
- G. Bearing design data.
- H. Special features (i.e., space heaters, temperature detectors, etc.).
- I. Wiring diagrams for motor power leads, over-temperature switch, heater and moisture monitoring.

2.15 CONDENSATION HEATERS

Condensation heaters, where specified under the detailed mechanical specifications shall be of the cartridge or flexible wrap around type installed within the motor enclosure adjacent to core iron. Heaters shall be rated for 120 V, single phase with wattage as required. The heater wattage and voltage shall be embossed on the motor nameplate. Power leads for heaters shall be brought out at the motor lead junction box.

2.16 WINDING TEMPERATURE DETECTORS

Where specified under the detailed mechanical specifications for individual equipment or on all A.C. motors to be connected to a variable speed drive, there shall be a factory installed winding temperature detector consisting of 3 thermostats (1 per phase) wired in series, with leads terminating in the main conduit box. This device shall protect the motor against damage for

overheating caused by single phase, over load, high ambient, abnormal voltage, locked rotor, frequent starts or ventilation failure. The protective device shall have normally closed contacts rated 120VAC, which opens on high motor temperature. Not less than two (2) sets of three (3) detectors shall be furnished with each motor requiring such detector with one left as a spare. Temperature detectors shall be TI Klixon 9700 series or equal.

2.17 SUBMERSIBLE TYPE 1 PROTECTION DEVICES

Where specified under the detailed mechanical specifications for individual equipment, furnish and install at the motor control center (unless indicated otherwise) a solid state device that provides a warning signal when the motor oil reaches a certain level of contamination by water. The contamination level is determined by measuring the resistivity of the motor oil bath. The resistivity shall be measured using a probe (di-electrode). The probe is connected to a lead, which runs back through the motor cables to the sensing device. The sensing device shall trip an auxiliary relay at low resistance (100K ohms or lower), to provide an alarm. The submersible Type 1 protection device shall be ABS Pumps Inc., Sealminder or equal.

2.18 SUBMERSIBLE TYPE 2 PROTECTION DEVICES

Where specified under the detailed mechanical specifications for individual equipment, furnish and install at the motor control center (unless indicated otherwise) a solid state protection device for monitoring the temperature and leakage detectors installed at the equipment. The solid state device shall operate on the current sensing principal whereby a change in temperature or leakage condition shall change the resistance of the associated sensor and thus alter the current in the sensing circuit. The protection device shall contain two sets of dry contacts, one for over temperature and one for leakage. The dry contacts will change state upon occurrence of an over temperature or leakage condition so as to shutoff the equipment on over temperature and provide an alarm for leakage. The submersible Type 2 protection device shall be Flygt, ITT Industries MiniCAS or equal.

2.19 SUBMERSIBLE TYPE 3 PROTECTION DEVICES

- A. Each pump shall be provided with its own self-contained control and status protection device module which shall be mounted within the motor control center (unless indicated otherwise). This module shall operate from a 24 VAC transformer furnished with module and shall provide a single point within the control system for pump sensor output processing. The protection device module shall have a manual reset so that the operator must locally restart the pump and thus be provided with local indication as to the cause of pump stoppage.
- B. The protection device module shall interface for the direct connection of all pump/motor internal monitoring devices by furnishing the module with four (4) 24 VAC Relays for the following functions.
 - 1. Stator winding over temperature protection (stops pump, local LED indication).

2. Stator leakage alarm (local LED indication and contacts for remote alarm indication).
 3. Lower bearing temperature protection (adjustable, stops pump, local LED indication).
- C. The submersible Type 3 protection device shall be Flygt, ITT Industries, CAS or equal.

2.20 SINGLE PHASE MOTORS

- A. General: Unless otherwise specified, motors smaller than 143T (1/2 hp) frame shall be single phase, capacitor start. Small fan motors may be split-phase or shaded pole type if such are standard for the equipment. Wound rotor or commutator type single-phase motors are not acceptable unless their specific characteristics are necessary for the application.
- B. Voltage: Motors shall be rated for operation at 115 volts, single phase, 60 Hz. Should unusual conditions require a three-phase motor on a frame smaller than 143T, it shall be designed for 200 volts, three phase, 60 Hz, but only after written approval has been received from the Engineer.
- C. Enclosure: Motors shall be totally-enclosed in conformity with NEMA Standard MG1-10.35. Small fan motors may be open type if suitably protected from moisture, dripping water and lint accumulation.
1. Locked rotor current shall not be greater than specified in NEMA Standard MG1-12.32, Design "N".
- D. Bearings: Motors shall be provided with sealed ball bearings lubricated for 10 years normal use.

2.21 THREE PHASE MOTORS - FRAMES 143T THROUGH 449T

- A. General: All motors 1/2 HP and larger shall be on a NEMA frame 143T or larger. Motors shall be designed and connected for operation on a 240 or 480 volt, 3 phase, 60 hertz alternating current system, as applicable. Dual voltage (230/460) rated motors are acceptable.
- B. All motors shall be NEMA Design B, normal starting torque unless noted otherwise, Starting KVA/HP (Locked rotor) shall not exceed the values given in NEMA Standard MG1-10.37. Motors shall be manufactured by US Motors, General Electric, Westinghouse, Reliance, or equal.
- C. Bearings: Anti-friction motor bearings shall be designed to be re-greasable and initially shall be filled with grease suitable for ambient temperatures to 40 degrees C. Bearings shall be AFBMA Types BC or RN, heavy duty, or shall otherwise be shown to be suitable for the intended application in terms of B-10 rating life, Class M3 or better.

1. All grease lubricated bearings, except those specified to be factory sealed and lubricated, shall be fitted with easily accessible grease supply, flush, drain and relief fittings. Extension tubes shall be used when necessary. Grease supply fittings shall be standard hydraulic type as manufactured by the Alemite Division of the Stewart-Warner Corporation.
- D. Insulation: Insulation systems shall be Class B or F (except as modified below) and shall be the manufacturer's premium grade, resistant to attack by moisture, acids, alkalies, and mechanical or thermal shock.
- E. Enclosures: Motors shall have a cast iron frame and cast iron or stamped steel conduit box. Conduit box shall be split from top to bottom and shall be capable of being rotated to four positions. Synthetic rubber like gaskets shall be provided between the frame and the conduit box and between the conduit box and its cover. Motor leads shall be sealed with a non-wicking non-hygroscopic insulating material. A pad with drilled and tapped hole, not less than 1/4-inch diameter, shall be provided inside the conduit box for a motor frame grounding stud.

Motors weighing more than 50 pounds shall be equipped with at least one lifting lug. All hardware shall be corrosion resistant. Motors shall be delivered with manufacturer's standard paint.

The following specific features are required in addition to the preceding general specifications for the motor enclosures noted:

1. Open Drip Proof - Manufacturer's standard design with Class B insulation, stamped steel motor lead junction boxes and 1.15 service factor (@ 40 degrees C).
2. Totally Enclosed Fan Cooled - TEFC motors shall include Class B insulation, cast iron junction box, 1.15 service factor (@ 40 degrees C) tapped drain holes (corrosion resistant plugs for frames 286T and smaller and automatic breather/drain devices for frames 324T and larger), upgraded insulation by additional dips and bakes to increase moisture resistance.
3. Explosion Proof - Explosion proof motors shall include Class B insulation, 1.15 service factor (@ 40 degrees C). Tapped drain holes (corrosion resistant plugs for frames 286T and smaller and automatic breather/drain/drain devices for frames 324T and larger), UL label for Class 1, Division 1, Group D Hazardous areas.
4. Severe Duty - Motors shall be of the corrosion resistant type conforming to motors designated by the manufacturer as "Chemical Duty", "Mill and Chemical", "Custom Severe Duty", or similar applicable manufacturer's quality designation. Severe duty motors shall include Class F insulation (applied at Class B rise), 1.15 service factor (@ 40 degrees C), tapped drain holes (corrosion resistant plug for frames 286T and smaller automatic breather/drain devices for frames 324T and larger), epoxy finish, upgraded insulation by additional dips and bakes to increase moisture resistance.
5. Submersible - Motors shall be housed in a watertight casing and shall have Class F insulated windings which shall be moisture resistant. Pump motors shall have cooling characteristics suitable to prevent continuous operation in a totally, partially, or non-submerged condition continuously without overheating or other damage. The

power cable shall be of adequate length to allow the unit to be wired as detailed on the electrical drawings without splices.

6. Inverter Duty – Motors shall be premium efficient design with inverter grade (Class H) insulation. Each inverter duty motor shall meet NEMA MG-1, Part 31 specifications for variable frequency drive (VFD) inverter duty applications. Motors shall be US Motors 841 Plus or equal.
7. Efficiency - Unless otherwise specifically specified for a specific motor, all motors shall be high-energy efficient type. Efficiencies shall be as determined in accordance with IEEE Standard 112 and NEMA MG-1-12.59. Motors shall be US Electric Motors "Premium Efficiency"; Baldor "Super-E", or equal.

2.22 ELECTRICAL DEVICES FURNISHED WITH MECHANICAL EQUIPMENT

- A. Control panels supplied with mechanical equipment shall have the control switches, indicating lights, relay logic, and dry contact SCADA interfaces as indicated for each panel on the P&ID Drawings. Unless otherwise specified or shown all electrical power, control or instrumentation devices furnished as a "package" with mechanical equipment shall conform to the latest issue and addenda to the Joint Industry Council Electrical Standards for Mass Production Equipment (EMP-1-67), applicable NEMA Standards, National Electric Code (NEC 1999), or as modified herein.
- B. Panels housing electrical equipment shall be NEMA rated for area into which panel is to be installed as shown on Contract Electrical Drawings. NEMA 4X panels shall be stainless steel. NEMA 1, 12 or 3R panels shall be galvanized steel, electrostatic applied baked enamel, painted gray. Panels located in Class 1 locations shall be explosion proof.
- C. Devices mounted in non-ventilated panels shall be rated for a 50 degrees C (122 °F) ambient. Panels with devices rated less than 50 degrees C shall have ventilation fans and louvers. Louver openings shall have removable metal filters. All outdoor panels shall have heaters with guards and thermostat. Fans and heaters shall be powered from panel internal 120VAC control power.
- D. A main panel power disconnect device to disconnect all power within the panel shall be an integral part of the panel and shall be one of the following types:
 1. A horsepower rated heavy-duty fused safety switch or circuit breaker for 480, 240, or 208 volt, 1 phase or 3 phase panels. An outer door mounted operator for each switch or breaker padlockable in the off position shall be provided.
 2. Circuit breaker for 120 volt, 1 phase panels.
- E. Individual motor circuit protector (magnetic only circuit breaker) or fused protection shall be provided for each motor feed from panel.

- F. All panels supplied with a 480-volt power feeder shall be provided with an integrally mounted dual winding 120-volt secondary control power transformers with primary and secondary fusing. Control power transformers shall have the neutral grounded.
- G. All door mounted devices shall be of a heavy-duty industrial type quality. Lights, switches and pushbuttons shall be standard 30mm diameter, NEMA 13, U.L. listed and water & oil tight. All outer door mounted devices shall have black phenolic nameplates with 3/16" (minimum) white letters fastened by device assembly or stainless steel screws.
- H. All indicating lights shall be full voltage 120VAC, LED type with push to test switch and wiring. Light lens colors shall be as follows:

Open/On	Green
Closed/Off	Red
Alarm/Trouble	Amber
Power On	White

- I. Control relays shall be plug-in type with clear see-through sealed housing. Provide relay energized neon lamp or LED inside relay housing.
- J. Time delay relays shall be solid state, plug in type with LED timer energized indicator lights.
- K. All fuse shall have visible blown fuse indicator lights.
- L. Contacts for external status, alarms or equipment interlocking shall be of the isolated contact type and provided as required per individual equipment specifications or Process and Instrumentation "I-Series" Drawings. Contacts shall be rated 10 amps at 120VAC continuous pilot duty. Alarm contacts shall be of the maintained latching contact type, requiring manual reset. Reset pushbuttons shall be provided and located on outer door for latching alarms.
- M. Motor starters shall be magnetic, 120VAC coil solenoid operated, NEMA rated for horsepower of supplied equipment, contactor type, with chatter-proof armatures. Each motor starter to have a normally open and a normally closed auxiliary contacts. Provide one bimetallic type thermal overload relay for each phase.
An outer door insulated mechanical reset mechanism shall be installed for each motor starter thermal overload reset.
- N. Watertight gasketed conduit hubs shall be used for all conduit penetrations to outdoor panels. Conduit entries to outdoor panels shall not enter top of panels.
- O. Auxiliary devices (pressure switches, flow switches, etc.) located remotely from panels but furnished under this Section shall have enclosures as specified in the individual mechanical

sections, or in conformance with the NEMA area classification noted on Contract Electrical drawings.

- P. Schematic (elementary) or connection wiring diagrams, and equipment material lists shall be furnished for all panels. For panels containing a complex control scheme, a written operational theory shall be cross-referenced to the schematic diagram. The wiring diagram in its "as built" form shall be fastened to the panel door when panel is delivered to jobsite. The equipment material list shall identify the actual manufacturer, manufacturer's part or model number and a cross-reference as to its location in the panel. Generic part or model numbers are not to be used in material lists.

2.23 WIRING

- A. Conductors extending beyond a panel to other auxiliary equipment which is pre-wired on a skid type or package base shall be protected by galvanized rigid steel conduit. Where terminating at a motor or other similar device requiring frequent movement or which produces excessive vibration liquid tight type flexible conduit shall be used. Liquid tight conduit will be limited to three (3) feet maximum length at any termination. All pre-wired wiring shall be copper, #14 AWG minimum.
- B. Input or output instrumentation level signals shall be 4-20 mA and provided as required per the individual equipment specification and Process & Instrumentation "I-Series" drawings. All signal wiring shall have copper twisted shield pairs with overall shield.
- C. Separate power, control and instrumentation terminal strips shall be provided for all external panel connections. All terminal points shall have black machine printed identification numbers on white background.
- D. All wires inside panels and on pre-wired packages and skids shall have wire labels at each end point. Wire labels shall be white shrink tubes with permanent ink black machine typed lettering.

2.24 PRESSURE GAUGES

Pressure gauges furnished with mechanical equipment shall be as specified in Section 15080.

2.25 TOOLS AND SPARE PARTS

- A. All special tools required for exclusive operation and maintenance of respective items of equipment shall be furnished with those items of equipment by the manufacturer. This includes special tools, instruments, accessories required for proper "in-plant" adjustment, maintenance, overhaul, and operation. Tools shall be high-grade, smooth, forged, alloy tool steel.

- B. All tools and spare parts shall be carefully packed in cartons, labeled with indelible markings, and shall be adequately treated for a long period of storage. Complete ordering information including manufacturer, part number, part name, and equipment name and number(s) for which the part is to be used shall be supplied with the required spare parts. The tools and spare parts shall be delivered and stored in a location as directed.
- C. Spare parts for certain equipment provided under Divisions 11, 15, 16 and 17 have been specified in the pertinent Sections of the Specifications. All spare parts shall be collected and stored in a designated area. In addition, an inventory listing all spare parts, the equipment they are associated with, the name and address of the supplier, and the delivered cost of each item shall be furnished. Copies of actual invoice for each item shall be furnished with inventory to substantiate the delivered.

2.26 LUBRICANTS

Provide all mechanical equipment with a sufficient supply of correct lubricant for starting, testing, and an initial 120-day operation period. All lubricants shall be of types recommended by the applicable equipment manufacturer. Subject to the approval of the equipment manufacturer's, lubricants shall be limited to the least number or types required for normal maintenance of all equipment. Not less than 90 days before the date scheduled for field testing of equipment three (3) copies of a listing indicating all lubricants for item of mechanical equipment shall be provided. Unless otherwise noted, all grease lubrication fittings shall be of an approved standard hydraulic type.

2.27 LIFTING LUGS

Lifting lugs shall be provided for all equipment weighing 50 pounds or more.

2.28 VIBRATION

- A. This section specifies the maximum allowable vibration levels for all mechanical equipment over 20 horsepower. Additional requirements that may be more stringent may also be listed in individual equipment specifications. In that case, the more stringent of the two requirements shall apply. Testing of equipment at the factory and in the field as identified in PART 3 of this specification shall demonstrate compliance with the specified vibration limits. All vibration tests shall be conducted under actual operating conditions:
 1. Unfiltered readings at each unit shall have less than the following peak to peak amplitudes.

Operating Speed (revolutions per minute)	Centrifugal Blowers	Unfiltered (Overall) Peak-to-Peak Amplitude (mils)		
		Other Rotating Equipment	Non-Clog Mixed Flow Pumps	Clean Fluid Pumps
0 - 300	N/A	5.0	6.0	6.0
301 - 600	N/A	4.0	5.0	5.0

601 - 900	N/A	3.0	4.0	3.0
901 - 1,200	N/A	2.0	3.5	2.0
1,201 - 1,500	N/A	1.8	3.0	1.8
1,501 - 1,900	N/A	1.5	2.5	1.5
1,801 - 2,400	N/A	1.0	2.0	1.0
2,401 - 3,000	N/A	0.8	1.5	0.8
3,001 - 3,600	1.25	0.7	1.3	0.7
Above 3,600	1.0	0.6	1.2	0.6

2. Vibration Velocity Limits: Unless otherwise specified, equipment is not to exceed the following peak velocity limits:

Item	Unfiltered Overall Limit (inches per second)	Any Filtered Peak Limit (inches per second)
Non-Clog or Mixed Flow Pumps	0.35	0.25
Clean Fluid Pumps	0.25	0.20
Motors and Steady Bearings	0.25	0.20
Gear Reducers, Radial	Not to exceed AGMA 6000-A88 limits	
Other Reducers, Axial	0.10	0.10
Centrifugal Blowers	0.15	0.10

- B. For all equipment, axial shaft vibration displacements (relative to casing) shall not exceed 50 percent of the maximum lateral shaft vibration displacements (relative to casing existing at any point along the shaft).
- C. The above vibration responses are to include the range from 5.0 Hz to 5000 Hz and shall therefore encompass both low and high frequency responses of the subject equipment. The measurements shall be obtained with the equipment installed and operating at any capacity within the specified operating range. In addition to these maximum unfiltered readings, it is also stipulated that no narrow band spectral acceleration component, whether sub-rotational, higher harmonic or asynchronous multiple of running speed, shall exceed 40 percent of the synchronous displacement amplitude component without manufacturer's detailed verification of the origin and ultimate effect of said excitation.

Any equipment showing excessive vibration shall be corrected by the Contractor at his expense and the equipment retested.

- D. The Contractor shall furnish a written report covering all the test values and data for each unit tested.

PART 3 EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. Belt Driven Equipment: Mount with motors on common steel base with adjustable motor mount.
- B. Pumps: Align pump and motor. Completely fill steel and cast iron pump bases with concrete grout after properly set.
- C. Install equipment so nameplates are visible.
- D. Basis for equipment and material installation is the published recommendations of manufacturer. Submit such recommendations for review.
- E. Pipelines and other connections to mechanical equipment shall be installed square and shall not put in strain or use the equipment for support unless it is specifically designed for it.

3.2 IDENTIFICATION

- A. Provide manufacturers' nameplates on all equipment, identifying manufacturer's name, model number, size, capacity, and electrical characteristics.
- B. Leave all manufacturers' nameplates clean and legible. Install all equipment so view of nameplates is not obstructed.
- C. Identify all equipment with symbol number and service as shown. Identification shall be on 1-1/4 inch by 3 inch, or larger nameplates, securely fastened to equipment.
- D. Provide engraved identification of function on switches and manually operable controls.

3.3 CLEANING

- A. During progress of work, keep premises reasonably free of debris, cuttings, and waste material. Upon completion of work, and at other times as directed, remove all such debris from premises.
- B. Clean equipment and materials. Remove foreign materials including dirt, grease, splashed paint, and plaster. Restore to original condition any finish damaged.

3.4 FACTORY QUALITY CONTROL TESTING

- A. All pumps and mechanical equipment shall receive the following minimum factory testing. Additional testing requirements may be specified in the individual equipment specification sections.
- B. All pumps shall be provided with manufacturer's standard factory quality control testing as modified herein.
- C. All pumps greater than 5 horsepower shall receive a hydrostatic test of the pump casing at 1.5 times the pump shut off head.
- D. All pumps shall be statically and dynamically balanced and shall have a certified balancing report.
- E. All pumps 5 horsepower and above shall receive a standard manufacturers bench test that shall include a minimum of 5 test points defining the pump curve. Test points shall correspond to the design points given in the individual pump specification.

The remaining test points shall define the pump curve above and below the specified design conditions. In addition, pump shut off conditions shall also be tested. Test procedures shall follow appropriate sections of the Hydraulic Institute Standards in addition to the requirements in this and other Sections.

- 1. As a minimum, pump head, flow, power, speed, efficiency and NPSH shall be determined and recorded.
- F. All pumps scheduled to be driven by variable frequency drives shall be factory tested with a minimum of 5 test points at full speed and 5 test points at each speed specified under the design conditions in the individual pump specifications. If no alternate speed conditions are specified, 5 test points shall be provided at the minimum operating speed of the pump as recommended by the Manufacturer.
- G. Vertical turbine pumps shall have bowl tests only.
- H. Pump Test Tolerances: In accordance with appropriate Hydraulic Institute Standards, except the following modified tolerances apply:
 - 1. From 0 to plus 5 percent of head at the rated design point flow.
 - 2. 0 to plus 5 percent of flow at the rated design point head.
 - 3. No negative tolerance for the efficiency at the rated design point.
 - 4. No positive tolerance for vibration limits. Vibration limits in Hydraulic Institute Standards do not apply, use limits specified in this Section of the Specifications.
- I. All non-submersible pumps greater than 10 horsepower shall also be tested for vibration in each plane at each exposed bearing location, on the pump, and on the motor. Vibration limits shall meet the requirements specified in Section 2.28 or more stringent requirements if specified in the individual equipment specifications.

- J. All non-submersible pumps and non-vertical turbine pumps greater than 15 horsepower shall also receive a noise test. Measure the unfiltered overall A-weighted sound pressure level in dBA at 3 feet horizontally from the surface of the equipment on four sides at the mid point of the equipment height (set up temporary facilities to replicate field conditions, as shown on the contract drawings, including surrounding piping and walls). Pump and driver shall not exceed 85 dBA or lower noise level if specified in the individual equipment specifications. Pumps will need to pass the same noise test in the field, using actual installed conditions (including surrounding facilities), as described in the below the field performance testing section. If the pump does not meet noise limitations in the factory or installed field condition, manufacturer shall take immediate steps to correct the issue and limit the noise below allowable limits.
- K. For all pumps, except vertical turbine pumps, the actual job motor shall be used unless an alternate means of driving the equipment is agreed to by the Engineer prior to testing.
- L. All mechanical equipment shall be provided with the manufacturer's standard factory quality control tests, which shall clearly demonstrate conformance with the specifications and the specified manufactured equipment is free from defects. Standard tests shall be as modified herein.
- M. All blowers for aeration or channel air systems shall be provided with a standard ASME PTC-13 (wire to air) test at the blower rated speed. Blower airflow shall be adjusted based on inlet throttling or blower speed to match the blower service specified. All blowers for aeration or channel air systems shall be provided with a hydrostatic test to 15 psig.
- N. All blowers over 40 horsepower shall also be tested for vibration in each plane at each exposed bearing location, on the blower, and on the motor. Vibration limits shall meet the requirements specified in Section 2.28 or more stringent requirements if specified in the individual equipment specifications.
- O. All blowers and Fans over 10 horsepower shall receive a noise test. Measure the unfiltered overall A-weighted sound pressure level in dBA at 3 feet horizontally from the surface of the equipment on four sides at the mid point of the equipment height (set up temporary facilities to replicate field conditions, as shown on the contract drawings, including surrounding piping and walls). Blower and driver shall not exceed 85 dBA or lower noise level if specified in the individual equipment specifications. Blowers and fans will need to pass the same noise test in the field, using actual installed conditions (including surrounding facilities), as described in the below the field performance testing section. If the blower/fan does not meet noise limitations in the factory or installed field condition, manufacturer shall take immediate steps to correct the issue and limit the noise below allowable limits.
- P. All other rotating equipment greater than 40 horsepower shall be tested for vibration in each plane at each exposed bearing location, on the blower, and on the motor. Vibration limits shall meet the requirements specified in Section 2.28 or more stringent requirements if specified in the individual equipment specifications.

- Q. All other rotating equipment greater than 40 horsepower shall receive a noise test. Measure the unfiltered overall A-weighted sound pressure level in dBA at 3 feet horizontally from the surface of the equipment on four sides at the mid point of the equipment height (set up temporary facilities to replicate field conditions, as shown on the contract drawings, including surrounding piping and walls). Blower and driver shall not exceed 85 dBA or lower noise level if specified in the individual equipment specifications. Equipment will need to pass the same noise test in the field, using actual installed conditions (including surrounding facilities), as described in the below the field performance testing section. If the equipment does not meet noise limitations in the factory or installed field condition, manufacturer shall take immediate steps to correct the issue and limit the noise below allowable limits.
- R. For all mechanical equipment, the actual job motor shall be used unless an alternate means of driving the equipment is agreed to by the Engineer prior to testing.

3.5 TEST WITNESSING

Factory tests shall be non-witnessed unless specified in the individual equipment specifications. When factory tests are indicated as witnessed, the costs for witnessing the tests by the Engineer, travel, and lodging costs shall be born by the Owner for the first test. All such costs for any subsequent factory re-testing required shall be born by the Contractor. The Contractor shall notify the Owner in writing a minimum of 21 calendar days prior to commencement of witnessed factory tests.

3.6 FIELD REPORTS

Submit reports for Field and Factory testing. Report features:

- A. Report results in a bound document in generally accepted engineering format with title page, written summary of results compared to specified requirements, and appropriate curves or plots of significant variables in English units.
- B. Include appendix with a copy of raw, unmodified test data sheets indicating test value, date and time of reading, and initials of person taking the data.
- C. Include appendix with sample calculations for adjustments to raw test data and for calculated results.
- D. Include appendix with the make, model and last calibration date of instrumentation used for test measurements.
- E. Include in body of report a drawing or sketch of the test system layout showing location and orientation of the test instruments relative to the tested equipment features.

3.7 FIELD QUALITY CONTROL TESTING

- A. Temporary Facilities and Labor: Provide all necessary fluids, utilities, temporary piping, temporary supports, temporary access platforms or access means and other temporary facilities and labor necessary to safely operate the equipment and accomplish the specified testing. With Owner's permission, some utilities may be provided by fully tested permanently installed utilities that are part of the Work.
- B. Instrumentation: Provide all necessary test instrumentation, which has been calibrated within one year from date of test to recognized test standards traceable to the National Institute of Standards and Technology, Washington, D.C. or approved source. Properly calibrated field instrumentation permanently installed as a part of the Work may be utilized for Field Quality Control Tests.
- C. Field Quality Control Tests: Schedule test date and notify Engineer at least 7 days prior to start of test. Test Measurement and Result Accuracy:
- D. Use test instruments with accuracies as recommended in the appropriate referenced standards. When no accuracy is recommended in the referenced standard, use 1 percent or better accuracy test instruments.
- E. Do not adjust results of tests for instrumentation accuracy. Measured values and values directly calculated from measured values shall be the basis for comparing actual equipment performance to specified requirements.

3.8 FIELD TESTING

- A. All pumps and mechanical equipment shall receive the following minimum field testing. Additional field testing requirements may be specified in the individual equipment specification sections.
- B. Submit test plan indicating test start time and duration, equipment to be tested, other equipment involved or required; temporary facilities required, number and skill or trade of personnel involved; safety issues and planned safety contingencies; anticipated effect on Owner's existing equipment and other information relevant to the test.
- C. Perform general start-up and testing procedures for the equipment as recommended by the Manufacturer's written start up instructions.
- D. Prior to testing, verify equipment protective devices and safety devices have been installed, calibrated, and tested and that the manufacturer's representative has certified proper installation of the equipment.
- E. All mechanical pumps and equipment shall be given an 8-hour performance test and a 5-day facility startup/operational test in accordance with Section 01670. Equipment shall

be operated continuously under normal operation as intended by the Contract Documents. Operational testing shall include automatic control and instrumentation systems. Any equipment or control systems that fail to perform properly shall be corrected and retested by the Contractor. Upon completion of a satisfactory operational test, a certificate of completion shall be prepared and signed by the Owner.

- F. In addition to an operational test, certain mechanical equipment and pumps shall be given a field performance test as specified herein to demonstrate the complete system as installed meets the specified performance requirements.
- G. All operational and performance testing shall be completed and accepted prior to acceptance of the equipment by the Owner. Equipment warranty periods shall not begin until final acceptance of the equipment by the Owner.

3.9 FIELD PERFORMANCE TESTS FOR PUMPS

- A. All pumps shall be provided with a field performance test in accordance with applicable Hydraulic Institute Standards in addition to the requirements in this and other Sections.
- B. All pumps 5 horsepower and smaller shall receive a field test that shall include testing the pump at the specified design condition. Pump Flow, head, and horsepower shall be recorded.
- C. All pumps greater than 5 horsepower shall receive a field test that shall include a minimum of 5 test points defining the pump curve. Test points shall correspond to the design points given in the individual pump specification. The remaining test points shall define the pump curve above and below the specified design conditions. In addition, pump shut off conditions shall also be tested. Test procedures shall follow appropriate sections of the Hydraulic Institute Standards in addition to the requirements in this and other Sections. As a minimum, pump head, flow, power, speed, efficiency and NPSH shall be determined and recorded.
- D. All pumps scheduled to be driven by variable frequency drives shall be tested with a minimum of 5 test points at full speed and 5 test points at each speed specified under the design conditions in the individual pump specifications. If no alternate speed conditions are specified, 5 test points shall be provided at the minimum operating speed of the pump as recommended by the Manufacturer.
- E. Vertical turbine pumps shall be tested as a complete system after assembly.
- F. Pump Test Tolerances: In accordance with appropriate Hydraulic Institute Standards, except the following modified tolerances apply:
 - 1. From 0 to plus 5 percent of head at the rated design point flow.
 - 2. 0 to plus 5 percent of flow at the rated design point head.

3. No negative tolerance for the efficiency at the rated design point.
 4. No positive tolerance for vibration limits. Vibration limits and test methods in Hydraulic Institute Standards do not apply, use limits and methods specified in this or other Sections of the Specifications.
- G. All non-submersible pumps greater than 10 horsepower shall also be tested for vibration in each plane at each exposed bearing location, on the pump, and on the motor. Vibration limits shall meet the requirements specified in Section 2.28 or more stringent requirements if specified in the individual equipment specifications.
- H. All non-submersible pumps greater than 15 horsepower shall also receive a noise test. Measure the unfiltered overall A-weighted sound pressure level in dBA at 3 feet horizontally from the surface of the equipment on four sides at the mid point of the equipment height. Pump and driver shall not exceed 85 dBA or lower noise level if specified in the individual equipment specifications.
- I. For all pumps, the actual job motor or driver shall be used.
- J. Submit for engineering approval an alternative plan or waiver to the above listed field testing in cases where a certified pump curve has been provided by the manufacturer (as specified in the technical specifications) and there is insufficient water or appurtenances available to perform the field test. Submittal of alternative plan does not guarantee engineering acceptance.

3.10 FIELD PERFORMANCE TEST FOR MECHANICAL EQUIPMENT

- A. All mechanical equipment shall be provided with a field performance tests.
- B. Test all mechanical equipment at rated design conditions. Record equipment horsepower, speed, and other process performance parameters. Demonstrate compliance with the specified design conditions.
- C. All equipment over 20 horsepower and shall also be tested for vibration in each plane at each exposed bearing location, on the machine, and on the motor. Vibration limits shall meet the requirements specified in Section 2.28 or more stringent requirements if specified in the individual equipment specifications.
- D. All blowers and Fans over 2 horsepower and all other equipment over 20 horsepower shall receive a noise test. Measure the unfiltered overall A-weighted sound pressure level in dBA at 3 feet horizontally from the surface of the equipment on four sides at the mid point of the equipment height. Blower and driver shall not exceed 85 dBA or lower noise level if specified in the individual equipment specifications.
- E. For all mechanical equipment, the actual job motor or driver shall be used.

3.11 FIELD REPORTS

- A. Submit reports for field performance testing. Report features:
- B. Report results in a bound document in generally accepted engineering format with title page, written summary of results compared to specified requirements, and appropriate curves or plots of significant variables in English units.
- C. Include appendix with a copy of raw, unmodified test data sheets indicating test value, date and time of reading, and initials of person taking the data.
- D. Include appendix with sample calculations for adjustments to raw test data and for calculated results.
- E. Include appendix with the make, model and last calibration date of instrumentation used for test measurements.
- F. Include in body of report a drawing or sketch of the test system layout showing location and orientation of the test instruments relative to the tested equipment features.

3.12 PRELIMINARY OPERATION

Operate any portion of installation if requested. Such operation does not constitute acceptance of the work as complete.

3.13 STARTUP SERVICE

- A. Prior to startup, check auxiliary connections, lubrication, venting, controls, wiring, equipment for proper rotation, and install and properly set relief and safety valves to insure readiness of systems.
- B. Start and operate all systems. All mechanical equipment and systems shall be placed in service by qualified factory authorized technicians who shall provide a written statement that the equipment has been installed and placed in service as recommended by the manufacturer. If, in the opinion of the Engineer, a start-up technician is not qualified or competent to work on a particular piece of equipment, the Contractor shall replace that person with one who is qualified and competent.

END OF SECTION

SECTION 11302

SUBMERSIBLE PUMPS

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of furnishing and installing three (3) submersible sewage pumps at the Primary Pump Station and two (2) submersible pumps at the Storage Pump Station.

- A. Where both pump manufacturer model numbers and minimum pump curve data are provided, the manufacturer model numbers hold precedent over the pump curve data unless models exist that meet the minimum pump curve data and exceed the efficiencies of the pump model specified. Specification requirements, other than the minimum pump curve data, hold precedence over the cited pump model numbers.
- B. Pumps of the latest design shall be provided.
- C. All pumps shall be provided by the same manufacturer.

1.2 EQUIPMENT TAG NUMBERS

Tag Numbers	Equipment Name
PMP 1111	Primary Pump 1
PMP 1112	Primary Pump 2
PMP 1113	Primary Pump 3
PMP 1021	Storage Pump 1
PMP 1022	Storage Pump 2

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300: Submittals
- B. Section 08310: Access Hatches

- C. Section 09900: Painting and Finish Schedule
- D. Section 11010: General Mechanical Equipment Provisions
- E. Section 14313: Davit Crane
- F. Division 16: Electrical

1.4 SUBMITTALS

- A. In accordance with Section 01300.
- B. Manufacturer's literature and certificates of compliance with these and referenced specifications. Submit data regarding pump and motor characteristics and performance. The data shall include pump performance curves which show that the units meet the specified requirements for head, capacity, efficiency, and horsepower for the capacities specified.
- C. Manufacturer's installation instructions, parts list, and operating and maintenance instructions. Provide operation and maintenance manuals in accordance with Specification Section 01680.
- D. Provide startup services and training in accordance with Specification Section 01670 and 01675.
- E. Submit seismic calculations, stamped and signed by a California registered engineer, in accordance with Section 01610.

1.5 WARRANTY

The pumps and motors will be covered by a five (5) year pro-rated limited warranty that shall comprise the following terms: The initial 18 months from the official start-up date of the equipment shall be covered 100 % for parts and labor. The following months of 19 through 39 shall be covered 50 % for parts and labor. All remaining months until 60 months of service is reached will be covered 25% for parts & labor. This warranty shall not be limited by hours of running time or operation from variable speed drives.

1.6 PUMP TEST

The pump manufacturer shall perform a certified performance test, on each pump supplied for this project. Tests shall include capacity, head, bhp and efficiency, in accordance with Hydraulic Institute, to a minimum of seven points on the performance curve plus shutoff and runout. At no point on the curve shall the pump be allowed to run into the motor service factor.

1.7 ENVIRONMENTAL CONDITIONS

Exposures: The equipment will be subject to rainfall, wind (including dust and dirt), direct sunlight and a corrosive environment due to wastewater, splashing, hydrogen sulfide and hydrocarbon gases. Ambient air temperatures may range from 15°F to 115°F. Relative humidity may fluctuate between 10 and 100 percent.

PART 2 MATERIALS

2.1 GENERAL

The Primary and Storage Pumps shall be capable of handling screened raw sewage. The pumps shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. Guide cable or single rail systems will not be allowed. There shall be no need for personnel to enter the wet-well to remove pumps. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact or via gasket. The entire weight of the pump/motor unit shall be borne by the pump discharge elbow. No portion of the pump shall bear directly on the sump floor.

2.2 PRIMARY PUMP DESIGN CRITERIA

Pump shall be Flygt Model NP3202 (impeller 273), or equal.

The naming of a manufacturer in this specification is not an indication that the manufacturer's standard equipment is acceptable in lieu of the specified component features. Naming is only an indication that the manufacturer may have the capability of engineering and supplying a system as specified.

The pump motor shall be inverter duty type and shall be capable of running continuously and indefinitely in a partially submerged condition between 60 and 100 percent of full speed. Pump shall be capable of meeting the design criteria herein powered by the variable frequency drive specified in Division 16.

Minimum Motor Size	72 HP
Minimum Discharge Size	4-inches (at discharge elbow)
Maximum Motor Speed	3550 RPM
Power Requirements	460 V, 3 phase
Static Head	63 Feet
Minimum Sphere Passage	3-inch

The pumps shall meet the following performance criteria at full speed.

Operating Point	Flow, (gpm)	Head, (ft)	Min. Overall Efficiency at Operating Point, (%)
Pump Curve Point 1	350	283	43
Design Point	655	237	57
Pump Curve Point 3	950	181	58

2.3 STORAGE PUMP DESIGN CRITERIA

Pump shall be Flygt Model NP3153 (impeller 465), or equal.

The naming of a manufacturer in this specification is not an indication that the manufacturer's standard equipment is acceptable in lieu of the specified component features. Naming is only an indication that the manufacturer may have the capability of engineering and supplying a system as specified.

The pump motor shall be inverter duty type and shall be capable of running continuously and indefinitely in a partially submerged condition between 60 and 100 percent of full speed. Pump shall be capable of meeting the design criteria herein powered by the variable frequency drive specified in Division 16.

Minimum Motor Size	15 HP
Minimum Discharge Size	4-inches (at discharge elbow)
Maximum Motor Speed	1760 RPM
Power Requirements	480 V, 3 phase
Static Head	60 Feet
Minimum Sphere Passage	3-inch

The pumps shall meet the following performance criteria at full speed.

Operating Point	Flow, (gpm)	Head, (ft)	Min. Overall Efficiency at Operating Point, (%)
Pump Curve Point 1	200	79	42
Design Point	430	63	59
Pump Curve Point 3	700	43	58

2.4 MATERIALS

- A. The pump and motor package shall be Factory Mutual approved Class I, Division I, Group C & D service, or equivalent UL listed.
- B. Casing shall be ASTM A48, Class 35B cast iron, and sized according to manufacturer.
- C. Pump shafts shall be Series 431 stainless steel. Carbon steel shafts are not acceptable. The shaft shall be one piece construction without joints or stubs attached. All shafts shall be dynamically balanced and shall be amply sized to minimize shaft deflection. Shaft overhang shall not exceed 2.5 times the shaft diameter.
- D. Impeller shall meet the physical and tensile strength requirements of ASTM A-532 (Alloy III A), 25% chrome iron. Impeller shall be cast in one-piece design and shall be statically balanced. The design of the impeller and the shape of the blades shall be such that rags or similar materials will not clog the pump to seriously affect the efficiency. The impeller shall be attached to the shaft in a manner such that the impeller cannot be loosened by torque from either forward or reverse rotation. A minimum 2-vane impeller shall be used.
- E. Where applicable, stainless steel Wear Rings, for volute and Impeller, shall be provided. The stationary wear ring shall be type 316 stainless steel or Class 45 cast iron, with a minimum Brinnell hardness of 325 to 375. The rotating wear ring shall be type 304 or 400 stainless steel, with a minimum Brinnell hardness of approximately 200. Rubber rings shall not be allowed.
 - 1. Impeller (for Flygt “N” Pumps): The impeller(s) shall be of A-532 (Alloy III A), 25% chrome iron, statically balanced, semi-open, multi-vane, back-swept, non-clog design. The impeller vane leading edges shall be mechanically self-cleaned upon each rotation as they pass across (a) spiral groove(s) located on the volute suction which shall keep them clear of debris, maintaining an unobstructed impeller leading edge and sustaining a high level of hydraulic efficiency. The impeller vanes shall have screw-shaped leading edges that are hardened to Rc 60 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in wastewater. The screw shape of the impeller vanes shall provide an inducing effect for the handling of sludge and rag-laden wastewater. Impellers shall be locked to the shaft, held by an impeller bolt and treated with a corrosion inhibitor.
 - 2. Volute Bottom/Insert Ring (for Flygt “N” Pumps): The pump volute shall be of A48 Class 35B gray cast iron and shall have (an) integral spiral shaped cast groove(s) at the suction of the volute. The internal volute insert ring shall provide effective sealing between the pump volute and the multi-vane, semi-open impeller. The sharp spiral groove(s) shall provide a release pathway as well as shearing edges for trash and stringy materials to maintain clear impeller leading edges. The clearance between the internal volute bottom and the impeller leading edges shall be adjustable.

2.5 BEARINGS

- A. Pump bearings shall be of the ball or roller type. The motor pump shaft shall be supported by three permanently grease-lubricated ball bearings.
- B. The upper bearing shall be single roller bearing, the lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces. Pump bearings shall be of the anti-friction type designed to give 50,000 hours life by the L_{10} calculations under any conditions of operation.
- C. Anti-friction bearings which are lubricated shall be protected in accordance with the bearing manufacturer's recommendations against the formation of rust during a period of storage while awaiting the completion of installation and startup.

2.6 MECHANICAL SEALS

Each pump shall be provided with a tandem mechanical shaft seal system consisting two totally independent seal assemblies. The lower seal shall be independent of the impeller hub. The seals shall operate in an lubricant reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide or silicon-carbide seal ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide or silicon-carbide seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment and shall be capable of operating in either clockwise or counter clockwise direction of rotation without damage or loss of seal. For special applications, other seal face materials shall be available.

Should both seals fail and allow fluid to enter the stator housing, a port shall be provided to direct that fluid immediately to the stator float switch to shut down the pump and activate an alarm. Any intrusion of fluid shall not come into contact with the lower bearings.

The following seal types shall not be considered acceptable nor equal to the dual independent seal specified: shaft seals without positively driven rotating members, or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. No system requiring a pressure differential to offset pressure and to affect sealing shall be used.

Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. The motor shall be able to operate continuously while non-submerged without damage while pumping under load.

Seal lubricant shall be a nontoxic water/glycol mix.

2.7 FASTENERS

All nuts and bolts shall be Type 304 or 316Ti stainless steel.

2.8 MOTOR

Motor shall be non-overloading at all points on the pump's operation curve. The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be specifically designed for submersible pump usage and designed for continuous duty pumping media of up to 40°C (104°F) with an 80°C temperature rise and capable of at least 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches shall be embedded in the stator end coils to monitor the temperature of each phase winding. One PT-100 type temperature sensor shall be installed in the stator winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber shall be sealed off from the stator housing and shall contain a terminal board for connection of power and pilot sensor cables using threaded compression type terminals. A mechanical float switch (FLS) shall be mounted in the junction chamber to signal if there is water intrusion. A pump memory module shall be provided and mounted in the junction chamber or in the pump control module to record pump run time, number of starts as well as contain the motor unit performance and manufacturing data and service history. The use of wire nuts or crimp-type connectors is not acceptable. The motor and the pump shall be produced by the same manufacturer. The motor shall be rated for use in Class 1, Division 1, Group C & D atmospheres as explosion proof.

The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C. A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics. The pump shall be capable of continuous operation in a totally, partially, or non-submerged condition.

The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

2.9 CABLE ENTRY SEAL

Provide the following:

- A. Type 1: The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of dual cylindrical elastomer grommets, flanked by washers, all having a close tolerance fit against the cable outside diameter and the cable entry inside diameter. The grommets shall be compressed by the cable entry unit, thus providing a strain relief function. The assembly shall provide ease of changing the cable when necessary, using the same entry seal. The cable entry junction chamber and motor shall be sealed from each other, which shall isolate the stator housing from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

2.10 PILOT CABLE

The pilot cable shall be designed specifically for use with submersible pumps and shall be type SUBCAB (SUBmersible CABLE). The cable shall be multi-conductor type with stainless steel braided shielding, a chlorinated polyethylene rubber outer jacket and tinned copper conductors insulated with ethylene-propylene rubber. The conductors shall be arranged in twisted pairs. The cable shall be rated for 600 Volts and 90°C (194°F) with a 40°C (104°F) ambient temperature and shall be approved by Factory Mutual (FM). The cable length shall be adequate to reach the junction box without the need for splices.

2.11 MOTOR PROTECTION

Provide Type 2 protection devices in accordance with Section 11010.

Each pump motor stator shall incorporate three thermal switches, one per stator phase winding and be connected in series, to monitor the temperature of the motor. Should the thermal switches open, the motor shall stop and activate an alarm. A float switch shall be installed in the seal leakage chamber and will activate if leakage into the chamber reaches 50% chamber capacity, signaling the need to schedule an inspection.

The thermal switches and float switch shall be connected to a Mini CAS control and status monitoring unit. The Mini CAS unit shall be designed to be mounted in the pump control panel.

2.12 COOLING JACKETS

- A. Glycol Filled with Internal Circulation: The motor shall incorporate a closed-loop cooling circuit with an integrated cooling pump. The coolant pump impeller shall be mounted directly on the motor shaft between the tandem mechanical seals to circulate coolant fluid into the top inter-space between the cooling jacket and motor housing, over the surface of the motor, through ducts in the bearing housing and into a volute-casing heat exchanger.

Heat losses from the motor shall be transferred to the fluid pumped in the volute-casing heat exchanger, which forms a structural unit together with the discharge cover of the actual wastewater pump. After passing through the volute-casting heat exchanger, the medium returns to the suction side of the internal coolant pump. Coolant shall be non-toxic water/glycol mixture.

The cooling system shall provide for continuous submerged or completely non-submerged pump operation in liquid or in air having temperature of up to 40 °C, in accordance with NEMA standards. Restrictions limiting the ambient or liquid temperatures at levels less than 40 °C are not acceptable.

2.13 PUMP DISCHARGE ELBOWS

- A. Elbows shall be permanently installed in the wet well, bolted to the concrete floor. They shall be designed to receive the pump connecting flange automatically when the pump is lowered into place, without the need of any bolts, gaskets, or nuts. There shall be no need for personnel to enter pump well.
- B. Sealing design shall incorporate metal-to-metal contact between machined surfaces. Pump/Motor unit mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Joint sealing will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific bolt torque limit. Rectangular cross sectioned rubber, paper or synthetic gaskets that require specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

2.14 GUIDE BARS AND BRACKETS

Two guide bars shall be provided for guiding the pump unit in raising and lowering. The guide bars shall not support any portion of the weight of the pump. The lower guide bar holders shall be integral with the discharge elbow. Guide bars shall be sized according to the manufacturer's recommendations, and shall be constructed of Schedule 40, type 316 stainless steel pipe, cut to the required length. Both the upper & any intermediate guide rail brackets shall be 316 stainless steel; mounted in accordance with manufacturer's recommendations. Intermediate guide rail brackets must be used if the wet well is greater 21 feet in depth.

2.15 PUMP LIFTING SYSTEM

- A. Each Primary Pump shall be supplied with a lifting system, Grip-eye or equal, to allow the pumps to be removed for servicing in one continuous lift using a davit crane specified in section 14313.

2.16 SAFETY CABLE HOOKS

Hooks shall be 316 stainless steel attached to the access hatch frame or concrete for connection of pump lifting lines.

2.17 CABLE HOLDER

316 Stainless steel cable holder shall be designed for bolting to the access hatch frame or concrete and capable of attaching the power cable strain grip and the liquid level control cables. The electrical contractor shall supply the appropriately sized 316 stainless-steel cable support kellum grips for each of the pump's power and sensor pilot cable(s).

2.18 TOOLS AND SPARE PARTS

Tools and Spare Parts: All special tools required for normal operation and maintenance shall be furnished with the equipment. Provide two (2) sets of spare rotating & stationary wear rings or volute bottom ring (for Flygt N-pumps) as applicable, upper & lower mechanical seal and bearing plus a set of "O" rings for each pump model supplied.

2.19 ACCESS HATCHES

- A. Hatch for the Primary Pump Station FRP basin shall be supplied by the FRP basin manufacturer and coordinated with the submersible pump manufacturer. All other hatches located over submersible pumps with guide rails shall be supplied by the same manufacturer as the submersible pump to ensure coordination between the hatches, guide rails and pump discharge elbow. Access hatches shall meet the requirements of section 08310.
- B. The access hatch assembly shall consist of a double leaf access hatch over the pumps as shown on the drawings. The door shall provide clear opening as shown on the drawings and be ¼-inch aluminum diamond pattern plate reinforced to withstand H-20 loadings. Safety grating shall be provided such that pump can rest on the grating when the access hatches are opened.

PART 3 EXECUTION

3.1 INSTALLATION OF EQUIPMENT

Install pumps and guide rail systems in accordance with manufacturer's recommendations and as shown on the Drawings.

3.2 PROTECTIVE COATING

The submersible pumps shall be factory coated with a manufacturer's standard corrosion resistant coating system and field coated in accordance with specification section 09900.

3.3 ACCEPTANCE TESTS

- A. After installation of the pumping equipment and when water is available, each unit shall be given a running test during which it shall be demonstrated its ability to operate without vibration or overheating and to pump satisfactorily. During the tests, observations shall be made of head, capacity, and motor input to detect any defects in the equipment. All defects or defective equipment revealed by or noted during the test shall be corrected or replaced promptly at the expense of the Contractor, and if necessary, the test shall be repeated until satisfactory results are obtained. The Contractor shall furnish all labor, piping, equipment, and materials necessary for conducting the tests. Methods of determining head, flow, and power consumption shall be provided by the Contractor and subject to approval by the Engineer.
- B. All adjustments necessary to place the equipment in satisfactory working order shall be made at the time of the above tests.
- C. In case the Contractor is unable to demonstrate to the satisfaction of the Engineer that the units will satisfactorily perform according to these specifications and manufacturer's requirements and that they will operate free from vibration and heating, the unit may be rejected. The Contractor shall then remove and replace or modify the equipment at no additional expense to the Agency.

3.4 START UP SERVICE

The services of a factory-trained representative of the submersible pump manufacturer shall be provided as part of the pump provision. Services shall include one 8-hour day on site, which shall include the supervision of equipment startup and instruction of the Owner's personnel in the operation and maintenance of the equipment. The representative shall also validate any warranties provided by the manufacturer for the equipment.

3.5 FACTORY TEST

Non-witness factory performance test shall be conducted on each pump and shall comply with Specification Section 11010. Results shall be furnished to the Engineer for review and approval prior to shipment of equipment.

END OF SECTION

SECTION 11303

SUMP PUMPS

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of furnishing a sump pump.

1.2 NUMBER OF UNITS AND LOCATION

Tag Numbers	Equipment Name
PMP 1511	Emergency Storage Basin 1 Sump Pump

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300: Submittals
- B. Section 11010: General Mechanical Equipment Provisions
- C. Division 15: Piping materials
- D. Division 16: Electrical

1.4 SUBMITTALS

- A. In accordance with Section 01300.
- B. Manufacturer's literature and certificates of compliance and referenced specifications.
- C. Manufacturer's installation instructions, parts list, and operating and maintenance instructions. Provide operation and maintenance manuals in accordance with Specification Section 01680.
- D. Submit local control panel front layout and schematics for sump pump.

- E. Provide startup services and training in accordance with Specification Section 01670 and 01675.

1.5 WARRANTY

A supplier's written warranty shall be provided for the equipment specified in this section. The warranty shall be for a minimum period of one (1) year for start-up or 18 months from time of equipment shipment, whichever comes first.

1.6 ENVIRONMENTAL CONDITIONS

Exposures: The equipment will be subject to rainfall, wind (including dust and dirt), direct sunlight and a corrosive environment due to wastewater, splashing, hydrogen sulfide and hydrocarbon gases. Ambient air temperatures may range from 15°F to 115°F. Relative humidity may fluctuate between 10 and 100 percent.

PART 2 MATERIALS

2.1 GENERAL

Pumps shall be capable of handling digested sludge, scum, raw sewage, and wash-down water containing non-abrasive 2” max solids. The pumps shall set on the sump floor as shown on the drawings. The pump motors shall be constant speed and capable of running continuously and indefinitely in a partially or non-submersible conditions.

Contractor is responsible for supplying the pumps and motors, power cables, control panels, and all other appurtenances, as specified herein and shown on the drawings.

2.2 PUMP CHARACTERISTICS

- A. Pump shall be Flygt, Model NS 3085 MT (impeller 462) or equal.
- B. The naming of a manufacturer in this specification is not an indication that the manufacturer’s standard equipment is acceptable in lieu of the specified component features. Naming is only an indication that the manufacturer may have the capability of engineering and supplying a system as specified.

C. Design Criteria:

1. Performance Requirements:

Motor Size	3 HP
Discharge Size	3-inches

Maximum Motor Speed	1,700 RPM
Power Requirements	460V, 3 phase, 60 Hz
Operating Point 1	240 gpm @ 24 feet
Operating Conditions	460 gpm @ 14 feet
Operating Point 3	560 gpm @ 9 feet

2. Pump and Motor Casing

- a. Type: Water tight, oil filled.
- b. Material: ASTM A 48, minimum Class 35B, gray cast iron of sufficient thickness to withstand 1.5 times the shut off pressure generated by the largest impeller available for this model in accordance with the current revision of the Hydraulic Institute Standards. The discharge connection shall be a standard 3 inch NPSM3-8. Integral feet of cast iron shall be made a part of the casing for accurately positioning the pump suction opening at the correct elevation off the sump floor for good pump down capability.
- c. Water-Tightness: Able to run submerged up to 50 feet.
- d. Motor Cooling: Rated at continuous duty at partial submersion as shown on the drawings.
- e. O-Ring Seals: Capable of sealing mated surfaces (major components) watertight; with machined surfaces and grooves.

3. Impellers

- a. Type: Non-clog.
- b. Impeller type shall be semi-open with pump out vanes on back shroud.
- c. Shall contain a solid series 400 stainless steel shaft.
- d. Material: Hard Iron
- e. Number of Vanes: Maximum 3.

4. Bearings: Pump shaft shall rotate on a minimum of two (2) sets of oil lubricated bearings. Upper bearing for radial forces shall be self-aligning spherical roller type. Lower bearing for combined axial and radial forces shall be angular contact ball type. Bearing housing shall be made of gray cast iron, ASTM A48.

5. Shaft Seals

- a. Provide tandem mechanical shaft sealing system.
- b. Lower mechanical seals shall be constructed of Tungsten Carbide, Type 21.
- c. Upper mechanical seals shall be constructed of carbon.
- d. Moisture Sensing System: Intrinsically safe types that signal seal leakage.

- e. Provide oil chamber with manufacturer’s standard drain and inspection plug, with positive anti-leak seal, easily accessible from the outside.
6. Cable Entry Seal And Junction Chamber
- a. Cable entry seal design shall not require specific torque requirements to insure a watertight and submersible seal.
 - b. Cable entry seal shall consist of a single cylindrical elastomer grommet, flanked by stainless steel washers.
 - c. The entry body shall perform compression and strain relief that is separate from the sealing function.
 - d. The cable entry junction chamber shall be separate from the motor chamber to prevent foreign material from gaining access to the motor interior through the top of the pump.
7. Simplex Pump Controls
- a. Simplex Pumps shall have a simple 460 Volt electrical plug connection
 - b. 30 foot power cord
 - c. Built in thermal overload protection
8. Major Casting Materials: The impeller, casing, bearing/seal housing and motor cover shall be of ASTM A48 Class 25 high quality hard iron.
9. Corrosion Protection: The pump/motor shaft wetted end shall be series 400 stainless steel.
- D. Minimum Sphere Passage: 2”
- E. Pump shall have 3” discharge. Contractor shall provide 40 ft of 3” diameter flexible hose with a quick connect coupling suitable for connection to the pump. Contractor shall also provide an adaptor to connect to the 4” quick connect coupling shown on drawings.
- F. Pump shall be capable of running dry or fully submerged without damage to components.
- G. NPSH: To ensure cavitation-free operation, pump's NPSH requirements must be low enough to permit stable, continuous operation at 100% or greater of best efficiency point.
- H. Noise: Pump shall be capable of continuous operation without producing noise in excess of Hydraulic Institute and OSHA guidelines.
- I. Materials of Construction:

Lower Motor Casing	Cast Iron
Shaft	Stainless Steel

Impeller	Hard Iron; Non-Clog
O-Rings	Buna N
Bearings	Heavy Duty Ball
Mechanical Seal	Silicon Carbide

J. Motor:

1. Motor Characteristics:
 - a. Type: Squirrel cage induction motor, shell type design.
 - b. All electrical parts in oil filled watertight housing.
 - c. Horsepower, Voltage and Phase: As described in section 2.02 A
 - d. Frequency, Hertz: 60
 - e. Service Factor: 1.15
 - f. NEMA Design Type: B
 - g. Motor Insulation: Class B, moisture resistant, able to withstand 40 degrees Celsius ambient temperature plus 80 degrees Celsius temperature rise.
2. Provide motors that are rated suitable for continuous operation in 40 degrees Celsius ambient temperature at project site altitude.
3. The motor shall be designed for continuous duty handling pumped media of 40 degrees Celsius and capable of a minimum of thirty (30) evenly spaced starts per hour.
4. The motor shall be capable of continuous operation under load with the motor submerged or partially submerged, without derating the motor.
5. Motor Sealing: Design motor case and seals to withstand 50 feet of submergence.

The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. Thermal switches set to open at 125°C (260°F) shall be embedded in the stator end coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The thermal switches shall open at 125°C (260°F), stop the motor and activate an alarm. A leakage sensor shall be available as an option to detect water in the stator chamber. The Float Leakage Sensor (FLS) is a small float switch used to detect the presence of water in

the stator chamber. When activated, the FLS will stop the motor and send an alarm both local and/or remote. Use of voltage sensitive solid state sensors and trip temperature above 125°C (260°F) shall not be allowed. The thermal switches and FLS shall be connected to a Mini CAS (Control and Status) monitoring unit. The Mini CAS shall be designed to be mounted in any control panel. The motor and the pump shall be produced by the same manufacturer.

6. Motor shall be provided with ball type anti friction bearings. Sleeve type bearings shall not be considered equal and shall not be allowed. Bearings shall be designed for a B-10 life of 50,000 hours minimum.
 7. Thermal Protection: Provide thermal protection as specified in Specification Section 11010.
 8. Moisture Detection: Moisture protection Type 1 as specified in Specification Section 11010.
- K. Power Cable: Oil and water resistant cord, 30 feet minimum.
1. Submersible to same water depth as motor casing.
 2. Type SJTOW 18/4, with optional seal/heat sensor.
 3. Insulation rated for 90 degrees Celsius.
 4. Non-wicking fillers.
 5. Length: Sufficient to connect to surface junction box (without the need of splices) as indicated on the Drawings or 25 feet, whichever is greater.
 6. Power cable and seal sensor cable shall come with various lengths.
 7. All power and control conductors shall terminate at terminal blocks in the local control panel or junction box.
 8. Sized to conform to NEC, ICEA, and CSA specifications.
 9. Power cable shall be sealed at the motor end as it enters the motor casing by a two part barrier to moisture intrusion.
- L. Tools and Spare Parts: All special tools required for normal operation and maintenance shall be furnished with the equipment. Furnish two (2) each of all gaskets, and one (1) each of all mechanical seals.

PART 3 EXECUTION

3.1 INSTALLATION OF EQUIPMENT

Install pumps in accordance with manufacturer's recommendations and as shown on the Drawings.

3.2 MANUFACTURER'S FIELD SERVICE

Equipment manufacturer shall furnish the services of qualified factory trained field service engineer for inspection of pump system during start-up and certification that system is installed correctly.

3.3 TESTING

Perform factory testing and field testing as specified in Section 11010.

END OF SECTION

SECTION 11337

BASKET SCREEN AND WASHER COMPACTOR

PART 1 GENERAL

1.1 DESCRIPTION

Scope: The work of this section consists of furnishing and installing one (1) mechanical basket screen and washer/compactor built together on one prefabricated unit . Spiral screen separates, conveys, compacts and de-waters solids in waste stream. Spiral screen uses perforated trough with spiral and attached brush to allow water and solids small enough to pass through perforations, capturing the larger solids separating the soft organics (fecal) through the perforation while lifting the rags and other solids into transport section for conveyance and then into discharge section for compaction, de-watering and discharge. Spiral is driven by electric motor and speed reducer. The entire unit will consist of a spiral assembly mounted at 35 degrees which includes a spiral, screen basket, transport tube, and a drive assembly. Controls for the prefabricated system shall also be included. The screen unit shall fit into the influent channel of the headworks, as shown in the contract drawings.

All equipment located within hazardous area supplied shall be rated for a Class I, Division 2, Group C and D hazardous environment. Hazardous area shall be as indicated in electrical drawings.

Note: The new screen must fit within the constraints for the channel and support location and support bearing area as the existing screen. Some customizations of the new screen to fit these existing structural constraints may be required. Vendor shall make themselves familiar with the existing geometry.

1.2 REFERENCE STANDARDS

- A. Equipment shall, as applicable, meet the requirements of the following industry standards.
- B. ASTM International (ASTM):
 - 1. ASTM A36 - Carbon Steel Plate.
 - 2. ASTM A536 - Ductile Iron Castings.
 - 3. ASTM A48 - Gray Iron Castings.
 - 4. ASTM A564 Grade 630 condition H1150 (17-4) stainless steel
- C. American Iron and Steel Institute (AISI):

1. AISI Type 1020 Steel
 2. AISI Type 1045 Steel.
 3. AISI Type 4130 - Heat Treated Alloy Steel.
 4. AISI Type 4140 Heat Treated Alloy Steel.
 5. AISI Type 18-8 Stainless Steel
 6. AISI Type 303 Stainless Steel.
 7. AISI Type 304 and 304L Stainless Steel.
 8. AISI Type 316 and 316L Stainless Steel.
- D. Society of Automotive Engineers (SAE):
1. SAE Type 660 Bearing Bronze.
- E. National Electrical Manufacturer's Association (NEMA) Standards.
- F. National Electrical Code (NEC).
- G. Underwriters Laboratory (UL and cUL).
- H. International Electrotechnical Commission (IEC).

1.3 EQUIPMENT TAG NUMBER

Tag Numbers	Equipment Name
SCR 1012	Basket Screen No. 1

1.4 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 - Submittals
- B. Section 09900: Painting and Finish Schedule
- C. Section 11010: General Mechanical Equipment Provisions
- D. Division 16: Electrical

1.5 SUBMITTALS

- A. In accordance with Section 01300:
 1. Submit shop drawings, parts lists, complete descriptive literature, catalog cut sheets, engineering and physical data, etc. as necessary to fully describe and define all items to be furnished under this specification.
 2. Provide complete design calculations shall be submitted to show compliance with design and seismic criteria, in accordance with Section 01610.
 3. Provide operation and maintenance manuals in accordance with Specification Section 01680.

4. Provide startup services and training in accordance with Specification Section 01670 and 01675

1.6 QUALITY ASSURANCE

- A. All equipment furnished under this Section shall:
 1. Be of a manufacturer who has been regularly engaged in the design and manufacture of the equipment;
 2. Be of latest design; and,
 3. Be demonstrated to the satisfaction of the owner that the quality is equal to the equipment specified herein.
- B. Factory Assembly and Testing: The basket screen, washer and compactor, and manual bar screen shall be factory assembled and factory tested at the point of manufacture. A second test shall be conducted on-site after the screen and washer/compactor installation, to ensure that the screenings/washing system is installed properly and performs according to the specification. The test shall be conducted by a service representative, which is employed by the equipment manufacturer. The U.S. testing shall be videotaped and a copy of the videotape shall be provided to the Engineer.
- C. Design Requirements: The screen will be capable of treating up to 2 MGD peak flow, at an influent suspended solids concentration of 430 mg/l and typical contents found in raw sewage. The influent to the screen will be raw sewage from an influent pumping station with potential for solids surging during various pump station operating conditions (i.e. cleaning cycles).
- D. The screen shall be suitable for installing in 5.3 feet deep and 1.5 feet wide channel.
- E. The downstream water elevation shall be a maximum of 12 inches, and a screening headloss of 10 inches maximum at peak flow of 2 MGD.
- F. Environmental Conditions: Ambient air temperature may range from 20°F to 115°F. Relative humidity may fluctuate between 10 and 100 percent. All equipment supplied shall be rated for a Class I, Division 2, Group C and D hazardous environment.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Packaging, Shipping, Handling, and Unloading
 1. Packaged in containers or on skids suitable for normal shipping, handling, and storage.
 2. Protected from rain, snow, impact, and abrasion while in the possession of the carrier.
- B. Acceptance at Site

1. Contractor shall review the contents of the shipment at time of delivery and promptly notify the carrier and supplier of any discrepancies.
- C. Storage and Protection
1. Equipment to remain in the packaging provided by the supplier until it is installed.
 2. Equipment to be stored in a dry environment between 40 and 100 degrees F.

1.8 WARRANTY

- A. A supplier's written warranty shall be provided for the equipment specified in this section. The warranty shall be for a minimum period of one (1) year for start-up or 18 months from time of equipment shipment, whichever comes first.

PART 2 MATERIALS

2.1 ACCEPTABLE PRODUCTS

- A. The basket screen shall be WesTech's CleanFlo Spiral Screen, JWC Auger Monster, or equal.
- B. The naming of a manufacturer in this specification is not an indication that the manufacturer's standard equipment is acceptable in lieu of the specified component features. Naming is only an indication that the manufacturer may have the capability of engineering and supplying a system as specified.

2.2 PROCESS DESCRIPTION

- A. The screen unit will consist of a spiral assembly mounted at 35 degrees which includes: a perforated screen trough, spiral, spray nozzle piping, filter and valve manifold, transport casing, discharge casing, discharge bagging assembly, packing gland housing, speed reducer, motor, and controls.
- B. For units with an integral washer/compactor, the wastewater and unwashed screenings will be introduced to the unit, with solids retained on the inside surface of the screen basket. Screenings captured on the screen will be periodically swept from the screen by reversing the direction of the transport spiral. The liberated putrescible material will pass onto the wastewater treatment plant. The captured and washed screenings retained on the perforated basket will then be dewatered and discharged by the transport spiral. The frequency, duration, and number of these "wash cycles" will be adjustable using a PLC. The standard wash cycle will be fully adjustable in the control system PLC and will include provisions to periodically reverse the spiral to move collected screenings into the agitation zone. Units that use only water sprays and pressing actions in combination with sprays will not be acceptable. Units that do not reverse the spiral to push the screenings into flow will not be

acceptable. Units that use a single fixed volume batch of water per screenings batch will not be allowed. Units that use grinders in lieu of mechanical agitation will not be allowed.

2.3 MATERIALS

- A. Perforated Screen Trough
 1. Perforations: Nominal 6mm (1/4-inch diameter with 57% open area.)
 2. Baffles mounted on both sides of trough with replaceable 1/4-inch neoprene channel seals.
 3. Base plate sits flat on channel floor to position trough at 35-degree inclination.
 4. Material: AISI 304 stainless steel, electropolished

- B. Spiral
 1. Lower section of spiral includes 1/2-inch groove for mounting of brush.
 2. Brush mounts into groove and is secured with set screws.
 3. Single piece helically wound brush with 1/2-inch tall nylon bristles, wire and epoxy secured within stainless steel backing
 4. Upper section of spiral bolts to drive plate and shaft.
 5. Material: ASTM A225GR Alloy steel minimum hardness 225BHN.

- C. Spray Nozzle Piping and Filter & Valve Manifold
 1. Spray Nozzle Piping
 - a. Mounts on both sides of the Perforated Screen Trough, connects to single inlet regulated with manual ball valve.
 - b. Primary wash with V-spray nozzles rated 1.5 GPM @ 40 PSI.
 - c. Impact wash with high impact velocity nozzles rated for 1.0 GPM @ 40 PSI.
 2. Filter & Valve Manifold
 - a. Mounting bracket allows manifold to be secured to wall or floor in an accessible location.
 - b. Basket Strainer
 - 1) Size 80 wire mesh screen
 - 2) Housing Material: Bronze
 - c. Y-Strainer
 - 1) Size 20 wire mesh screen
 - 2) Housing Material: Bronze
 - d. Solenoid Valve
 - 1) 120 volt AC coil, explosion proof.
 - 2) Valve body material: Bronze
 - e. Ball Valve
 - 1) Manual operation
 - 2) Valve body material: AISI 316 stainless steel

- D. Transport Casing Segments
 1. Cylindrical construction with flanged ends for bolted connection.
 2. Lower wear bars 1/2-inch thick 17-4 stainless steel with minimum hardness of 33 HRc.
 3. Upper wear bars 3/8-inch thick 17-4 stainless steel with minimum hardness of 33 HRc.
 4. Inspection cover on segments longer than 1000mm.
 5. Casing Material: AISI 304 stainless steel.

- E. Discharge Casing Section
 - 1. Cylindrical construction with flanged ends for bolted connection.
 - 2. Full diameter bottom discharge opening with flange for bolted connection.
 - 3. Lower wear bars ½-inch thick 17-4 stainless steel with minimum hardness of 33 HRc.
 - 4. Upper wear bars 3/8-inch thick 17-4 stainless steel with minimum hardness of 33 HRc.
 - 5. Inspection cover located over discharge outlet.
 - 6. Casing Material: AISI 304 stainless steel.

- F. Discharge Bagging Assembly
 - 1. Adapter
 - a. Mounts to discharge flange of Discharge Casing and mounts Cassette Bag Holder
 - b. Material: AISI 304 stainless steel.

 - 2. Cassette Bag Holder
 - a. Three (3) piece assembly with flanged discharge cylinder for connection to adapter, continuous bag flare and clamp
 - b. Material ABS plastic.
 - c. AISI 316 stainless steel ring clamp with retaining spring.
 - d. Manufactured by Paxxo.

 - 3. Continuous Bag
 - a. Cassette bag 230 ft. long continuous non-porous three-ply, co-extruded polyethylene with a thickness not to exceed 1.8 mils.
 - b. Manufactured by Paxxo.

- G. Packing Gland Housing
 - 1. Packing includes four (4) PTFE impregnated cords stack on top of one another to create seal.
 - 2. Housing material: AISI 304 stainless steel

- H. Speed Reducer
 - 1. Helical parallel shaft mounted with 160:1 reduction ratio.
 - 2. Manufacturer: Nord Gear Corporation.

- I. Motor
 - 1. TEFC Motor: Baldor Electric Company, or approved equal.
 - a. Installed Horsepower: 2 HP.
 - b. Motor Service Factor: 1.15.
 - c. Minimum Motor Efficiency (at Full Load): 86.5 percent.
 - d. Minimum Motor Power Factor (at Full Load): 75.

- J. Identification:
 - 1. Corrosion resistant nameplate affixed to top cover of Spiral Screen.
 - 2. Nameplate Information: Manufacturer's name and address, Model No., Serial No., Capacity, Max. psi, Weight, Manuf. Date.

- K. Finishes:
 - 1. Paint Coatings for Ferrous Materials: Prepared to SSPC-SP6 (Commercial Blast Cleaning) and coated with minimum 6 to 8 mils TDFT (total dry film thickness) of an aliphatic acrylic polyurethane paint in the color Hunter Green.

2. Paint Coatings for Previously Coated Components (Motors, Speed Reducers, etc.): Prepared to SSPC-SP1 (Solvent Cleaning) and SSPC-SP2 (Hand Tool Cleaning) and coated with minimum 6-8 mils TDFT (total dry film thickness) of an aliphatic acrylic polyurethane paint in the color Hunter Green.

2.4 PIVOTING SUPPORT

Holds spiral screen at proper inclination in waste stream and provides mechanism for lowering or raising screen. Pivot allows for 360 degree rotation of spiral screen and side to side movement within channel.

- A. Pivot
 1. Pivot uses tube in tube design to allow spiral screen to be removed from pivot any disassembly of fasteners.
 2. Material: AISI 304 stainless steel.
- B. Support
 1. Support with guide slot to allow sliding movement of spiral screen for proper centering and sealing in channel.
 1. Material: AISI 304 stainless steel.

2.5 LEVEL SENSORS

Measures water level in waste stream using radar and providing information to Controller for operation.

- A. Level Sensor Configuration-Discrete (Upstream only)
 1. Uses one (1) level sensor to measure upstream water level and a set point to operate system.
 2. Measuring principal: Radar
 3. Measuring Range: 66 feet.
 4. Ingress protection: IP68/ NEMA 6P
 5. Output signal: 4 to 20mA
 6. Manufactured by Endress+Hauser Micropilot FMR20
- B. Mounting Bracket
 1. Threaded connection for Level Sensor and flange for mounting to wall of channel.
 2. Material: AISI 304 stainless steel.

2.6 MOTOR CONTROLLER

NEMA enclosure with programmable logic controller (PLC), operator interface terminal (OIT), operation indicator lamps, emergency stop pushbutton, reset pushbutton and selector switch.

1. Model# PC2231S (Upstream Only Level Sensor) as manufactured and supplied by JWC Environmental Inc.
 - a. Motor Controller Power Supply: 460 V/ 3 PH/ 60 Hz.
- B. Enclosure, Selector Switches, Pilot Lights, Pushbutton, and Emergency Stop Pushbutton.

1. Enclosure NEMA 4X:
 - a. AISI 304 stainless steel with hinged door and mounting flanges.
 2. Selector Switch:
 - a. 22 mm, three-position, rated equal or better than the enclosure and indicate On-Off-Level.
 3. Pilot Lights:
 - a. 22 mm, LED (pilot lamp), rated equal or better than the enclosure and indicate POWER ON, AUGER RUN, and FAIL.
 4. Pushbutton:
 - a. 22mm momentary rated equal or better than the enclosure. Rests system after emergency stop circuit is rest and acknowledges any alarm condition and allows for re-starting of system.
 5. Emergency Stop Pushbutton:
 - a. 22mm maintained (Rotate to unlatch) rated equal or better than the enclosure.
- C. Programmable Logic Controller
1. Basis of Design: Siemens S7-1200
 - a. 100kB working memory.
 - b. (14) 24 Vdc inputs, (10) relay outputs.
 - c. (2) 0-10 Vdc analog inputs.
 - d. PROFINET interface.
- D. Operator Interface Terminal
1. Basis of Design: Siemens KTP400
 - a. Key/ touch operation, 4 in. widescreen TFT (Thin Film Transistor) display.
 - b. 4 MB configuration memory.
 - c. PROFINET interface.
 - d. SD card slot.
 - e. NEMA 4X suitable for indirect sunlight.
- E. Motor Starter, Overload Relay and Control Power Transformer:
1. Starter
 - a. IEC, full voltage, and reversing.
 - b. Maximum short circuit protective fault current 100 kA.
 2. Overload Relay
 - a. Adjustable and sized to full load amperes (FLA) of the motor.
 3. Control Power Transformer
 - a. Produce 120-volt AC power from the supply power. Sized and fused in accordance with code to accommodate the control power requirements.
- F. Current Transducer
1. Discrete output type with an adjustable set point from 1-135A with 200ms or faster response time.
- G. Operation:
1. Auger Control: In accordance with ON-OFF-LEVEL Selector Switch.
 - a. OFF Position (OFF): De-energizes Auger.
 - b. ON Position: Energizes Auger
 - c. LEVEL Position: Auger operates based on the water level measured by the

system's level sensor(s).

- 1) Auger Run Cycle will be initiated and will continue until water level difference measured is less than set point. Auger Run Cycle fully programmable from OIT.
 - 2) Auger Accumulated Run Timer initiates the operation of the auger after number of accumulated run cycles has been achieved or if level sensor fails. Accumulated Run Timer fully programmable from OIT.
 - 3) Auger Start Time Interval Setpoint monitors time period from last Auger Run Cycle and initiates a run cycle if time period exceeds the setpoint.
2. Auger JAM Condition: In accordance with setting of current transducer.
 - a. Controller will stop and reverse the Auger motor no more than two times in a 30 second period. OIT displays Auger Fail to Run and FAIL indicator lamp will illuminate.
 - b. Auger will stop operation.
 3. Auger MOTOR OVERLOAD Condition: In accordance with setting of Motor Overload Relay.
 - a. OIT displays Auger Motor Overload and FAIL indicator lamp will illuminate.
 - b. Auger will stop operation.
 4. Auger MOTOR OVERT EMP Condition: In accordance with setting of Motor Thermostat. (Only with applicable motors).
 - a. OIT displays Auger Motor Overtemp and FAIL indicator lamp will illuminate.
 - b. Auger will stop operation.
 5. Auger Reverse Jog Soft Switch (via OIT)
 - a. Energizes the auger reverse contactor while depressed. Only functional when auger selector switch is ON or LEVEL.
 6. UPSTREAM or DOWNSTREAM LEVEL PROBE FAILED Condition:
 - a. Initiates continuous run cycles on loss of signal from any probe.
 7. Power Failure:
 - a. While System is Operating: System shall return to normal operation when power is restored.
 - b. While System is in a Fail Condition: System shall return to a fail state when power is restored. The fail state shall not be cleared until reset.
 - c. Reset of Auger: Accomplished RESET pushbutton.

2.7 Equipment Networking into SCADA

- A. The supplier shall incorporate and provide an open interface to the PLC based control system. This interface shall allow the operator to view all information used in the execution of the program including, but not limited to, alarms and indications of all equipment, as well as all scaled analog information. Any alarms or delays used within the program shall be available for viewing via the SCADA system. The supplier may not claim that the code is proprietary and closed, but may require the Owner and its agent to sign confidential agreements to prevent disclosing trade secrets to the supplier's competition.
- B. The supplier shall provide the PLC program to the owner or its agents in printed ladder logic via electronic media of the program, whenever possible. This information will be used to integrate the equipment into the overall SCADA system. The supplier shall make modifications as required to allow for Ethernet based communication from the supplier's

equipment to the SCADA system as part of the base bid for this project. The modifications shall include items such as replacing the CPU or processor with a higher end model that has Ethernet or other communications capabilities. Addition of terminal servers, modems or other interface modules that convert the SCADA Ethernet to a native protocol like Modbus or DF1 serial communications shall be provided by the supplier as part of this contract. All labor required to perform this conversion, upgrade, or enhancement shall be supplied under this contract by the supplier. The interface shall be demonstrated and prove that this networking is operable during startup and prior to owner acceptance of the equipment.

2.8 ANCHOR BOLTS

The screen and the washer/compactor manufacturer shall furnish 316 stainless steel anchor bolts. The General Contractor shall set the anchors in accordance with the Manufacturer's instructions. Seismic calculations shall be required as noted in Section 01610.

2.9 FACTORY ASSEMBLY, TESTING AND INSPECTION

The screen and washer/compactor shall be factory assembled and tested for a minimum of one (1) hour prior to delivery, and shall be delivered to the site fully assembled (other than the motor/reducer unit, discharge chute and supports). It shall be capable of being set in place and field erected by the Contractor with minimal field assembly.

2.10 INSTALLATION, OPERATION AND MAINTENANCE MANUAL

In addition to the normal Installation, Operation and Maintenance manuals required by contract, a spare manual will be shipped with the unit in order to allow for proper operation of equipment prior to release of all final Installation, Operation and Maintenance Manuals to the end user.

2.11 PAINTING

Non-stainless steel parts shall be cleaned, primed and coated in accordance with Section 09900. Motors and gear reducers shall be painted the same color. Stainless steel shall be passivated after fabrication. Factory coated equipment shall be repainted in the field as specified in Section 09900.

PART 3 EXECUTION

3.1 INSTALLATION

- A. The equipment shall be installed in conformance with the manufacturer's instructions. The manufacturer's service technician shall thoroughly check and inspect equipment after installation, initiate testing, make necessary adjustments, and instruct owner's personnel in proper operating and maintenance procedures. Two day's visit by the manufacturer's service technician shall be allotted for this purpose. Additional days, if required, will be paid by the Owner for a nominal rate. Sales representatives will not be deemed acceptable in lieu of a factory-employed service technician.

- B. Equipment shall demonstrate compliance with the specifications and shall operate to the satisfaction of the Owner under actual operating conditions.

END OF SECTION

SECTION 11391

AUTOMATIC SAMPLERS

PART 1 GENERAL

1.1 DESCRIPTION

This section covers the furnishing and installation of one (1) refrigerated automatic flow proportional composite sampler suitable for outdoor installation at the Headworks (located outside of the classified area).

1.2 EQUIPMENT TAG NUMBERS

Tag Number	Equipment Name
SMP 1041	Influent Refrigerated Sampler

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Section 01300 - Submittals
- B. Division 17 - Instrumentation.

1.4 SUBMITTALS

- A. In accordance with Section 01300.
- B. Submit complete manufacturer's descriptive literature, include catalog cuts, dimensional data, and other such information.
- C. Provide operation and maintenance manuals in accordance with Specification Section 01680.
- D. Provide startup services and training submittals in accordance with Specification Section 01670 and 01675.

1.5 QUALITY ASSURANCE

- A. A written supplier's warranty shall be provided for the equipment specified in this section. The warranty for the unit shall be for a minimum period of one (1) years from start-up or 18 months from time of equipment shipment, whichever comes first. Such warranty shall cover all defects or failures of materials or workmanship, which occur as the result of normal operation and service.

PART 2 MATERIALS

2.1 GENERAL

The refrigerated sampler shall be engineered for outstanding corrosion resistance and be suitable for use over a wide range of sampling applications. Samplers shall be rotationally molded UV-resistant polyethylene with molded in place thermal insulation, weather proof and not require a fiberglass enclosure for outdoor installation. The refrigerated sampler shall be equally suited for sequential and composite sampling applications, field interchangeable.

2.2 REFRIGERATOR

- A. The collected sample shall be stored in a refrigerated enclosure capable of maintaining a sample temperature of $39^{\circ}\text{F} \pm 1.8^{\circ}\text{F}$ ($4^{\circ}\text{C} \pm 1^{\circ}\text{C}$) in ambient temperatures from -20°F to 120°F (-29°C to 49°C).
- B. The CFC free refrigerator shall include sensing devices for ambient air temperature, evaporator plate temperature, and interior air temperature. The refrigerator shall include built-in heaters to prevent the sample from freezing if the ambient air temperature drops below freezing. The unit shall be self-defrosting and shall use a forced air condensing coil with filtered frontal ventilation. A compressor with a minimum rating of 1/6 H.P. shall be used.
- C. The copper refrigeration lines shall be protected with polyester tubing and phenolic paint. The condenser coil shall be coated with polyurethane for added corrosion resistance. The refrigerator evaporator plate shall be aluminum with a food grade epoxy coating to resist corrosion. The exterior and base of the refrigerator shall be constructed of rotationally molded reinforced plastic with a UV resistant gel-coat. The interior of the refrigerator shall be food grade ABS plastic for easy cleaning and to inhibit bacterial growth. The refrigerator shall include 1-1/2 inches of rigid foamed-in-place insulation to aid in sample preservation. The refrigerator shall have a hinged, reinforced fiberglass plastic controller enclosure which is capable of being locked. The temperature control shall be made by the electronic sampler controller. Manual knobs shall not be accepted. The refrigerator's door shall also have a lockable latch to prevent unauthorized tampering with the sample compartment contents. A gasket shall be used to seal the refrigerator door. A magnetic gasket shall be used to seal the refrigerator door. The refrigerator power supply and solid-

state thermostat shall be contained in a sealed, NEMA 4 equivalent, enclosure above the refrigerator compartment to keep it away from corrosive gases. All other exposed metal components shall be either anodized or irradiated aluminum, stainless steel, or galvanized steel.

2.3 SAMPLE PUMP SYSTEM

- A. The samples shall be collected using a peristaltic pump typically producing a line velocity of 2 feet per second in a 3/8 inch ID suction line. The body of the peristaltic pump shall be made of high strength plastic for corrosion resistance. The pump shall be capable of producing at least 26 feet suction lift. Peristaltic pump shall include spring loaded rollers to prevent jamming of pump during sampling of high solids. A settable indicator shall be provided to warn the user when it is time to replace the pump tubing.
- B. Before and after each sample is collected, the pump shall air purge the suction line. Pre-purges and post-purges shall be automatically controlled.
- C. The sampler shall utilize a detector to sense the presence of the liquid at the pump. Once the liquid has been detected, the sampler shall deliver repeatable and accurate sample volumes regardless of changing head, intermittent flow in the suction line, or battery condition. The controller shall be programmable for up to three sample collection retries if liquid is not detected due to suction line plugging or absence of liquid. Up to three suction line rinse cycles shall be programmable to precondition the suction line.
- D. The sample stream shall not pass through any valves or metering chambers, or through any distribution tubing unless under pumped flow. The materials in contact with the flow stream shall be limited to medical grade silicone rubber, vinyl or Teflon, and stainless steel. The suction line shall be made of 3/8 inch ID vinyl with a length of 26 feet. A weighted 316 stainless steel strainer shall be supplied.

2.4 CONTROLS

- A. All mechanical and electronic components shall be housed in a watertight control box mounted on top of the sampler's fiberglass refrigerator. The controller shall conform to NEMA 4X and 6 standards for submersible, watertight, dust-tight, and corrosion resistant operation. A desiccator shall be installed in the control box to prevent moisture damage to the components.
- B. This display shall be angled for easy viewing and backlit for easy use in all light conditions. The sampling program shall be established using a 24-position keypad and a 40 character liquid crystal display or graphic dot matrix display with smart menu and keypad. The display shall continuously communicate the sampler's status. Two programming modes, "basic" and "extended", shall be provided. The basic programming mode shall allow the user to easily set up typical sampling routines. The extended programming mode shall expand the versatility of the sampler by providing options to allow the user to create

complex sampling routines. The sampler shall have software capable of storing up to three sampling programs identified by number.

- C. The basic and extended modes shall allow the user to program the sampler to collect either sequential or composite samples at user-definable time intervals (time pacing), or at equal flow volume intervals based on a pulsed or 4-20 ma input signals. For this project, provide a 4-20 ma interface module to utilize a 4-20 ma input signal from an external flow meter (flow pacing). The sampler shall use an internal real-time clock to provide both time and date information. It shall also offer two types of time pacing; uniform and non-uniform. Uniform time paced samples shall be collected at regular time intervals from 1 minute to 99 hours and 59 minutes. Non-uniform time intervals from 1 to 999 minutes between samples, or based on real-time settings, shall be capable of being programmed. Non-uniform time shall be common to both sequential and composite sampling routines. A delay to first sample shall be programmable in minutes from 0 to 9,999, or by the real time clock up to one month in advance.
- D. The sampler program shall allow the user to select from 3 types of multiplexing; samples per bottle, bottles per sample, and multiple bottle compositing (a combination of the first two). The sampler shall switch bottles after a period of time has elapsed, or a predetermined number of samples have been collected.
- E. The sampler shall be capable of storing key information for each sampling routine such as start time, halt and resume times, the time each sample was collected, and cause of any missed samples. This information shall be accessible at any time during or after a sampling routine, before the next routine has started. The sampler shall have the ability to be programmed for up to 12 start sampling/stop sampling routines.
- F. The sampler shall include a full bottle shutoff system to prevent overfilling the sample bottles.

2.5 POWER SUPPLY

- A. The sampler shall operate on 115 volt AC, 60 Hz line power.
- B. The sampler shall contain an internal lithium battery which will have a minimum typical life of 5 years, and shall maintain the sampler's program settings, when the sampler is turned off or in the event of an external power interruption.

2.6 SAMPLE BOTTLES

- A. Provide one spare 2.5 gallon polyethylene sample bottle.
- B. Provide the following sample bottles with the appropriate assemblies with each sampler:

1. One two and one-half (2.5) gallon polyethylene container with tube support, full container shutoff, etc.
2. One set of twenty-four (24) 1 liter polyethylene bottles with bottle tray, retainer, distributor assembly arm, conversion kit, etc.

2.7 MANUFACTURER

- A. Sampler shall be ISCO Model 5800, ISCO Model 6712FR, Hach Model AS950, or equal.
- B. The naming of a manufacturer in this specification is not an indication that the manufacturer's standard equipment is acceptable in lieu of the specified component features. Naming is only an indication that the manufacturer may have the capability of engineering and supplying a system as specified.

PART 3 EXECUTION

3.1 GENERAL

Install as shown on drawings and in conformance with manufacturer's recommendations.

END OF SECTION

SECTION 11604

SAFETY EQUIPMENT

PART 1 GENERAL

1.1 SCOPE

Under this item, the Contractor shall furnish personal safety equipment, including:

- A. Emergency Shower and Eye Wash
- B. Fire Blankets
- C. First Aid Kit
- D. Safety Rope
- E. Life Preserver
- F. Safety Glasses

1.2 SUBMITTALS

- A. In accordance with Section 01300.
- B. Manufacturer's literature and certificates of compliance with these and other referenced sections.
- C. Manufacturer's installation instructions, parts list, and operating and maintenance instructions. Provide operation and maintenance manuals in accordance with Specification Section 01680.

1.3 MANUFACTURER

The naming of a manufacturer in this specification is not an indication that the manufacturer's standard equipment is acceptable in lieu of the specified component features. Naming is only an indication that the manufacturer may have the capability of engineering and supplying a system

as specified.

PART 2 MATERIALS

2.1 GENERAL

Personnel safety equipment shall meet or exceed ANSI requirements as specified below.

2.2 EMERGENCY EYE WASH

2.3 Porta Stream II Eye Wash Station, or equal. See plans.

2.4 FIRE BLANKET

A. Manufacturers: One of the following or equal:

1. VWR Scientific, No. 56611-202

B. Features and Characteristics

1. Blanket: Roller-type, fire-resistant treated 100% wool blanket, nominal 62 by 82 inches.
2. Case: Wall-mounted enamel coated metal with friction-held door, no latch, 70x5x5 inches.

C. Quantity and Location

1. One in the Control Building

2.5 FIRST AID KIT

A. Manufacturers: One of the following or equal:

1. VWR Scientific, No. 56613-048

B. Features and Characteristics

1. Prefinished, wall-mounted metal cabinet.
2. Standard medical supplies capable of serving up to 10 people.
3. Meets OSHA 1910.266-Appendix A requirements.

- C. Quantity and Location
 - 1. One in the Control Building.

2.6 SAFETY ROPE

- A. Manufacturers: One of the following or equal:
 - 1. Mine Safety Appliances Company
 - 2. California Safety
- B. Features and Characteristics
 - 1. Diameter: 9/16-inch.
 - 2. Length: 150 feet.
 - 3. Accessories: Snap hook on one end.
- C. Quantity and Location: One with each life preserver, distance between the life preservers are not to exceed 200 feet.

2.7 LIFE PRESERVER

- A. Product: U.S. Coastguards and OSHA approved. Doughnut-shaped, 30-inches diameter, with mounting brackets, storage cabinet, and pulling rope as required.
- B. Quantity and Location: Provide eight (8) life preservers or enough to ensure distance between the life preservers do not exceed 200 feet around the two Emergency Storage Basins. Install as directed by Engineer.
- C. Manufacturer: Cheyenne Manufacturing, or equal.

2.8 SAFETY GLASSES

- A. Product: Wilson, Spectra Series, plastic with clear lenses, or equal.
- B. Quantity and Location:
 - 1. Two at the Chemical Feed System. Install as directed by Engineer.
- C. Provide a wall mounted storage cabinet for safety glasses at all locations.

PART 3 EXECUTION

3.1 INSTALLATION

Install equipment in strict accordance with manufacturer's recommendations.

END OF SECTION

SECTION 13322

CALCIUM NITRATE CHEMICAL FEED SYSTEM (LINKED)

PART 1 GENERAL

1.1 SCOPE

- A. This section includes the fabrication, delivery, installation, and placement into successful operation of a Chemical Feed System with a web based Linked control system. Customer shall have direct access to this web based system to allow remote adjustments and verification of system status. This system will be complete and include chemical feed pumps, feed controls, liquid storage tanks, and all piping and appurtenances required to feed calcium nitrate into a wastewater collection system and one full load of calcium nitrate to facilitate start-up and system optimization. All materials shall be provided in accordance with these specifications.
- B. All components of the system shall be compatible with the conditions and chemicals to which they are subjected to during the normal operation of the system. Compounds with which the materials must be compatible with include, but are not limited to:
1. Hydrogen Sulfide
 2. Calcium Nitrate (Bioxide® Solution, or approved equal)
- C. A summary comparing the required Linked and Basic functions of the dosing system is provided in the table below:

	Linked	Basic
Dose Curves	24 hours / 7 days	24 hours
Temperature Compensation	Yes	No
Flow Pacing Mode	Yes	Yes
Flow Pacing Modifiers	24 hours / 7 days	No
Rain Compensation	Yes	No
Interface	Yes	No
Tank Level Monitoring	Yes	Yes
HMI	Color / Touchscreen	Color / Touchscreen

1.2 PROCESS DESCRIPTION

The system shall provide for bulk storage of calcium nitrate and metering of the calcium nitrate from the bulk storage tank to the Primary Pump Station. The system shall contain controls as necessary to facilitate seven discrete dosing profiles that vary in 1-hour increments over a 24-hr period. A calibration cylinder shall be permanently installed to facilitate calibration of feed pumps.

The calcium nitrate material shall utilize the inherent ability of the facultative bacteria normally present in wastewater to metabolize hydrogen sulfide and other odor-causing, reduced sulfur containing compounds. The material shall provide nitrate-oxygen to the wastewater to support this biochemical mechanism. This nitrate-oxygen shall be applied via nitrate salts. The material shall be chemically stable, allowing continuous removal of sulfide contributed by side streams downstream of the application point. As a result of the biochemical process, the material shall provide the additional benefit of biochemical oxygen demand (BOD) reduction in the wastewater. The feed system is capable of reducing chemical usage by at least 10% versus typical 2-timer systems by dosing more closely to the demand curve.

1.3 EQUIPMENT TAG NUMBER

Tag Number	Equipment Name
TNK 140	Chemical Feed Tank 1
PMP 1411	Chemical Feed Pump 1
PMP 1412	Chemical Feed Pump 2

1.4 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Section 01610: Seismic Design Criteria
- B. Section 01615: Wind Design Criteria
- C. Section 11010: General Mechanical Equipment Provisions
- D. Division 16: Electrical

1.5 MANUFACTURER AND QUALITY ASSURANCE

- A. The system shall be provided by Evoqua Water Technologies LLC of Sarasota, Florida, or approved equal.
- B. The naming of a manufacturer in this specification is not an indication that the manufacturer's standard equipment is acceptable in lieu of the specified component features. Naming is only an indication that the manufacturer may have the capability of engineering and supplying a system as specified.
- C. The manufacturer of this equipment shall be one recognized and established in the design, production, and operation of calcium nitrate (Bioxide VDLT Linked chemical feed system, or approved equal). The equipment shall be constructed and certified in accordance with appropriate specifications and standards.
- D. The manufacturer shall maintain regular production facilities at their place of business. These facilities shall be open for inspection by a representative of the Owner or Engineer at any time during construction and testing of this equipment.
- E. Standards. All control system design, fabrication, and wiring shall conform to the National Electrical Code, standards of Underwriters Laboratories and any other applicable federal codes. Control system panels shall bear the listing of a Nationally Recognized Testing Laboratory (UL, ETL etc.).
- F. All components of the feed system will be provided by a single manufacturer who shall have sole-source responsibility for the system.
- G. All equipment shall be furnished by a single manufacturer who shall be responsible for the coordination of the system design.

- H. The material specifications contained herein conform to the design of a particular manufacturer and are intended to establish the type, function, and standard of quality required. It is not the intent of these specifications to exclude the equipment of alternative manufacturers provided that in the opinion of the Engineer, the overall performance standards, experience, and material quality required herein are met.
- I. If the material specifications of the equipment to be supplied are different than those contained herein, some changes to the specified design may be required. The design and construction of such changes shall be the responsibility of the Contractor or the equipment manufacturer at no additional cost to the Owner. Any proposed design changes must be approved by the Engineer before they can be implemented.
- J. The equipment supplier shall have at least 15 years experience in the design, application, and supply of calcium nitrate chemical feed systems for wastewater, and shall submit a list of not less than 10 installations of calcium nitrate chemical feed systems as evidence of meeting the experience requirement. The list shall be submitted during construction and shall include the following information for not less than 10 installations: agency name and address; name and telephone number of the responsible person in charge of the chemical feed system; and the size of the system.

1.6 SUBMITTALS

- A. In accordance with Section 01300.
- B. The manufacturer shall submit complete shop drawings and engineering data to the Owner or Engineer, upon request. These submittals shall include, at a minimum:
 - 1. Drawings showing plan and elevation views of the feed system
 - 2. Control system layout drawing
 - 3. Control systems electrical diagram
 - 4. Manufacture's catalogue information on major system components including, but not limited to:
 - a. Chemical Feed Pumps
 - b. Linked Feed Controls
 - c. Liquid Storage Tanks
 - d. Operator Interface
 - 5. Statement of design conditions and performance guarantee
 - 6. Statement of warranty
 - 7. Reference list for section 1.4 above
- C. Operation and maintenance manuals shall be provided by the Manufacturer prior to installation of all major equipment components in accordance with Section 01680. The equipment supplier shall furnish five (5) copies of operation and maintenance manuals which will be retained at the installation site to assist operators. These manuals shall include at a minimum:
 - 1. Supplier's erection and assembly recommendations and a complete list of recommended spare parts
 - 2. Information in hazards associated with the system and the appropriate safety precautions
 - 3. All appropriate Material Safety Data Sheets (SDS)
 - 4. Equipment installation instructions
 - 5. Equipment startup instructions
 - 6. Equipment maintenance procedures
 - 7. Troubleshooting guide
 - 8. Individual operation and maintenance information on major system components, including but not limited to:

- a. Chemical Feed Pumps
- b. Linked Feed Controls
- c. Liquid Storage Tanks

1.7 WARRANTY

- A. The Manufacturer shall guarantee that the system will perform as described in these Specifications. The Manufacturer shall warrant the system, complete, to be free from defects in materials or workmanship for a period twelve (12) months from acceptance or eighteen (18) months from shipment, whichever occurs first. The Manufacturer shall repair or provide replacement for any defective components under this warranty. In addition, the chemical storage tanks shall be warranted for a period of five (5) years from warranty start date.

1.8 ENVIRONMENTAL CONDITIONS

- A. Exposures: The equipment will be subject to rainfall, wind (including dust and dirt), direct sunlight and a corrosive environment due to hydrogen sulfide and hydrocarbon gases. Ambient air temperatures may range from 15°F to 115°F. Relative humidity may fluctuate between 10 and 100 percent.

1.9 DELIVERY

- A. Fabricated assemblies shall be shop assembled and property match marked for ease of field erection.
- B. All components will be erected by the Contractor immediately upon receipt from the Manufacturer or stored in strict conformance with storage recommendations provided by the Manufacturer.
- C. Delivery shall be coordinated with the Contractor.

1.10 SUBSTITUTIONS

- A. Any substitutions or deviations in equipment or arrangement from that shown on the drawings specified herein shall be the responsibility of the Manufacturer or Contractor. Any deviations must be accompanied by detailed structural, mechanical, electrical drawings and data for review by the Engineer. All costs associated with review of the substitutions or deviations and costs associated with project drawing changes as a result of approval shall be borne by the Manufacturer or Contractor. There shall be no additional costs to the Owner due to substitutions or deviations.

PART 2 – MATERIALS

2.1 PRODUCT INFORMATION

- A. Calcium Nitrate (Bioxide® or approved equal)
 - 1. Design Requirements
 - a. The material supplied shall be an aqueous solution of calcium nitrate containing a minimum of 3.6 pounds of nitrate-oxygen per gallon.

- b. The material shall be capable of reducing the dissolved hydrogen sulfide concentration in wastewater to less than 0.1 mg/l.
- c. The material shall be free of any objectionable odor producing compounds.
- d. The material shall not add TDS, chloride or sodium.
- d. The pH of the material shall not be less than 4.0 or greater than 7.5.
- e. The material shall have a freezing point less than -10 °F.

2. Safety Requirements

- a. The material shall not be listed as an Extremely Hazardous Substance under Section 302 of EPCRA, nor be listed as a CERCLA hazardous substance.
- b. The material shall be exempt from Federal DOT placard requirements.
- c. Recommended handling procedures for the material shall require protective gloves and safety glasses only. Any material recommending more sophisticated equipment (i.e., face shield, body suit, etc.) during routine handling shall not be considered.

2.2 COMPONENTS

A. Tank

The chemical storage tank shall be constructed of Rotationally Molding High-Density Cross-linked Polyethylene (HDXLPE). No other material of construction shall be acceptable.

1. Specifications

The chemical storage tank shall be double wall and have the following capacity and approximate dimensions (+/- 5%):

Parameter	Chemical Tanks
Nominal Capacity	4,350 U.S. gal
Diameter	10' 3"
Height	10' 4 ¼"
Empty Weight	2125 lb.
Specific Gravity	1.90

Seismic restraints with engineer stamp shall be included.

2. Manufacturing

- a. High density cross-linked polyethylene tanks shall be manufactured by the rotational molding process in accordance with ASTM D-1998-93 Standard Specification for Polyethylene Upright Storage Tanks.

- b. Appearance. Finished vessel walls shall be as free as commercially practicable of visual defects that will impair the serviceability of the vessel.
- c. Dimensions and Tolerance. The vessel diameter shall be measured externally. Measurement shall be taken in a vertical position.

3. Material

- a. Plastics. The polyethylene shall preferably be virgin material. Any use of regrind, recycled, or reprocessed materials or combinations of such materials shall not rely upon the performance data of their original constituents but must meet the requirements of this standard in its own right.
- b. Fillers and Pigments. The plastic shall contain no fillers. All plastic shall contain an ultraviolet stabilizer. This stabilizer shall be compounded in the polyethylene. Pigments must be compounded at the same time of resin manufacture.

4. Fittings

- a. All fittings with the exception of the overfill protection site glass, shall be located on the tank top or dome. No penetrations of the side-wall shall be made.
- b. Plastic Fittings. Plastic fittings shall be "bulk-head" or "two-flange" style. All bolts shall be all thread design. Each bolt shall have a gasket, which is on the inside of the vessel.
- c. Openings that are cut in vessel to install fittings shall not have sharp corners. Holes shall have minimum clearance to ensure the best performance of fittings.
- d. For all flanged connectors, the flange drilling and bolting shall be in accordance with ANSI/ASME B-16.5 for 150-psi pressure class straddling the principal centerline of the vessel.

B. Process Feed System

- 1. General. The operation of the Chemical Feed System shall be controlled from a Control Panel. All equipment control switches, pilot lights, controllers, etc. and the chemical feed pumps shall be housed in this panel.
- 2. Enclosure. The control panel enclosure shall be constructed of 316 stainless steel and shall be rated NEMA 4X. The hinged door shall be padlockable. Lock to be provided by Owner. The enclosure shall be mounted on the Calibration Stand.
- 3. Components. The Control Panel shall contain the following:
 - 1 - Touch Screen Operator Interface with color display and integrated tank level indication
 - 1 - HMI On/Off Soft Switch for auxiliary equipment
 - 2 - HMI Off/Auto Soft Switches for pump control
 - 1 - Set of Contacts with surge arrestor to accept Tank Level device
 - 1 - Cellular Modem for remote communication

* - Panel shall have the capability to accept a Resistance Temperature Device

4. Controls Layout. The panel shall be outfitted with a main power disconnect located in the Calibration Stand.
5. Standards. All control system design, fabrication, and wiring shall conform to the standards of Underwriters Laboratories, National Electrical Code, and any other applicable federal codes.
6. System Operation. Chemical Feed Pumps. The chemical feed pumps shall be controlled by a two-position OFF/AUTO soft switch. The control system shall utilize 24 discrete dosing set points, one set-point for each hour of the day. It shall be possible to utilize 24 different discrete dosing set-points for each day of the week. Control systems utilizing less than 168 discrete flow set-points per week shall not be acceptable.
 - a. When in the AUTO position, the pump shall be controlled by the advanced dosing controller. The advanced dosing controller shall vary the feed rate in 1-hour increments as specified by the user. The pumps shall be turned on and off by the advanced dosing controller to match the specified dose curve. The system shall have the capability to automatically adjust the feed rate based on wastewater temperature.
 - b. System shall automatically calculate and dose the specified volume of product with either one pump or two pumps activated. System shall have the capability to verify the volume dosed matches the preset curve via the tank level and shall alarm at three preset tank levels.
 - c. Automatic functions shall be protected by one-level security.
 - d. Flow set points shall be linearly interpolated to provide for smooth flow curve for each day
 - e. Systems shall be capable of dosing from seven different flow curves. Daily flow curves shall also be adjustable by a global setting to increase the feed rate percentage across all 24 daily set points.
 - f. System shall allow user to copy daily curves from one day to another for ease of set-up.
 - g. System shall have selectable High-Low-Empty digital output alarms and provide for remote customer lockout contacts for remote customer shutdown.
 - h. Feed pumps shall have the capability to be interlocked with the sewage pumps and shall have the capability to be automatically shut-down on empty tank alarm.
 - i. System shall be capable of providing alarms for tank or pipe leak detection. Optional equipment is available if both tank and pipe leak detection is required.
7. Calibration Stand. Pump control box shall be mounted on a 316 stainless steel pedestal. The pedestal will consist of the following:

- a. Calibration Cylinder. The stand shall house a calibration cylinder used to measure the chemical being injected into the system. A 3-way valve shall be located at the top and bottom of the calibration tube to facilitate flow measurement. Access inside this pedestal shall be accomplished through a door located on the front of the pedestal. Instructions for use of this cylinder shall be permanently affixed to the interior of the enclosure.
- b. Disconnect Switch. A main power disconnect shall be located in the control stand.

C. Pumps

- 1. General. Provide Evoqua Water Technologies LLC. Bellows Pump(s), or approved equal, as shown on the following table. Each pump shall include motor, base, sealed bearings, flexible coupling, and check valve filters.

Quantity	Model No.	Bellows Size	Adjustable Flow Rate Range (mL/min)	Max Discharge Pressure (psi)
2	15908-002	1.0"	50-500	40

- 2. Performance. Pump rates and maximum discharge pressures shall be in accordance with the table above.
 - a. The pumps shall be self-priming capable of suction lifts, when dry, up to seven (7) feet, and with bellows full, they will prime up to twenty (20) feet.
 - b. Flow rate of each pump shall be adjustable by (a) diameter of bellows, and (b) adjustment of stroke length. A calibration cylinder and valves will be installed to calibrate the pump feed rates.
 - c. Pump suction and discharge shall be 3/8" ID polypropylene barbed connection for "T" tubing.

- 3. Construction.

<u>Material Reference</u>	<u>Material</u>
Bellows	Polypropylene
Poppet valves	EPT®
O-rings	EPT®
Springs	Hastelloy C

- 4. Motors. Motor shall be totally enclosed 115 volt, 60 Hz, 0.034 HP, single-phase and shall be rated for continuous duty.

D. Piping & Appurtenances

- 1. All suction and discharge piping shall be standard ½", Schedule 80 PVC. All valves, fittings, and connectors shall be Schedule 80 PVC.
- 2. All fill line piping shall be 2" Schedule 80 PVC. All fill line valves, fittings, and connectors shall be Schedule 80 PVC.

3. Fill line shall have a 2" stainless steel male camlock with a 2" plastic female camlock cap.
4. All chemical feed seals shall be compatible with the chemicals to be used in the regular operation, maintenance, and cleaning of the feed system.
5. All fittings shall be solvent-welded or threaded.
6. Contractor must install chemical feed discharge lines so that the product is injecting directly into the waste streams and not onto structures or equipment.
7. A wye strainer shall be installed on the suction line.

E. Level Indication

The manufacturer shall provide one pressure transducing tank level indicator which utilizes the control panel. The system shall contain 3 adjustable relays to allow for alarms and other electrical uses as well as one 4 – 20 mA output. Manufacturer will provide a remote level indicator panel with high-low-empty alarms. Panel shall be NEMA 4X stainless steel. Panel shall be pad lockable. Lock to be provided by Owner.

Manufacturer will supply a mechanical tank level display utilizing a float mechanism. Reverse level tape will be provided with the tank.

2.3 ANCHORAGE AND FASTENERS

- A. Anchor Bolts: All anchor bolts shall be a minimum of ½-inch diameter and made of type 304 stainless steel. The equipment supplier shall furnish all anchor bolts, nuts, and washers required for the equipment.
- B. Fasteners: All structural fasteners shall be a minimum of ½-inch diameter and made of type 304 stainless steel. The equipment supplier shall furnish all fasteners required for the assembly of the equipment.
- C. Anchorage shall be provided with engineered stamped calculations. See Specifications 01610 and 01615.
- D. Equipment is to be placed on an existing slab of unknown dimensions. Assume slab is 6-inches thick.

PART 3 – EXECUTION

3.1 GENERAL

The equipment shall be installed properly to provide a complete working system. Installation shall follow the supplier's recommendations.

3.2 SHOP ASSEMBLY

The equipment specified herein shall be completely factory assembled as one unit as far as practical. All mating parts shall be trial fit and match-marked. The manufacturer shall submit certification of shop assembly before shipment.

3.3 SITE AND UTILITIES

The completed system, tanks, and other appurtenances shall be located on a foundation as shown in the plan drawing. The following utilities shall be provided at the feed system site and located as shown on the drawing and as indicated in the approved project proposal.

3.4 EQUIPMENT SHOP TESTING

Before shipping the chemical Feed System, the Manufacturer shall perform shop tests. These tests shall include at a minimum:

- A. Visual inspection of all equipment.
- B. Complete assembly and wet testing of all calibration piping.

3.5 INSTALLATION, STARTUP, OPTIMIZATION AND TRAINING

- A. Provide startup services and training in accordance with Specification Section 01670 and 01675.
- B. The manufacturing of chemical feed system shall furnish a factory-trained representative for not less than two (2) days for the feed systems supplied. The days shall not necessarily be consecutive; however, the times shall be as approved by the Contractor, and Owner.
- C. A day shall be considered as 8 hours. The factory-trained representative shall perform the following:
 - 1. Installation services. All installation personnel shall be trained and qualified in the areas of plumbing, electrical work, and instrumentation as required to complete the installation.
 - 2. Place each piece of equipment into initial service.
 - 3. Optimize chemical feed system to achieve designated program goals.
 - 4. Train and instruct the operating personnel in the proper operation of the equipment and in the proper maintenance of the equipment.

3.6 SUPPORT SERVICES

Provide 18-months of Evoqua water technical subscription cellular monitoring and support service, or equal, starting from the date that the factory-trained representative's initial site visit.

3.7 FIELD TESTS

- A. The performance of the system shall be in accordance with the terms of the process description in section 1.2 of Part 1 of this document
- B. If required, Manufacturer shall make any changes to the system, at his own expense, that may be necessary to assure satisfactory and efficient operation of this system.

END OF SECTION

SECTION 13614

FRP PACKAGE WET WELL

PART 1 GENERAL

1.1 DESCRIPTION

This specification is intended for the design, fabrication, pre-assembly and supply of a pre-fabricated fiberglass reinforced plastic (FRP) sewage lift station wet well for installation in the vertical position to serve as the Primary Pump Station wet well. The station shall consist of an all FRP wet-well tank, including top and bottom, all internal piping, electrical controls, other components, accessories necessary for reliable operation, foundation systems, FRP bottom concrete infill and Angular Aggregate Fill (adjacent to FRP wet well) as required. The final foundation design details shall be provided by the Contractor in a design-build format as described on the drawings and specification sections below.

Contractor shall furnish all labor, materials, equipment and performance of all work necessary or incidental to furnish and install a triplex prefabricated FRP wet well. The wet well shall be a completely factory-assembled unit, requiring only minor adjustments and reassembly in the field.

1.2 RELATED WORK IN OTHER SECTIONS

- A. Section 01300: Submittals
- B. Section 01610: Seismic Design Criteria
- C. Section 01615: Wind Design Criteria
- D. Section 02020: Geotechnical Report
- E. Section 03100: Concrete
- F. Section 01640: Product Handling
- G. Section 01680: Operations and Maintenance Manuals
- H. Section 02225: Structure Excavation and Backfill

I. Division 16: Electrical Connections

1.3 SUBMITTALS

A. Shop Drawings

1. The prefabricated FRP wet well manufacturer shall prepare shop drawings for the complete wet well including structural and opening details, equipment mounting and location details, and manufacturer's cut sheets for each item of equipment in the wet well. The main component of the submittals shall be drawings of the complete prefabricated FRP wet well prepared by the manufacturer. Manufacturer's cut sheets shall indicate capacities, dimensions, and materials of construction for all equipment in the prefabricated FRP wet well.
2. The Contractor shall provide shop drawings for foundation systems, FRP bottom concrete infill and Angular Aggregate Fill (adjacent to FRP wet well), as required.
3. The prefabricated FRP wet well supplier shall prepare a complete operations and maintenance (O&M) manual for the complete wet well. The O&M manual shall include routine maintenance requirements and spare parts lists for each major item of equipment in the wet well. The names and telephone numbers of companies where spare parts and/or trained service technicians are available shall also be included for each item of equipment.
4. Within three (3) weeks of receipt of the order the supplier will furnish three (3) complete sets of drawings for approval. The drawings will provide detail of the major construction elements and a list of all equipment furnished.

B. Quality Control Submittals

1. Manufacturer's Certificate of Compliance.
2. Special shipping, storage and protection and handling instructions.
3. Manufacturer's written/printed installation instructions.

1.4 SHIPPING AND STORAGE INSTRUCTIONS:

- A. The manufacturer of the prefabricated FRP wet well shall coordinate with the contractor so that the wet well is delivered to the jobsite on time for installation. Handling instructions shall be provided by the wet well manufacturer with the wet well to insure proper handling of the wet well structure.
- B. The wet well will be shipped assembled to the greatest extent possible to reduce installation and start-up costs.
- C. All materials and equipment necessary for the fabrication and installation of FRP wet-well shall be stored according to the manufacturer recommendation to prevent cracking, twisting, bending, breaking, chipping or damage of any kind to the materials or equipment, including damage due to over exposure to the sun. Any material which, in the opinion of

the Engineer, has become damaged as to be unfit for use, shall be promptly removed from the site of work, and the Contractor shall receive no compensation for the damaged material or its removal.

1.5 WARRANTY

Manufacturer shall warrant the wet well to be free of defects in materials and workmanship for a period of two years after the date of delivery.

1.6 QUALITY ASSURANCE:

- A. The material covered by these specifications shall be furnished by an ISO-9001:2000 certified manufacturer of proven ability who has regularly engaged in the manufacture and installation of FRP systems.
- B. Substitution of any component or modification of system shall be made only when approved by the Engineer.
- C. Fabricator Qualifications: Firm experienced in successfully producing FRP fabrications similar to that indicated for this project, with sufficient production capacity to produce required units without causing delay in the work. The manufacturer of the wet-well shall be able to show experience in manufacture of FRP wet-wells for more than five years.
- D. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work.

1.7 DESIGN CRITERIA

- A. Foundation design shall be per the 2019 California Building Code (CBC). See above references (Section 1.2) for additional design requirements. See Drawing Nos. S100 and S101 for additional design information. For bidding purposes, assume volume of concrete for 'FIRST POUR' equals forty (40) cubic yards and for 'SECOND POUR' equals ten (10) cubic yards. For bidding purposes, assume the minimum reinforcing requirements are a concrete to reinforcing ratio equal to 0.005. In other words, for a sixty inch (60") thick mat reinforcing spaced at six inches (6") would be required to be #9 @ 12" T&B EW (note other configurations may be acceptable, see Drawings Nos. S100 and S101).

FRP bottom design shall include benching to minimize dead zones in the wet well and shall be per FRP Wet Well manufacturer. For bidding purposes, assume volume of concrete equals five (5) cubic yards.

Angular Aggregate Fill (adjacent to FRP wet well) shall be per FRP Wet Well manufacturer. For bidding purposes, assume volume of Fill equals fifty (50) cubic yards.

Provide stamped, signed calculations and drawings, by a registered Civil or Structural Engineer in the State of California.

- B. Dimensions: The wet-well shall be a circular cylinder, sized per the plans for the San Juan Bautista Sanitary Sewer Force Main to Hollister Project. The wet-well shall be produced per length in the plans +/- 1/2". The nominal inside diameter shall be 120". The tolerance on the inside diameter shall be +/- 1%.
- C. A safety factor of (3) on the minimum ultimate tensile strength of the laminate on all wet wells less than 6' in diameter shall be used in designing the wall, bottom and roof thickness of the station, taking into account all normally imposed loads arising from floatation, soil pressures, normal backfill, handling loads, operating loads and static loads imposed by equipment used in hoisting the pumps in and out of station. Sufficient strength shall be provided for the following loading conditions:
 - 1. Resistance to buckling when empty and when the groundwater elevation is at grade.
 - 2. The anchoring structure at the wet-well base, within the reinforced concrete base zone, shall be designed to resist external hydrostatic water forces of an empty or full cylinder with the groundwater at grade elevation.

The structural and buoyancy calculations shall be stamped by a California Professional Engineer.

- D. The wet-well shall be suitable for use in typical sanitary sewer environment with a temperature range not to exceed 140°F.
- E. Cutouts shown in the plans and details for the wet-well shall be capable of maintaining the unit's structural integrity.
- F. Wet-well Tops and Hatch Openings:
 - 1. The wet-well shall be provided with an FRP top designed to withstand backfill and concrete slab.
 - 2. Hatch opening dimensions and position shall be coordinated to suit the submersible pumps with a minimum of 6" clearance.
 - 3. Hatch shall include double leaf spring assist and fall-protection installed flush to the surrounding concrete slab elevation. See wet well drawings.
 - 4. See Specs 08310 – Access Hatches for requirements.
 - 5. Hatches shall be coordinated with pump equipment manufacturer and the wet well hatch openings and details shall be coordinated between manufacturer's by the Contractor.
- G. Marking and Identification: All wet-wells shall be marked with the following information:
 - 1. Manufacturers Identification
 - 2. Manufacturers Serial Number
 - 3. Wet-well Diameter and Length

4. ASTM Designation

1.8 REFERENCES

- A. ASTM D3753 – Standard Specification for Glass-Fiber-Reinforced Polyester Manholes and Wet-wells
- B. ASTM A36 – Standard Specification for Structural Steel
- C. ASTM A283D – Standard Specification for Structural Steel
- D. ASTM D883 – Definitions of Terms Relating to Plastics
- E. ANSI B16.1 – Standard Specification for 125 lb. Standard Flat Face Cast Iron Flanges
- F. ASTM D3299 – Standard Specification for Filament-wound Glass-fiver Reinforced Thermoset Resin Corrosion-resistant Tanks
- G. ASTM C581 – Practice for Determining Chemical Resistance of Chemical Thermosetting Resins Used in Glass-Fiber Reinforced Structures Intended for Liquid Service
- H. ASTM D695 – Standard Test Methods for Compressive Properties of Rigid Plastic
- I. ASTM D790 – Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
- J. ASTM D2584 – Standard Test Method for Ignition Loss of Cured Reinforced Resins
- K. ASTM D2412 – Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe buy Parallel Plate
- L. ASTM D2583 – Standard Test Method for Indentation Hardness of Rigid Plastics By means of a Barcol Impressor

PART 2 MATERIALS

2.1 MANUFACTURERS

The complete wet well shall be manufactured by Topp Industries, Inc. Barski Industries or approved equal.

2.2 WET-WELL/WET WELL COMPONENTS

A. Main Chamber/ Wet-well

1. The main chamber shall be a vertical cylinder made integrally with a reinforced bottom capable of withstanding hydrostatic pressure with water to grade while the station is completely empty. The station bottom shall be flat with benching . The shell section will be made of FRP using the filament winding process. This process provides maximum strength to weight ratio. This chamber shall also be constructed to handle the external ground loads for the specific application and also withstand both corrosive environments of the liquids inside and outside the wet well. Filament wound external reinforcing ribs shall be provided for additional strength against buckling and also provide a method of securing the support lugs. Quantity and size of these ribs shall be calculated for each application. Main chamber is to have adequate hydraulic storage capacity for each application and is designed for mounting and removal of the submersible pumps specified. The interior finish is to be a smooth, bright white molded finish for ease of cleaning. Designed that are required to be pressed into wet concrete to accommodate hydrostatic pressure shall not be acceptable.

B. Hardware

1. Fasteners, anchors, and other structural hardware shall be 316 Stainless Steel.

C. Entrance Covers

1. The hinged and lockable Safe-hatch access covers are to be made of either FRP or checker plate aluminum. Each access cover will be suitable to support the weight of two men (500 lbs) or 300 lbs/ square foot. Other than the Safe-Hatches, the hinges are to be fabricated out of stainless steel. The cover stays and lock boxes are to be made of stainless steel or marine grade aluminum. Doors are to be designed to lay flat on their backs when open or maintained in the vertical position by cover stays or pneumatic cylinders.
2. The access cover unit shall be equipped with a Safe-Hatch hinged safety grate to provide protection against fall-through and to control access into the confined space. Grate openings shall be sized to allow for routine maintenance inspection without having to open the safety grate. The closed safety grate shall be designed to support the weight of one pump to facilitate site pump wash-down and inspection.
3. Refer to Specs 08310 – Access Hatch requirements.

D. Influent and Discharge Connections

1. All connections to the wet-well wall shall match to the specified pipe materials in the drawings Acceptable connection type is a hub and linkseal combination

E. Lifting Lugs/ Top Flange

1. A minimum of (2) lifting lugs/trunnions are required on stations eight feet in diameter or larger, each capable of handling the entire weight of the station. These lugs will also be capable of handling a lift from the horizontal position to the vertical position. Material can be mild steel epoxy coated, galvanized or stainless steel. It is critical that the shape of the lugs is such that they cannot pull out of the fiberglass overlay. The overlay can be hand lay-up or filament wound in conjunction with the top external reinforcing rib. This eliminates the need for bolting through the station shell. Stations 6 feet in diameter and less shall be furnished with an FRP top flange which the cover will be bolted to. These stations are lifted by applying straps around the cylinder under this flange. Use of chains for this purpose is not acceptable and will damage the FRP structure.

F. Ballast/ Anti-floatation Flange

1. For stations 6 feet in diameter and less, the station shall be provided with one (1) anti-floatation flange located near the bottom of the station or as shown on the drawings. This anti-floatation flange is an integral part of the station and is sufficient in design to withstand the forces acting upon the station due to the subsoil water pressure. Once the station is inserted into the hole, concrete ballast may be required depending on the station depth, please refer to the recommendations for concrete ballast as recommended by the manufacturer. The combination of the flange and the loading of backfill material over the concrete shall provide adequate ballast against buoyancy under full hydrostatic head conditions.

G. Basin Geometry

1. The pump station shall be supplied with a flat bottom with benching to facilitate the handling of unscreened raw sewage. Basin geometry shall be considered self-cleaning (through benching) and shall be required to pump away a majority of solids with each pumping cycle. The flat surface area shall be minimized to an area that is directly influenced by the pump suction and shall be free of obstacles. The bottom surface area shall have a ratio of 1:4 as it relates to the cross-sectional area of the pump station. The benching of the pump station bottom shall further optimize the self-cleaning features of this station by directing all solids, trash and sludge, normally found in sewage and wastewater, to the suction of the submersible pumps to facilitate removal and effectively clean the bottom.

2.3 PIPING

- A. The riser from each pump shall exit the top. All piping, shall be made of either 200 psi rated DIP or 200 psi rated 316 stainless steel. All flanges shall be full and flat face type and have ANSI B16.1, class 125 drilling.
- B. The wet-well shall include discharge elbows and piping to accommodate the use of the wet wells pumps.

2.4 PUMPS

- A. The wet-well/ wet well package shall be purchased in coordination with the Primary Pumps (see specification 11302).

2.5 CABLE ENTRY SEAL

- A. The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomeric grommet, flanked by stainless steel washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable.
- B. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

2.6 MATERIALS

Fiberglass Reinforced Polyester Wet Well: Unless otherwise indicated the plastic terminology used in this specification shall be in accordance with the definitions given in American Society for Testing and Materials (ASTM) designations D883 - Definitions of Terms Relating to Plastics.

A. Reinforced Material

1. The reinforcing material shall be a commercial grade of glass fiber (continuous strand, chopped-strand, continuous mat and non-continuous mat) having a coupling agent, which will provide a suitable bond between the glass reinforcement material and resin.

B. Resins

1. The resins used shall be a commercial grade polyester and shall be evaluated as a laminate by test or determined by previous service to be acceptable for the intended environment. The resins used may contain the minimum amount of fillers or additives required to improve handling properties. Up to 5% by weight of thixotropic agent, which will not interfere with visual inspection, may be added to the resin for viscosity control. Resins may contain pigments and dyes by agreement between manufacturer and engineer, recognizing that such additives may interfere with visual inspection of FRP laminate quality.

C. Laminate Structure

1. The FRP laminate shall consist of a resin rich inner surface: chop-spray interior liner; and, a chop-hoop filament-wound structural exterior layer.
 - a. Inner surface:

- 1) The resin rich inner surface shall be free of cracks and crazing with smooth finish and with an average of not over two (2) pits per square foot, providing the pits are less than 0.125 inches in diameter and 0.3125 inches in depth and are covered with sufficient resin to avoid exposure of any fiberglass reinforcement material. Some waviness shall be permissible as long as the surface is smooth. Between 0.01 to 0.02 inches of resin, rich surface shall be provided.
- 2) Chop-Spray Interior Liner: The interior liner shall be reinforced by 25 to 35% by weight of chopped strand glass fiber having fiber lengths from 0.5 to 2.0 inches. The chop-spray interior liner protects the chop-hoop filament-wound structural exterior liner from corrosion damage caused by “wicking” of the wet well liquid contents. A minimum of 0.100 inches of chop-spray interior liner shall be provided.
- 3) Chop-Hoop Filament-Wound Structural Exterior Layer:
 - a) The structural reinforcement of the wet well shall be by the chop-hoop filament-wound manufacturing method only. The axial reinforcement shall be continuous-strand glass fiber. The longitudinal reinforcement shall be chopped-strand glass fiber. The glass fiber reinforcement content of the chop-hoop filament wound structural exterior layer shall be 50 to 80% by weight. The exterior surface of the wet well shall be relatively smooth with no exposed reinforcement fibers or sharp projections. Hand finish work is permissible to prevent reinforcement fiber exposure. The wall thickness of the chop-hoop filament-wound structural exterior layer shall vary with the wet well height to provide the aggregate strength necessary to meet the tensile and flexural physical properties requirements.

D. Physical Properties

1. Wet Well FRP Wall Laminate: The wet well FRP wall laminate must be designed to withstand wall collapse or buckling based on the following assumptions and third party specifications:
 - a. Hydrostatic Pressure of 62.4 lbs. per square foot
 - b. Saturated soil weight of 120 lbs. per cubic foot
 - c. Soil Modulus of 700 pounds per square foot
 - d. Pipe stiffness values as specified in ASTM D3753
 - e. The wet well FRP laminate must be constructed to withstand or exceed two times the assumed loading on any depth of the wet well.

E. Wet Well FRP Bottom Laminate

1. The wet well FRP bottom laminate shall have less than 0.375 inches of center elastic deflection (deformation) when in service in totally submerged conditions.
- F. FRP Laminate Surface Hardness
1. The finished FRP laminate will have a Barcol Hardness of at least 90% of the resin manufacturer's specified hardness for the fully cured resin. The Barcol Hardness shall be the same for both interior and exterior surfaces.
- G. Wet Well Top Flange
1. The wet well top flange shall have an outside diameter at least 4.0 inches greater than the inside diameter of the well.
 2. A six-hole pattern shall accommodate the mounting of a cover with at least 0.375 inches in diameter 300 series stainless steel fasteners. Non-corroding stainless steel threaded inserts shall be fully encapsulated with non-continuous mat or chopped-strand glass fiber reinforcement. The inserts shall have an offset tab to prevent stripping or spinning out when removing and reinserting cover fasteners.
- H. Bottom Rib
1. As an anti-floatation measure, the bottom rib shall be used to lock the wet well into the concrete pad. The bottom rib shall be sufficient to prevent floatation of the wet well based on the jobsite conditions.
- I. Pump Quick Disconnect Mounting Studs
1. Shall be 300 series stainless steel threaded studs of at least 0.375 inches in diameter shall be used. Once installed, the studs shall be sealed with at least two layers of non-continuous glass fiber mat or chopped-strand glass fiber reinforcement.
- J. Discharge Coupling
1. (1 1/4" and 2" Systems) A 1 1/4" or 2" NPT full coupling full welded in the center of a 14 gauge steel plate, finished with black enamel, shall be factory installed with at least 0.375 inches in diameter 300 series stainless steel fasteners. The wet well wall penetrations shall be sealed with FRP mud. Couplings are also available in PVC or 304 stainless steel material. (3" and 4" systems) A sufficient quantity and type of "Link-Seal" type modular, mechanical, inter-locking, synthetic rubber links shaped to continuously fill the annular space between the discharge pipe and the aluminum sleeve shall be used to provide a hydrostatic seal. The aluminum sleeve shall be bolted on the wet well or valve box wall and sealed FRP mud.
- K. Electrical Coupling
1. A NPT full coupling full welded in the center of an 14 gauge steel plate, finished with black enamel, shall be factory installed with at least 0.375 inches in diameter 300 series stainless steel fasteners. The wet well wall penetrations shall be sealed with FRP mud. Couplings are also available in PVC or 304 stainless steel material.
- L. Inlet

1. A 12" nominal pipe diameter thermoplastic pipe grommet shall be field installed by the contractor in a 13" diameter hole in the wet well wall. The pipe grommet shall provide a mechanical seal and shall not require any secondary sealing materials. Alternatively to the pipe grommet, an FRP sleeve with FRP mud is allowed. Prior to fabrication, manufacturer shall confirm size with Contractor depending on approved pipe materials.
- M. Float Bracket
1. Float Bracket shall be fabricated from 300 series stainless steel with four compression style cord grips maintain float level position. It shall be factory installed with at least 0.375 inches in diameter 300 series stainless steel fasteners. The wet well wall penetrations shall be sealed with silicone sealer.
- N. Ventilation
1. Wet well ventilation shall comply with all applicable codes.
- O. Slide Rail Assembly
1. The slide rail assembly shall include pump quick disconnect discharge elbow, sealing flange with rail guide, upper guiderail bracket, lifting cable and guiderails.
- P. Pump Quick Disconnect (PQD) Discharge Elbow
1. The pump quick disconnect (QDC) discharge elbow, made of cast iron, designed to mount directly on the wet well floor, shall be supplied for each pump. It shall have a standard ANSI B16.1 125 lb. flange, flat faced and drilled on the discharge side, with a machined mating pump connection. The design shall be such that connection between the pump and QDC is made without the need for any nuts, bolts or gaskets.
- Q. Sealing Flange with Rail Guide
1. The sealing flange with rail guide shall be mounted on each pump discharge. It shall have a machined mating flange, which matches the QDC discharge elbow. Sealing of this pump and discharge piping connection shall be accomplished by a simple linear downward motion of the pump along the guiderails culminating with the entire weight of the pumping unit supported by the QDC discharge elbow.
- R. Upper Guiderail Bracket
1. The upper guiderail bracket, made from ASTM A283D structural steel, shall align and support the two guiderails at the top of the wet well. It shall bolt directly to the hatch frame (or aluminum upper guiderail bracket in wet wells with solid fiberglass covers) and incorporate a beveled stainless steel inserts for secure rail installation.
- S. Lifting Cable
1. The lifting cable shall be 300 series stainless steel with a diameter of at least 3/16" and a nominal breaking strength of at least 2,500 pounds.
- T. Guiderails

1. The guiderails shall be schedule 40 stainless steel pipe, coordinated with the pump submitted (guide rail size to be determined by the pump manufacturer). There shall be two guiderails per pump to insure proper alignment with the QDC discharge elbow and stationary piping.

U. Solid Fiberglass Cover

1. The solid fiberglass cover shall be constructed with continuous mat or chopped-strand glass fiber reinforcement with a minimum thickness of 0.325 inches. The cover shall be grass green in color. The cover shall be mounted to the wet well with six 300 series stainless steel fasteners of at least 0.375 inches in diameter.

V. Aluminum Hatch Cover

1. The access hatch shall have a recessed handle and locking pin. The hatch shall be held open in the vertical position by means of a positive locking arm of corrosion resistant design. The cover shall be mounted to the wet well with at least six 300 series stainless steel fasteners of at least 0.375 inches in diameter.
2. Hatch cover shall include a safety grate (safety hatch)
3. Hatch shall be coordinated with pump equipment to ensure proper size, guide rail and cable mounting details, and pipe penetration requirements

W. Interior Finish

1. The white interior finish shall be a premium isophthalic NPG gelcoat. Resin for the corrosion liner and structural layers shall be premium grade isophthalic polyester at minimum. Vinyl esters resins shall be used on the corrosion liner for leachate or more severe corrosive environments. Glass fiber reinforcing materials other than the surfacing veil is to be commercial Grade "E" type glass.

X. Laminate Construction

1. All FRP laminates shall have a corrosion liner on surfaces that are exposed to the corrosive environment and a structural laminate. The tank shell and its external reinforcing ribs shall use the helical filament winding process for the structure. The structural laminate shall be by the hand lay-up/ spray-up method for all sections or parts other than the tank shell.

Y. Corrosion Liner

1. The surface of the liner exposed to the corrosive medium shall be resin rich reinforced with a "C" grade surfacing veil. The veil shall be saturated with white pigmented resin or an ISO-NPG white gelcoat. This layer is to be .01 inch minimum thickness. The liner behind the surfacing veil shall have a minimum thickness of .10" and shall be reinforced with not less than 20% and not more than 30% by weight of non-continuous chopped strand mat. The inside surface is to be a smooth molded surface with a bright white finish. Corrosion liner shall be free of air and voids for optimum corrosion resistance.

Z. Surface Finish

1. **INSIDE:** All inside surfaces should be smooth and free of cracks and crazing. The inside surface will be pigmented or gel coated to a bright white finish. All surfaces other than those made in contact with the mold surface shall be coated with air-inhibited resin or gelcoat, this includes any cut edges of laminates.
2. **OUTSIDE:** All external surfaces are to be resin coated with an air inhibited resin coat, including any drilled holes, ground areas or cut edges. The portion of the station to be above ground level shall be painted with forest green color high UV gelcoat. Above ground portions may also be painted with a polyurethane base type paints. Different colors are acceptable as requested by owner.

PART 3 EXECUTION

3.1 PREPARATION:

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions and directions for installation of anchorages, including concrete ballasts, anchor bolts and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.2 INSPECTION AND TESTING:

- A. The Engineer shall have the right to inspect and test all materials to be furnished under these specifications prior to their shipment from the point of manufacture.
- B. All labor, power, materials, equipment and appurtenances required for testing shall be furnished by the Contractor at no cost to the Owner.

3.3 INSTALLATION

- A. Provide temporary bracing or anchors in form work for items that are to be built into concrete masonry or similar construction.
- B. If required, all field cut and drilled edges, holes and abrasions shall be sealed with a catalyzed resin as recommended by the manufacturer.
- C. Install items specified as indicated and in accordance with manufacturer's instructions.
- D. Install ballast concrete and top slab per the design drawings.
- E. **Start-up Service:** The initial startup of the prefabricated FRP wet well shall be performed by a qualified factory representative of the wet well manufacturer. It shall be the responsibility of the factory representative to supervise the startup and instruct the owner's

personnel in the proper operation and maintenance procedures for the entire prefabricated FRP wet well.

END OF SECTION

SECTION 14313

DAVIT CRANE

PART 1 GENERAL

1.1 SCOPE OF WORK

The work of this section includes the furnishing and installation one (1) stationary davit crane and accessories, as described below and shown in the contract drawings. The final foundation design details shall be provided by the Contractor in a design-build format as described on the drawings and specification sections below.

1.2 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Section 01300 – Submittals
- B. Section 01610 – Seismic Design Criteria
- C. Section 01615 – Wind Design Criteria
- D. Section 02020 – Geotechnical Report
- E. Section 03100 – Concrete
- F. Section 15094 – Hangers and Supports

1.3 SUBMITTALS

- A. In accordance with Section 01300, submit complete description literature, materials lists, and shop drawings. Provide operation and maintenance manuals in accordance with Specification Section 01680.
- B. The Contractor shall provide shop drawings for foundation systems and davit crane anchorage.

1.4 ENVIRONMENT

Equipment shall be suitable for indoor and outdoor use and capable of functioning in ambient air temperature ranging from -22°F to 158°F. Relative humidity may fluctuate between 10 and 100 percent. All equipment supplied shall be rated for a NEMA Class identified on the drawings.

1.5 DESIGN CRITERIA

- A. Foundation design shall be per the 2019 California Building Code (CBC). See above references (Section 1.2) for additional design requirements. See Drawing Nos. S100 and S101 for additional design information. For bidding purposes, assume volume of concrete for 'TOP MAT FND' equals sixteen (16) cubic yards. For bidding purposes, assume the minimum reinforcing requirements are a concrete to reinforcing ratio equal to 0.005. In other words, for a fourteen inch (14") thick mat reinforcing spaced at twelve inches (12") would be required to be #6 @ 12" T&B EW.
- B. For bidding purposes, assume four (4) construction joints.
- C. Anchorage design. Foundation design (see above) must take into account anchorage design requirements.
- D. Provide stamped, signed calculations and drawings, by a registered Civil or Structural Engineer in the State of California.
- E. Final anchorage requirements shall be such that the davit crane can pick all three pumps and clear a 48" truck bed elevation with the bottom of the pump.

PART 2 MATERIALS

2.1 DAVIT CRANE

- A. General: The Contractor shall furnish and install one davit crane with worm gear hand winch and disc brakes for load control. Crane shall be supplied with a base socket as shown on the Drawings and specified herein.
- B. Schedule and Design Criteria
 - 1. One (1) stationary davit crane and mounting base located at the Primary Pump Station., shall be complete and shall meet or exceed the following criteria.

Lifting Capacity	1,800 pounds minimum
Hook Height 1	150" minimum above deck
Boom Reach 1 (Horizontal)	87" (mast center-line to hook)
Hook Height 2	139" minimum above deck

Boom Reach 2 (Horizontal)	75" (mast center-line to hook)
Total Lift (Low to High Hook)	30 feet
Winch Handle Lifting Force (1)	25 pounds maximum
Base Mounting, Number and Location (as shown on drawings)	1 at the Primary Pump Station – Pedestal Base

(1) Winch shall be compatible with use of an electric drill motor.

- C. Construction shall be suitable for operating in a cold and hot, wet and corrosive environment, anchored in a classified space and subject to hydrogen sulfide corrosion products. Davit crane, boom, mast, winch, cable, base and all accessories shall have an epoxy paint gray finish.
- D. Crane, winch and base socket parts such as castings, forgings, and stampings shall be designed with a safety factor of not less than 5, based upon the ultimate strength of the material.
- E. The winch shall have a quick disconnect anchor for quickly attaching or removing the wire rope from the winch drum. The winch shall be stainless steel hand type with worm gear and have an epoxy paint (gray) finish.
- F. The crane shall be able to rotate 360° load movement.
- G. The crane shall include a rotational handle located on the mast at least 18-inches long and pinned at the connection point to the mast for ease of use and mobility.
- H. Hand operated ratchet style screw-jack to adjust height and reach, for stationary crane.
- I. The bases shall be supplied by the same manufacturer as the davit crane.
- J. Wire rope shall be 5/16" diameter stainless steel cable with a stainless steel oval snap hook supplied by the same manufacturer as the davit crane and shall have the same capacity.
- K. One wire rope assembly, 40 feet long, shall be supplied for each lifting application (three, one for each pump) and shall be left in place. Fixation Element for wire rope end security shall be provided for each wire rope assembly. The Fixation Element shall be 304 SST, with a groove and hole large enough for winding and securing wire rope.
- L. Cable Spool: Each wire rope assembly shall be supplied with a cable spool with quick disconnect feature. The cable spool shall include a spring loaded ratchet pawl, that allows the wire rope to be held onto the spool and prevents wire rope slack. Spool shall be 316 SST.

- M. Positional lock: provide a manual multi-position lock to prevent crane from rotation once locked in place.

2.2 MANUFACTURER

- A. The davit crane and base and wire rope shall be Thern Incorporated, Yale Crane, or equal, with modifications as needed to comply with this specification section.
- B. The naming of a manufacturer in this specification is not an indication that the manufacturer's standard equipment is acceptable in lieu of the specified component features. Naming is only an indication that the manufacturer may have the capability of engineering and supplying a system as specified.
- C. Warrantee shall exceed 1 year.

PART 3 EXECUTION

3.1 INSTALLATION

Install in accordance with the manufacturer's recommendations and as shown on the Drawings.

END OF SECTION



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Contract Documents and Specifications for

City of San Juan Bautista

**Sanitary Sewer Force Main to Hollister
Project**

**Volume 1B
Bid Set**

Date: December 2022



CITY OF SAN JUAN BAUTISTA

SANITARY SEWER FORCE MAIN TO HOLLISTER PROJECT

LICENSEE RESPONSIBLE FOR TECHNICAL SPECIFICATIONS

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CITY OF SAN JUAN BAUTISTA

SANITARY SEWER FORCE MAIN TO HOLLISTER PROJECT

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SECTION 15010

GENERAL PROCESS AND ONSITE UTILITY PIPING PROVISIONS

PART 1 GENERAL

1.1 SCOPE

This section contains general provisions applicable to all process and onsite utility piping. Specific requirements for each type of pipe to be used are provided in other sections of Division 15. Where specific requirements for a particular type of pipe are different than those in this section, the specific requirements shall govern.

1.2 RELATED WORK IN OTHER SECTIONS

- A. Section 01300 - Submittals
- B. Section 01656 - Disinfection of Pipelines
- C. Section 01666 - Testing of Pipelines
- D. Section 02223 - Trenching, Backfilling, and Compacting
- E. Section 10400 - Identifying Devices
- F. Section 15080 - Piping Accessories and Appurtenances
- G. Section 15094 - Hangers and Supports
- H. Section 15100 - Valves
- I. Section 15400 - Plumbing

1.3 DRAWINGS

Drawings are diagrammatic and show the general design, arrangement and extent of the systems. Do not scale drawings for roughing in measurements, nor use as shop drawings. Make field measurements and prepare shop drawings as required. Coordinate work with shop drawings of

other specification divisions.

1.4 SUBMITTALS

In accordance with Section 01300.

- A. Submittals shall be provided for the following items plus any additional items required in the specifications for the particular types of pipe:
 - 1. Piping and jointing materials
 - 2. Fittings
 - 3. Specialties
 - 4. Fabrication drawings of all major runs of pipe and all pipe which cannot be fabricated in the field.
 - 5. The arrangement of piping and appurtenances proposed to serve equipment of other than the first named manufacturer.
- B. Contractor shall investigate the space requirements of the proposed piping before submitting shop drawings.

PART 2 MATERIALS

2.1 GENERAL

Pipe sizes are minimum nominal inside diameter unless otherwise noted. All sizes of pipe shall be as called out on the drawings and specified herein. All pipe and fittings delivered to the job site shall be clearly marked to identify the material, class, thickness, and manufacturer. All material shall be new and free of blemishes.

2.2 PIPING MATERIALS

- A. The Piping Materials Schedule lists the pipe materials that can be selected at the Contractor's option for each service, except where the drawings call for a specific pipe material. For any service not listed in the schedule, the pipe material shall be as allowed for a similar or connecting service of the same size.
- B. The Piping Materials Legend lists the pipe types and specification sections for the piping referred to by symbols in the Piping Materials Schedule.

PIPING MATERIALS SCHEDULE

Symbol	Service	Material (d, h)		Pipe ID Code (a)	Test Pressure PSI (b)
		Underground or Encased (j)	Exposed		
1W	Potable Water	I (3-inches or less), X (4-inches or greater) (e)	G (3-inches or less), A (4-inches or greater)	3	125
2W	Non-Potable Water	I (3-inches or less) (e) X (4-inches or greater) (e)	F (3-inches or less), A (4-inches or greater)	3	125
C	Conduit (Chemical Service)	J	A	1	10
D	Drain (i)	I (3-inches or less), V (4-inches or greater)	F (3-inches or less), A (4-inches or greater)	3	10
OF	Overflow	A,H (42-inches or less) (h)	I (3-inches and less) A (4-inches and above)	3	10
RS	Raw Sewage (pressure)	U (e)	A, R (i)(e)	2	160
RS	Raw Sewage (gravity)	H (42-inches or less) (e)	A (I), M	2	30

(a) See Section 10400.

(b) See Section 01666.

(c) Reserved

(d) Piping schedule lists all piping materials used unless otherwise shown on the drawings. Use dielectric fittings for dissimilar metals, in accordance with Section 15080.

(e) Piping system shall be restrained.

(f) Reserved.

(g) Reserved.

(h) Reserved.

(i) All drain pipes related to chemical facilities shall be chemical resistant schedule 40 PVC.

(j) All pipes below slabs shall be concrete encased, in accordance with Typical Detail S240. All pipes with less than 36-inches of cover shall be concrete encased, in accordance with Typical Detail S240.

(k) Reserved.

(l) Specialty lining- raw sewage and primary influent ductile iron piping and fittings shall be lined with Protecto 401.

PIPING MATERIALS LEGEND (a)

Symbol	Description	Specification Section
A	Ductile Iron	15062
AA	Black Steel Schedule 10 W High Temp Insulation	15062
B	Black Steel, Schedule 40	15051
BB	Black Steel, Pre Insulated	15051
C	Black Steel, Schedule 80	15051
CC	Double Contained Fuel pipe	15073
E	Black Steel, Schedule 40 Polyethylene Tape Wrap	15051
F	Schedule 40 Steel, Galvanized	15051
G	Copper Pipe	15031
H	C900 PVC, SDR 18 or C905 SDR 25	15071
I	Schedule 80 PVC	15071
J	Schedule 40 PVC	15071
K	AWWA C200, Cement Mortar Lined and Tape Coated Steel	15051
L	AWWA C200, Cement Mortar Lined and Coated Steel (a)	15051
M	AWWA C200, Fusion Epoxy Lined and Coated Steel	15051
N	Reinforced Concrete Pipe ASTM C76 (Unlined)	15041
NN	Reinforced Concrete Pipe ASTM C76 (T-Lock Lined)	15041
O	Reinforced Concrete Pipe ASTM C361	15041
P	Ductile Iron Glass Lined	15062
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R	316L Stainless Steel Pipe Schedule 10s	15052
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W	Corrugated Metal Pipe	02618
X	Restrained Joint PVC Pipe, C900 DR 18 or C905 DR 25	15071
Y	CPVC Schedule 80	15071
Z	ABS Vent Piping	15071

(a) Pipes 12-inches and under shall be Schedule 40 wall thickness unless noted otherwise.

2.3 POLYETHYLENE ENCASEMENT

All buried metallic piping, valves, specials, and fittings shall be polyethylene cased, double wrapped – 8 mils thickness, sized to pipe diameter, ANSI/AWWA-C105/A21.5. Ends taped off with vinyl pipe wrap tape 10-mil vinyl tape manufactured by Calpico Inc. (Calpico VI-10) or equal.

Polyethylene Encasement- “Clear” non-colored polyethylene film, in either tubular or sheet form. The polyethylene film shall have a minimum thickness of 8 mils and at no point shall not be less than 10 percent of the nominal thickness. Polyethylene film shall be manufactured from a Type 1, Class A raw polyethylene material conforming to “Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids” (ANSI/AWWA C-105/A21.5). Manufactured by Fee Spec’s-LP378D Northtown, Fulton Enterprise Inc., Global Polymer Tech, Unisource, or equal.

PART 3 EXECUTION

3.1 HAULING, UNLOADING AND DISTRIBUTING PIPE

- A. During loading, transportation and unloading, every precaution shall be taken to prevent injury to the pipe, coating, and lining. No pipe shall be dropped from cars or trucks, or allowed to roll down slides without proper retaining ropes. Each pipe shall rest on suitable pads, strips, skids or blocks securely wedged or tied in place. Padding shall be used on car or truck stakes, skids, etc., to prevent damage to the pipe during transportation and handling. Any pipe damaged shall be replaced or repaired as approved by the Engineer at no additional cost to the Owner.
- B. Each section of pipe shall be delivered in the field as near as practicable to the place where it is to be installed. Pipes shall be distributed along the side of trench opposite to the spoil bank within easy reach of the installing crew.
- C. Where it is necessary to move the pipe longitudinally along the trench, it shall be done in such a manner as not to injure the pipe. Pipe shall not be rolled or dragged on the ground. Where pipe is placed on stockpiles, it shall be neatly piled and blocked with strips between tiers.

3.2 INSTALLATION OF PIPELINES AND FITTINGS

- A. Trenching and Backfill:
 - 1. Except as otherwise noted on the plans or specified herein, all excavation and backfilling for piping shall be as specified in Section 02223, "Trenching, Backfilling, and Compacting".

2. Pipelines located in or under fill areas shall not be placed until the fill has been constructed and compacted to an elevation at least one (1) foot above the elevation of the top of the pipe.
3. All backfill other than where concrete encasement is required, for pipe lines installed under structures, slabs, footings, and paving shall be made with sand and fine gravel, thoroughly compacted in place to not less than 95% of maximum density.

B. Grades and Elevations:

1. All piping and appurtenances shall be installed in the position and to accurate lines, elevations, and grades as shown on the plans or specified herein. Where possible, piping shall be sloped to permit complete drainage. All pipelines shall be rigidly supported and braced by approved hangers, brackets, or other devices. When temporary supports are used, they shall be sufficiently rigid to prevent any shifting or distortion of the piping or related work. See Specification Section 15094.
2. Furnish all fittings necessary for the satisfactory alignment and arrangement of piping and all necessary unions and cleanouts.
3. An invert grade rod shall be used in laying all lines below ground.

C. Flexible Couplings:

1. Flexible couplings shall be installed where shown on the drawings and at such other points as may be required for ease of installation or removal of the pipe, subject to approval of the Engineer. Where necessary to prevent separation of pipe due to internal pressures, flexible couplings shall be of the type with set screws in the retainer gland or shall be provided with tie rods as approved by the Engineer. Where permanent flexibility is required, however, such as at connections to pumps or other equipment, and elsewhere as called for on the drawings, tie rods shall be the only acceptable restraining devices and shall be installed through separate mounting plates or lugs and not through flange bolt holes, in order to retain flexibility.
2. Where rubber or similar flexible couplings are called for on the Drawings, tie rods shall be provided if recommended by the manufacturer to prevent excessive elongation.

D. Flexible Joints: For pipelines extending from a concrete structure into earth, at least two flexible joints shall be provided in the earth within 3 feet of the structure face, one of which may be cast in structure with end flush with structure face. Piping beyond structure shall adequately supported by proper compaction under pipe or by supporting on firm undisturbed soil if necessary.

E. Union and Flanges:

1. In erecting the pipe, a sufficient number of screwed unions or flanged joints shall be used to allow any sections or runs of pipe to be disconnected without taking down adjacent runs. Screwed unions shall be used on pipelines two and one-half (2-1/2)

inches in diameter and smaller. Flanged joints shall be employed in pipelines three (3) inches in diameter and larger.

2. All exposed piping shall be provided with rigid joints as necessary to prevent shifting or separation due to internal pressures, seismic forces, or the weight of the pipe and its contents. Rigid joints shall include flanges, grooved couplings, screwed joints, welded joints, soldered joints, etc., unless otherwise noted on the drawings.
- F. Concrete Thrust Blocks: Unless noted otherwise, concrete thrust blocks shall not be allowed, except at specific locations shown on the drawings or specifically approved by Engineer. If approved, thrust blocks shall be poured between the pipe or fitting and undisturbed earth.
- G. Concrete Wall and Slab Penetrations:
1. Hydraulic Conditions - Piping passing through concrete walls normally below liquid level shall be installed with one of the following:
 - a. Cut-off collar cast on ductile iron fittings or pipe, 1/4-inch thick, 3-inches wide.
 - b. Cut-off collar welded to steel fittings or pipe, 1/4-inch thick, 3-inches wide.
 - c. Cored, canned or sleeved hole 3-inches to 7-inches larger diameter than pipe; pack with non-shrink grout.
 - d. Cored, canned, or sleeved hole of suitable size to be sealed with a modular mechanical interlocking EPDM synthetic rubber links shaped to continuously fill the annular space between pipe and opening, equal to "Link-Seal" by Thunderline Corp., Wayne, MI.
 2. Non-Hydraulic Conditions -
 - a. Piping passing through concrete walls, slabs, or footings from earth to earth shall have provision for reasonable relative movement by wrapping pipe with one-inch fiberglass entire thickness of concrete.
 - b. Horizontal or vertical piping passing through concrete walls, sidewalks, slabs, or footings from earth to air shall be wrapped with 3/8-inch thick, 60 durometer, rubber sheeting, secured with banding.
- H. Connections to Equipment:
1. The pipework of all pumps and equipment shall be adequately supported throughout and the weight thereof shall be carried independently of the pump casings or the equipment. All pipework shall be mounted parallel with vertical and horizontal axes of reference. All sections of pipe shall be rigidly bolted or joined together after being cut accurately to length in such a manner as to relieve any and all parts of equipment of undue strain resulting from closure of flanged or other joints or connections.
 2. Equipment shall be so positioned and aligned that no strain shall be induced within the equipment during or subsequent to the installation of pipework.

I. Pipe Joints:

1. Pipe shall be cleaned of dirt and scale prior to installation and all joints swabbed clean before jointing. Ends of all pipe shall be closed or plugged at the end of each day's work or otherwise as necessary to prevent the entrance of foreign materials.
2. The Contractor shall perform all work of cutting pipe and special castings necessary to the assembly, erection and completion of the work. All pipe shall be cut and reamed to fit accurately with smooth edges.

3.3 IDENTIFICATION:

See Section 10400.

3.4 TESTING:

See Section 01666.

3.5 CLEANING AND FLUSHING

- A. All pipelines shall be cleaned of all soil, dirt, rocks, and other debris and objectionable material.
- B. Pipelines 24-inches in diameter and smaller shall be cleaned first by pulling a tightly fitting cleaning ball or swab through the pipe. Pipelines larger than 24-inches in diameter may be cleaned manually or with a cleaning ball or swab.
- C. After initial cleaning, flush the interior of all piping. Upon completion of flushing, completely drain systems at all low points; remove, clean, and replace all strainer baskets and refill systems.

3.6 DISINFECTION:

See Section 01656.

END OF SECTION

SECTION 15031

COPPER PIPE

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of furnishing and installing copper pipe and fittings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 - Submittals
- B. Section 01666 - Testing of Pipelines
- C. Section 02223 - Trenching, Backfilling, and Compacting
- D. Section 15010 - General Process and Onsite Utility Piping Provisions
- E. Section 15080 - Piping Accessories and Appurtenances
- F. Section 15094 - Hangers and Supports
- G. Section 15100 - Valves

1.3 QUALITY ASSURANCE

References, American National Standards Institute (ANSI), American Society for testing and materials, (ASTM), Federal Specifications (FS), and manufacturers' printed recommendations. All potable water (1W) pipe, fittings, accessories, and fixtures shall be certified as "lead free" in accordance with the requirements set out in 22 CCR 116875.

1.4 SUBMITTALS

- A. In accordance with Section 01300.
- B. Submit materials list and catalog data sheets naming each product to be used identified by manufacturer and type number.

1.5 PRODUCT HANDLING

Handle pipe and fittings in a manner to insure delivery in a sound undamaged condition.

PART 2 MATERIALS

2.1 PIPE

- A. Underground: ANSI/ASTM B88, Type K, hard drawn or soft annealed, seamless water tube without joints when possible.
- B. Aboveground: ANSI/ASTM B88, Type L, hard drawn only, seamless water tube. Cast brass or wrought copper fittings for piping up to 2" and wrought copper fittings for 2-1/2" and larger.
- C. Tubing: Shall be soft copper.

2.2 COUPLINGS AND FITTINGS FOR COPPER TUBING AND PIPING

Unless otherwise specified, couplings and fittings for copper tubing 1/2-inch and smaller nominal diameter shall be compression type, brass or bronze, capable of holding the full bursting strength of the tubing, shall meet the requirements of ANSI B16.26; and shall be Swagelok, Gyrolok, or equal.

Couplings and fittings for copper tubing larger than 1/2-inch nominal diameter shall be wrought copper or bronze, solder joint pressure fittings and shall conform to ANSI B16.22. Mechanical type fittings (Swagelok, Gyrolok, or equal) may be used at Contractor's option in non-concealed locations.

2.3 SOLDER

- A. General Use: Lead-free, silver tin-antimony solder 95-5, or tin-silver solder 96.5-3.5, 95-5, or 94-6, with mildly corrosive liquid or petroleum based paste flux containing chlorides of zinc and ammonium.

PART 3 EXECUTION

3.1 CLEANING

As work progresses, clear the pipe interior of dirt and other debris by keeping swabs in the pipe and pulling them forward past each completed joint.

3.2 SOLDERED JOINTS

Solder joints for copper tubing shall be prepared by cleaning the ends of the tubing and the inner surfaces of the fittings with steel wool until they are bright. The cleaned surfaces shall be given a thin coating of "Handy-Flux", and the tubing end inserted into the fitting as far as possible. Remove internal parts of solder-end valves prior to soldering. Heating and finishing of the joint shall be done in accordance with the recommendations of the manufacturer of the fittings, using silver solder. The use of cored solder will not be permitted.

3.3 FLARED JOINTS

Flared joints for copper tubing shall be cut and burred, after which the sleeve nut shall be slipped on the tubing and the end flared with a flaring tool. Care shall be taken in flaring not to crack or split the flared portion, but if inspection reveals such damage, the flare shall be cut off and a new flare made. The flared end shall be squarely seated on the fitting and the nut tightened.

3.4 COMPRESSION JOINTS

Shall be installed in accordance with manufacturer's recommendations.

3.5 THREADED JOINTS

Apply Teflon tape to male threads.

3.6 UNIONS

Provide piping with unions to permit alterations and repairs.

3.7 DIELECTRIC PROTECTION

Copper tubing, piping, or fittings shall not be permitted to come in contact with steel piping, reinforced steel, or other steel at any location. Electrical checks shall be made to assure no contact is made between copper tubing and steel elements. Wherever electrical contact is demonstrated by such tests, the Contractor shall provide dielectric protection utilizing dielectric unions, isolation flange kits or similar means for in line piping and use rubber or plastic insulators for cases of physical contact as in hangers, frames, etc.

3.8 ASSEMBLY OF BURIED PIPE

Assemble in the trench or on adequate supports laid across the trench. Use care in lowering assembled pipe to avoid cracking or loosening joints.

3.9 DISINFECTION OF WATER SYSTEM

In accordance with Section 01656.

3.10 TESTING

In accordance with Section 01666.

END OF SECTION

SECTION 15051

STEEL PIPE

PART 1 GENERAL

1.1 DESCRIPTION

This section consists of furnishing and installing steel pipe and fittings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 02223: Trenching, Backfilling, and Compacting
- B. Section 15010: General Process and Onsite Utility Piping Provisions
- C. Section 15080: Piping Accessories and Appurtenances
- D. Section 15094: Hangers and Supports
- E. Section 15100: Valves

1.3 QUALITY ASSURANCE

- A. References: This section contains references to some or all of the following documents, latest revision. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

References	Title
ANSI B1.1	Unified Inch Screw Threads (UN and UNR Thread Form)
ANSI B1.20.1	Pipe Threads, General Purpose (Inch)
ANSI B16.1	Cast Iron Pipe flanges and Flanged Fittings Class 25, 125, 250, and 800
ANSI B16.3	Malleable Iron Threaded Fittings
ANSI B16.5	Pipe Flanges and Flanged Fittings
ANSI B16.9	Factory-Made Wrought Steel Butt Welding Fittings
ANSI B16.11	Forged Steel Fittings, Socket-Welding and Threaded

References	Title
ANSI B18.2.1	Square and Hex Bolts and Screws Inch Series including Hex Cap Screws and Lag Screws
ANSI B18.2.2	Square and Hex Nuts (1983)
ANSI B31.1	Power Piping
ANSI B31.3	Chemical Plant and Petroleum Refinery Piping
API STD 1104	Welding Pipelines and Related Facilities
ASME	Boiler and Pressure Vessel Code
ASTM A36/A36M	Structural Steel
ASTM A47	Ferritic Malleable Iron Castings
ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A105/A105M	Forgings, Carbon Steel, for Piping Components
ASTM A106	Seamless Carbon Steel Pipe for High Temperature Service
ASTM A197	Cupola Malleable Iron
ASTM A234/A234M	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM A283/A283M	Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars
ASTM A536	Ductile Iron Castings
ASTM A570/A570	Steel, Sheet and Strip, Carbon, Hot Rolled, Structural Quality
ASTM A572/A572M	High-Strength Low-Alloy Columbium Vanadium Steels of Structural Quality
AWWA C200	Steel Water Pipe 6-Inches and Larger
AWWA C203	Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot Applied
AWWA C205	Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4 in. and Larger - Shop Applied
AWWA C206	Field Welding of Steel Water Pipe
AWWA C207	Steel Pipe Flanges for Waterworks Services - Sizes 4 in. through 144 in.
AWWA C208	Dimensions for Fabricated Steel Water Pipe Fittings
AWWA C209	Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines
AWWA C210	Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
AWWA C214	Tape Coating Systems for the Exterior of Steel Water Pipelines
AWWA C600	Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA M11	Steel Pipe - A Guide for Design and Installation
SSPC	Steel Structures Painting Council Specifications

- B. Testing: Factory testing shall conform to the requirements of ASTM A53, ASTM A106, or AWWA C200 as applicable.

- C. All potable water (1W) pipe, fittings, accessories, and fixtures shall be certified as “lead free” in accordance with the requirements set out in 22 CCR 116875.

1.4 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01300.
- B. Show materials of construction, with ASTM reference and grade. Submit manufacturer’s certificates of compliance with referenced pipe standards, e.g., ASTM A 312, A 403, A774, A 778. Show wall thickness of steel cylinder and fittings.
- C. Submit piping layout drawings showing the location and dimensions of the pipe and fittings larger than 3 inches nominal diameter. Include layout lengths of valves, meters, blowers, and other equipment determining piping dimensions. Label or number each fitting or piece of pipe.
- D. Submit manufacturer’s data for flange and coupling gaskets.
- E. Submit certifications that welders are qualified in accordance with ANSI B31.1, Paragraph 127.5 for shop and project site welding of pipe work.

PART 2 MATERIALS

2.1 SCHEDULE 40 AND 80

- A. Pipe:
 - 1. Galvanized if indicated in Section 15010, otherwise black with lining and/or coating as specified in Section 15010 and this section.
 - 2. 2½-inches and smaller: ASTM A53, threaded couplings. Grooved couplings are an acceptable alternative for 2 ½-inch pipe.
 - 3. 3-inches and larger: ASTM A53, butt-welded, grooved couplings, or flanges.
- B. Fittings:
 - 1. Galvanized or lined and/or coated same as pipe.
 - 2. 2½-inches and smaller: malleable iron, ASTM A197, ANSI B16.3, Class 150. Alternatively, 2-½-inch fittings may be as specified below for 3-inches and larger.
 - 3. 3-inches and larger: Steel, ASTM A234, ANSI B16.9, Sch. 40, Sch. 80, or ductile iron in accordance with Section 15062; ends to match pipe.

- C. Screwed Joint Seal: Teflon tape.
- D. Flanges: Per 2.4, this Section.

2.2 AWWA C200 – FUSION EPOXY LINED AND COATED STEEL (FELCS) - EXPOSED PIPING

- A. Minimum Requirements: In accordance with AWWA C200 and Manual M11 with the following modifications:

Design Criteria for Pipe and Pipe Fittings	
	Minimum Wall Thickness
	Nominal Diameter, inches
	Wall Thickness, inches
	6 – 18
	20 – 30
	36 – 60
Inside Diameter of Unlined Pipe	Nominal
Inside Diameter of Lined Pipe	As measured from face to face of liner shall not be less than nominal diameter.

- B. Materials: ASTM A 53, seamless or straight seam electric resistance welded.
- C. Welding Fittings
 - 1. Welding Fittings for Piping 8-inches and less in Nominal Diameter: Butt-welding fittings in accordance with ANSI/ASTM B16.9, standard wall or standard weight.
 - 2. Welding Fittings for Piping Larger than 8-inches in Nominal Diameter: Butt-welding fittings in accordance with ANSI/ASTM B16.9, or, at the option of the Contractor, made up out of sections of pipe welded together, except where smooth bends are indicated for air lines.
 - 3. Fittings made up of sections of pipe welded together shall be made of pipe at least the same wall thickness as the pipe with which used, and bends shall be miter bends, fabricated in accordance with AWWA C208 and as supplemented by AWWA Manual M 11. Welding of these made-up fittings shall be in accordance with AWWA C206.
 - a. Design and fabricate outlets and branch fittings in accordance with AWWA Manual M11.
 - b. Bends may be welded to adjacent pipe sections. Bends shall be manufactured of the following number of pieces:
 - 1) Bends from 0 to 30 degrees angle, 2 pieces.

- 2) Bends from 30 to 45 degrees angle, 3 pieces.
- 3) Bends from 45 to 67-½ degrees angle, 4 pieces.
- 4) Bends from 67-½ to 90 degrees angle, 5 pieces.

D. Fabricated Steel Piping Fittings and Specials

1. General: Specified herein are the design and fabrication of fabricated steel piping fittings and specials, which include elbows, branches, nozzles, manifolds, headers, heads, collars, stiffeners, reinforcements, and other steel fabrications relating to steel piping, but shall not include steel pipe.
2. Design
 - a. Contractor shall design and detail fittings and specials.
 - 1) Design: In accordance with the recommended procedures in AWWA Manual M11, as complemented and modified herein.
 - 2) Nozzles: Reinforced in conformance with recommended practice in AWWA M11, Steel Pipe Manual.
 - 3) Design reinforcing fittings and specials for the specified test pressure.
 - 4) Fittings shall conform in dimension to AWWA C208, complemented with the provisions specified herein.
 - 5) The working stress for steel used for fabrication of pipe shall not exceed 50 percent of the yield stress.
 - b. The thickness of pipe, large elbows, and headers, except header nozzles, shall be the thicker of:
 - 1) The thickness designed in accordance with the design methods specified in the preceding paragraph “Fabricated Steel Piping Fittings and Specials”.
 - 2) The thickness indicated on the Drawings.
 - 3) The thicknesses indicated in Part 2.02 A., this section.
 - c. Elbows shall be of the number of pieces specified under paragraph Steel Pipe Fittings, “Welding and Fittings”, and thickness of material shall conform to thickness of pipe or manifold shells specified.
 - d. Ends of fittings to be welded to pipe shall be beveled for welding.
3. Fabrication
 - a. Shop fabricate steel piping fittings and specials in units as long as practicable for safe hauling and installation. Minimize number of field welds.
 - b. Fabricate fittings and specials to uniform lengths with proper end clearance for the specified types of joint or attachment.

- c. Fabricate fittings and specials to allow field assembly without cutting or special WORK.
- d. Where specified in Piping Schedule in Section 15010, or indicated on the Drawings, the inside of fabricated steel manifolds and other fittings and specials shall receive a cement-mortar lining in accordance with AWWA C 205.

Reinforce lining and coating for piping 24-inches in diameter and larger with wire fabric.

- e. Do not weld flanges to nozzle until the nozzles and reinforcements are completely welded to the header.

Accurately space and align flanges so that when connections have been made there will be no stress on the header, piping, or equipment. Properly locate and align equipment.

4. Dish Heads

- a. Dished Heads on 84-inch diameter and smaller manifolds:

- 1) 1 piece (seamless) spherically dished (torispherical) heads.
- 2) Larger heads may be seamed.

- b. Dish Radius: Same dimension as the outside diameter of the head measured at the skirt.

- c. Skirt Face Length: Not less than 3-inches.

- d. Design heads in conformance with recommended practice in AWWA M 11, Steel Pipe Manual.

- 5. Testing: No shop testing will be required for manifolds or piping connected thereto.

2.3 FLANGE ASSEMBLIES

- A. Flanges: Unless otherwise specified or required for the installation, steel flanges shall be ANSI B16.5, minimum Class 150, plain face or AWWA C207, Class D. Where 300 lb flanges are called for, they shall be forged steel, raised face in accordance with ANSI B16.5. Plain faced flanges shall not be bolted to raised face flanges.

- B. Gaskets:

- 1. Gaskets for plain faced flanges shall be the full face type. Thickness shall be 1/16-inch for pipe 10-inches and less in diameter and 1/8-inch for pipe 12-inches and larger in diameter. Unless otherwise specified, gaskets for raised face flanges shall match the raised face and shall be 1/16-inch thick for pipe 3½-inches and less in diameter and 1/8-inch thick for pipe 4-inches and larger.
- 2. For exhaust piping, provide gasket suitable for 1500 °F, Garlock Therma-pur Style 4122, or equal.

- C. Bolts: Flange assembly bolts shall be made out of the following materials of construction based on the service location:
1. Exposed Dry Environment: ASTM A307, Grade A, low carbon steel; with zinc phosphate coating per ASTM B633.
 2. Buried, Exposed Wet Environment, Submerged, chemical or corrosive exposure: 316 SST, B8M Class 1 per ASTM A193 and A194, with lubricated anti-seize; wrapped with wax tape if buried.
 3. Coupled to SST, aluminum, or bronze equipment/piping/appurtenances: same material as equipment/piping/appurtenances.
 4. Structural supports: see Division 5.
 5. Lubrication shall be nickel based (copper free) anti-seize; manufactured by TRX-Synlube by Ramco, Anti-Seize by Ramco, Jusk IT Husky Lube O'Seal, or equal.

2.4 Bolts: Flange assembly bolts shall be ANSI B18.2.1, Grade 5 minimum, hexagon head carbon steel machine bolts with ANSI B18.2.2 standard hot pressed hexagon nuts. Threads shall be ANSI B1.1, standard coarse thread series; bolts shall be Class 2A, nuts shall be Class 2B. Bolt length shall conform to ANSI B16.5. Flange assembly bolts and nuts for exposed service shall be (zinc phosphate coated, zinc electroplating (ASTM B633), hot dip galvanized, Tripac 2000 Blue Coating System).

2.5 THREAD

Pipe thread dimensions and size limits shall conform to ANSI B2.1.

2.6 PIPE LINING

- A. Liquid Epoxy: Unless otherwise specified or noted on the drawings, pipe and fittings shall be lined with liquid epoxy as specified in AWWA C210 to a minimum thickness of 16 mils in not less than two coats. Pipe and fittings for fuel oil return and supply shall be unlined.
- B. Coal Tar Enamel: Where specified, pipe and fittings shall be lined with coal tar enamel as specified in AWWA C203.
- C. Cement Mortar: Where specified, pipe and fittings shall be lined with cement mortar as specified in AWWA C205.
- D. Fusion Epoxy: Where specified, steel pipe and fittings shall be fusion epoxy lined and coated in accordance with this section.

2.7 PIPE COATING

- A. Liquid Epoxy: Unless otherwise specified, pipe and fittings for buried installation shall be coated with liquid epoxy, shop applied in accordance with AWWA C210 to a minimum thickness of 16 mils in not less than two coats.
- B. Polyethylene Tape Wrap:
1. Where specified, underground and encased steel pipe shall be given a corrosion protective wrapping as set forth herein. Pipe shall be spirally wrapped with Polyvinyl Chloride or Polyethylene pressure sensitive tape applied with a suitable primer. The wrap shall have a nominal thickness of 20 mils, consisting of either one layer of 20 mil tape or 2 separate layers of 10 mil tape.
 2. Before the primer and wrap is applied, the piping shall be thoroughly cleaned so that all surfaces shall be dry and free of dirt, dust, rust, mill scale, oil, grease or other foreign matter. Any solvents used shall be totally volatile so as to leave no trace of oil. Weld spatter, burrs or sharp points and edges shall be removed by chiseling, ball peening, or filing. After thorough cleaning, the piping shall be coated with a primer applied in accordance with the tape manufacturer's recommendations. The primer shall be Minnesota Mining "Scotchwrap Pipe Primer", or equal.
 3. After cleaning and priming, the piping shall be spirally wrapped with the pressure sensitive tape of the proper width for the pipe size on which it is being used, as recommended by the manufacturer. The tapes shall be tightly applied with a ½-inch minimum uniform lap, free from wrinkles and voids. Approved wrapping machines may be used. Tape shall be Minnesota Mining "Scotchwrap" No. 51, or equal.
 4. The field joints and fittings shall be covered as specified for wrapping pipe, except that a nominal 10 mil thick tape having a maximum width of 2-inches shall be used for fittings. Two thicknesses of the tape shall be applied to the fittings to provide a covering 20 mils thick over all surfaces. The tape shall be applied with adequate tension so that the tape will conform and adhere tightly to all surfaces of the fitting, without air pockets. "Scotchfil", or equal, shall be used to fill voids, flange faces around bolts, and other irregular surfaces, to provide a smooth even surface for the application of the tape wrap. Pipeline flanges and unions shall be completely wrapped. Where valves are in the pipelines, the pipe wrap shall cover the pipe flange and extend over the outer edge of the valve flange or the threaded portion of the valve body. The unwrapped surfaces of the valves shall be given two heavy coats of a coal tar enamel conforming to AWWA C204. Adequate drying time shall be allowed before backfilling or wax coating.
 5. Tape wrapped pipe shall be handled and stored in a manner to protect the wrap from damage. It shall not be dropped, walked on, rolled, or handled in any manner that might damage the wrap. Any skids or supports for temporary storing or holding of wrapped pipe shall be wide and padded to prevent cutting of this wrap. Where it is necessary to handle wrapped pipe with slings or cradles, they shall be of wide rubber or canvas.
 6. Tape-wrapped pipe and fittings shall be coated with a one-inch thick cement mortar shield coating in accordance with AWWA C205. Use spiral wire reinforcement for pipe and wire mesh or fabric for fittings and specials.

- C. Cement Mortar: Where specified, pipe and fittings shall be coated with cement mortar in accordance with AWWA C205. Use spiral wire reinforcement for pipe and wire mesh or fabric for fittings and specials.

2.8 FUSION EPOXY COATING AND LINING

- A. Where specified or shown on the drawings, steel pipe and fittings shall be fusion epoxy coated and lined. The fusion epoxy coating shall be 3M Scotchkote 206N (fluidized bed grade), or equal. Surface preparation shall be in accordance with SSPC-SP 10 Near White Blast Cleaning. The application method shall be by the fluidized bed method and shall attain 16 mils minimum dry film thickness.
- B. Field welds, connections and otherwise damaged areas shall be coated and patched according to the manufacturer's instructions with 3M Scotchkote 312.

2.9 GROOVED JOINTS

- A. In accordance with AWWA C606, except as modified herein.
- B. Roll groove pipe if wall thickness is less than minimum recommended by manufacturer for cut grooving.
- C. For non-submerged applications, bolts and nuts shall be ASTM A183, zinc electoplated to ASTM B633. Provide 316 stainless steel bolts and nuts for submerged applications.
- D. Buried joints shall be flexible grooved unless otherwise shown or required for the installation.
- E. Exposed joints shall be rigid grooved unless otherwise shown or required for the installation.
- F. Unless otherwise noted or required, rigid grooved joints may be substituted where flanged joints are shown on the drawings.

2.10 SCHEDULE 80 (FOR CHLORINE AND SULFUR DIOXIDE, LIQUID AND GAS PRESSURE SERVICE)

- A. General: All pipe and fitting shall be in accordance with Chlorine Institute Pamphlet 6.
- B. Pipe: Black steel pipe for chlorine and sulfur dioxide pressure service shall conform to Chlorine Institute Pamphlet 6, ASTM A 106, Grade A or B, and shall be Schedule 80 seamless, without lining, and pickled by manufacturer. Except where required to match mating fittings of vacuum regulator-check units, gas filters, valves, and protective

diaphragms for gages and switches, all fittings shall be socket welded. Socket welded fittings shall conform to ASTM 105, Grade 2 and ANSI B16.11, 3000lb, forged carbon steel. Bushings will not be allowed.

C. Fittings:

1. Pickled.
2. 2 inches and smaller: 3,000 lb. forged carbon steel, ASTM A105, Grade 2, and ANSI B16.11.
3. Flanged joints:
 - a. Flanges: Welding-neck or slip-on type, raised face, forged carbon steel, ASTM A105, ANSI B16.5 Class 300 for dimensions.
 - b. Gaskets: Self-centering ring-type, suitable for high temperature, Federal Specification HH-P 46E, 1/16-inch thick for pipe up to 1½ inches, 1/8-inch thick for pipe over 1½ inches.
 - c. Bolts: Heavy hex, carbon steel, ASTM A307 Grade B.

D. Screwed joint seal: PTFE paste on male threads only.

E. Unions: Unions for chlorine and sulfur dioxide service shall be two or four bolt tongue and groove, ammonia type, suitable for chlorine and sulfur dioxide service. Unions shall have female thread and connection and matched tongue and groove flanges employing a lead gasket. High tensile alloy steel corrosion-resistant bolts and nuts shall be used with each set of flanged unions. Unions shall be rated for 500 lb CWP service pressure. Furnish reducing-type, straight-type or blind-type unions, as required for the installation. Blind unions shall be provided as cleanouts where shown. Provide a straight union adjacent to each threaded valve or piece of equipment.

1. Unions shall be as manufactured by Henry Valve Company; Vogt Valve Commercial; or equal.

F. Cleaning and Storage: Shop fabricated chlorine and sulfur dioxide piping shall be cleaned of all dirt, oil and grease, mill-scale, and passivated. The cleaning, drying, and sealing shall be done by a firm specializing in this process, such as Dowell, Delta Tech, or equal. Immediately after passivation, open ends shall be sealed with heavy gauge plastic bags and taped. All piping awaiting erection shall be stored indoors in an area that is clean and dry.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Pipe Cutting, Threading and Jointing: Pipe cutting, threading and jointing shall conform to the requirements of ANSI B31.1.
- B. Pipe Welding:
 - 1. Pipe shall be welded by ASME-certified welders using shielded metal arc, gas shielded arc or submerged arc welding methods. Welds shall be made in accordance with the requirements of AWWA C206 for all piping, except Sch. 80. Welds shall be made in accordance with the requirements of ANSI B31.3 for Sch. 80.
 - 2. The Contractor shall provide for each welder, a welder qualification certificate indicating the welder is certified for pipe welding in accordance with ASME Boiler and Pressure Vessel, Section IX. Each welder's certificate shall be provided to the Engineer prior to that welder working on the job.
- C. Restrained Joints: Where restrained joints are required on the Drawings, the restraint may be provided by welded butt joints, welded bell and spigot joints, or grooved joints.
- D. Grooved joints shall be installed in accordance with manufacturer's latest published recommendations.
- E. Lining and Coating: Pipe lining and coating at field joints shall be applied as specified in Section 15051 - 2.06 and 2.07. Where cement mortar lining and/or coating is required, field joints shall be lined and/or coated to match pipe in accordance with AWWA C205.

3.2 SUPPORT

Pipes shall be adequately supported to prevent sags, kinks, or other deficiencies in appearance of strength. Additional supports shall be installed to provide adequate support, whether or not indicated on the drawings. No pipe shall be left unsupported wherever a change in direction of line of flow takes place. Supports shall meet the requirements stated above, but in no case shall the distance between supports exceed those specified in Section 15094.

END OF SECTION

SECTION 15052

STAINLESS STEEL PIPE

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of furnishing materials and constructing therewith new stainless-steel pipe, tubing, and fittings 30-inches in diameter and smaller.

- A. Pipe shall conform to ASTM A312.
- B. Stainless steel tubing shall be as specified in Part 2.15.

1.2 RELATED WORK ELSEWHERE

- A. Section 01300 - Submittals
- B. Section 01666 - Testing of Pipelines
- C. Section 02223 - Trenching, Backfilling, and Compacting
- D. Section 09900 - Painting
- E. Section 11010 - General Mechanical Equipment Provisions
- F. Section 15010 - General Process and Onsite Utility Piping Provisions
- G. Section 15080 - Piping Accessories and Appurtenances
- H. Section 15094 - Hangers and Supports

1.3 QUALITY ASSURANCE

Standards, American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), American Iron and Steel Institute (AISI), and American Welding Society (AWS).

1.4 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01300.
- B. Show materials of construction, with ASTM reference and grade. Submit manufacturer's certificates of compliance with referenced pipe standards, e.g., ASTM A312, A403, A774, A778. Show wall thickness of steel cylinder and fittings.
- C. Submit piping layout drawings showing the location and dimensions of the pipe and fittings larger than 2.5 inches nominal diameter. Include layout lengths of valves, meters, blowers, and other equipment determining piping dimensions. Label or number each fitting or piece of pipe.
- D. Submit manufacturer's data for flange and coupling gaskets.
- E. Submit certifications that welders are qualified in accordance with ANSI B31.1, Paragraph 127.5 for shop and project site welding of pipe work.

PART 2 MATERIALS

2.1 PIPE

Pipe shall conform to ASTM A312 or A778, Grade 304L or Grade 316 as indicated in the Drawings and/or Specifications. If not indicated, use Grade 304L. Pipe sizes and wall thickness shall conform to ANSI B36.19. Pipe 2.5 inches nominal diameter and smaller shall be Schedule 40S. Pipe 3 inches nominal diameter and larger shall be Schedule 10S.

2.2 FITTINGS

- A. Fittings 2.5 inches and smaller shall be threaded conforming to ANSI B16.11, 3,000-pound CWP. Material for threaded fittings shall conform to ASTM A403, Class WP, same material as connecting pipe.
- B. Fittings for buried or submerged pipe larger than 2.5 inches shall be butt-welded, conforming to ASTM 403, Class WP same material and wall thickness as the connecting piping, conforming to ANSI B16.9. Elbows shall be short radius.
- C. Fittings for aboveground or exposed pipe larger than 2.5 inches shall be butt-welded, grooved, or flanged, conforming to ASTM A403, Class WP same material and wall

thickness as the connecting piping, conforming to ANSI B16.9. Elbows shall be short radius.

2.3 JOINTS

- A. Joints for pipes 2.5 inches and smaller shall be threaded, same material as specified for fittings, 3,000-pound WOG, conforming to ANSI B16.11.
- B. Joints for buried pipe larger than 2.5 inches shall be butt-welded or flexible grooved, unless noted otherwise on drawings.
- C. Joints for aboveground or exposed pipe larger than 2.5 inches shall be rigid grooved end or flanged. Grooved-end joints shall be of the roll-grooved type.
- D. Stainless steel pipe fabricated into spool pieces shall have shop-welded circumferential butt-weld joints or flanges.

2.4 GROOVED-END COUPLINGS

- A. All metal parts in contact with the stainless steel piping and fitting shall also be stainless steel. Couplings used for hot air service shall have gaskets suitable for 300°F. The pipe ends shall be roll-grooved to the coupling manufacturer's specifications. Where roll grooving is impractical, the pipe shall have heavy-wall machine-grooved pipe nipples or machined ring collars fully welded to the pipe or fitting. Nipples shall be taper-bored to the I.D. of the adjoining pipe to allow full-weld penetration. Collars shall be welded on both sides to the piping. Nipples and collars shall be of the same alloy as the piping.
- B. Bolts in exposed service shall conform to ASTM A193, Grade B8M, Class 2.

2.5 THREAD LUBRICANT

Use Teflon thread lubricating compound or Teflon tape.

2.6 FLANGES

Provide weld-neck flanges conforming to ANSI B16.5 for piping 2.5 inches and smaller to connect to flanged valves, fittings, or equipment. Provide weld-neck or slip-on flanges for piping larger than 2.5 inches. Flanges shall be Class 150 per ANSI B16.5. Material for weld-neck and slip-on flanges shall conform to ASTM A182, Grade F304 or F316 to match pipe type. Flanges shall match the connecting flanges on the adjacent fitting, valve, or piece of equipment. Flange shall be flat face.

Where appropriate as determined by the Engineer, flanges may be Van Stone type. Van Stone joints shall be made up of stainless steel slip-on type rolled-angle face rings and ductile iron backup flanges drilled to ANSI 16.1, Class 125 standard. The angle face ring thickness shall be equal to or greater than the wall of the pipe or fitting. The angle leg shall not interfere with the flange bolt holes. For submerged or buried joints, backup flanges shall be stainless steel plate flanges.

2.7 BOLTS AND NUTS FOR FLANGES

- A. Bolts and nuts for flanges shall be stainless steel conforming to ASTM A193, Grade B8M, for bolts and ASTM A194, Grade 8M, for nuts.
- B. Bolts for flange insulation kits shall conform to ASTM A 193, Grade B7. Nuts shall conform to ASTM A194, Grade 2H.
- C. Provide washer for each nut. Washers shall be of the same material as the nuts.

2.8 LUBRICANT FOR STAINLESS-STEEL BOLTS AND NUTS

Lubrication shall be TRX-Synlube by Ramco, Anti-Seize by Ramco, Jusk IT Husky Lube O'Seal, or equal.

2.9 GASKETS FOR FLANGES

Full face or ring, except that ring gaskets shall be used for sizes 14-inch and greater. Gaskets shall be 1/8"inch thick synthetic rubber for test pressures up to 250 psi. Gasket to be Garlock Multi-Swell Style 3760, or approved equal.

For test pressures greater than 250 psi, provide suitable gasket as recommended by manufacturer.

2.10 OUTLETS

- A. Outlets 2.5 inches and smaller in piping 3 inches and larger shall be of the Thredolet type, per AWWA Manual M11 (1998 edition), Figure 13-23. Outlets shall be 3,000-pound WOG stainless steel per ASTM A182, Grade F304 or F316, or ASTM A403, Grade WP304 or WP316, to match pipe. Threads shall comply with ANSI B2.1. Outlets shall be Bonney Forge Co. "Thredolet", "Allied Piping Products Co. "Branchlet", or equal.
- B. For outlets 2.53 inches and smaller in piping smaller than 3 inches, use a tee with a threaded outlet.

- C. For outlets larger than 3 inches, use a tee. Tees, crosses, laterals and wyes shall be shop fabricated from pipe, and in addition, stainless steel reinforcement collars shall be fully welded to the branch and run of the pipe as necessary to maintain the specified pressure rating.

2.11 WALL PENETRATIONS

Wall pipes shall have integral shop welded wall stops, circumferentially welded to the pipe run.

2.12 FLEXIBLE COUPLING ASSEMBLIES

Flexible Coupling shall be provided at a minimum in the locations shown on the Contract Drawings. Couplings shall comply with the requirements of Section 15080, except that all metal parts in contact with the stainless steel piping and fitting shall also be stainless steel. Gasket material for hot air piping shall be able to withstand sustained operating temperatures up to 350°F. Flexible Coupling shall be held in place by means of an internal centering ring or centering lugs.

2.13 FINISH

After all shop operations have been completed, pipe and fittings shall be pickled and passivated in manufacturer's plant, and scrubbed and washed until discoloration and possible iron picked up from manufacturing process are removed. The standard finish for 16-gage through 8-gage material shall be No. 1 or 2B per ASTM A480; 3/16-inch and heavier plate material shall be No. 1 mill finish or better per ASTM A480.

PART 3 EXECUTION

3.1 FABRICATION/INSTALLATION REQUIREMENTS

The piping supplier during manufacturing, fabricating and handling stages, and the Contractor during handling and installation stages, shall use extreme care to avoid the contact of any ferrous materials with the stainless steel piping. All saws, drills, files, wire brushes, etc. shall be used for stainless steel piping only. Pipe storage and fabrication racks shall be nonferrous or stainless steel or rubber-lined. Nylon slings or straps shall be used for handling stainless steel piping. Contact with ferrous items may cause rusting of iron particles embedded in the piping walls. After installation, the Contractor shall wash and rinse all foreign matter from the piping surface. All welded joints shall be treated with a pickling solution, brushed with stainless steel wire brushes and rinsed clean. If rusting of embedded iron occurs, the Contractor shall pickle the affected surface with Oakite Deoxidizer SS or equal, scrub with stainless steel brushes, and rinse clean.

3.2 MARKING, SHIPPING, AND STORAGE

All pipe, fittings, and fabrications shall be properly marked with type, gage, and heat number. All fabricated piping shall have openings plugged and flanges secured for storage and/or transport after fabrication. All fabricated piping shall be piece-marked with identifying numbers or codes which correspond to the Contractor's layout and installation drawings. The marks will be located on the spools at opposite ends and 180 degrees apart. Pipe spools shall be loaded and blocked and lagged as necessary to ensure protection from damage during shipping. Stainless steel pipe and fittings shall be stored per manufacturer's recommendation. Dents, gouges, and scratches in stainless steel pipe and fittings are not acceptable and are reason for rejecting pipe and fittings.

3.3 INSTALLING THREADED PIPING

Ream, clean, and remove burrs from threaded piping before making up joints. Apply thread lubricant to threaded ends before installing fittings, couplings, unions, or joints.

3.4 INSTALLING FLANGED PIPING

- A. Set pipe with the flange bolt holes straddling the pipe horizontal and vertical centerline. Install pipe without springing, forcing, or stressing the pipe or any adjacent connecting valves or equipment.
- B. Lubricate bolts prior to installation.

3.5 INSTALLING GROOVED-END PIPING

Install grooved-end pipe and fittings in accordance with the coupling manufacturer's recommendations and the following:

- A. Clean loose scale, rust, oil, grease, and dirt from the pipe or fitting groove before installing coupling. Apply the coupling manufacturer's gasket lubricant to the gasket exterior including lips, pipe ends, and housing interiors.
- B. Fasten coupling alternately and evenly until coupling halves are seated.

3.6 FABRICATION, ASSEMBLY, AND ERECTION

- A. Beveled ends for butt-welding shall conform to ANSI B16.25. Remove slag by chipping or grinding. Surfaces shall be clean of paint, oil, rust, scale, slag, and other material detrimental to welding.
- B. Fabrication shall comply with ANSI B31.3, Chapter V.

- C. Welds shall be full circumferential. The minimum number of passes for welded joints shall be as follows:

Steel Cylinder Thickness (inch)	Minimum Number of Passes for Welds
Less than 0.1875	1
0.1875 through 0.25	2
Greater than 0.25	3

- D. Use the shielded metal arc welding (SMAW) or the tungsten inert gas (TIG) process for welding. Use the SMAW process for any pipe. Use the TIG process only on pipe having a maximum thickness of Schedule 10S.
- E. Welding preparation shall comply with ANSI B31.3, paragraph 328.4. Limitations on imperfections in welds shall conform to the requirements in ANSI B31.3, Tables 341.3.2A and 341.3.2B, and paragraph 341.4 for visual examination.
- F. Identify welds in accordance with ANSI B31.3, paragraph 328.5.
- G. Major piping assemblies shall be shop fabricated. Field welding of above ground piping shall be permitted only where indicated on the Contract Drawings or deemed necessary by the Engineer.

3.7 INSTALLING BURIED PIPE

Install in accordance with Section 02223, except as modified herewith. Pipe installed underground shall not deviate more than 1 inch from line or ¼ inch from grade. Measure for grade at the pipe invert.

3.8 INSTALLING ABOVEGROUND PIPE AND TUBING

- A. Install pipe without springing, forcing, or stressing the pipe or any adjacent connecting valves or equipment.
- B. Provide pipe hangars and supports as identified in the drawings.
- C. Install tubing fittings in strict conformance with manufacturer’s recommendations.

3.9 SUBMERGED PIPE

Install submerged piping as shown on the drawings.

3.10 COATINGS

After installation, the Contractor shall paint all steel or iron flanges, couplings, and appurtenances in accordance with Section 09900. Painting of the stainless steel pipe is not required. However, the Contractor shall be responsible for supplying and installing the stainless steel piping with a consistently clean surface. Identifying spool piece marks shall be removed with paint thinner or solvents and the entire stainless steel surface shall be washed with detergent and hot water and rinsed clean.

3.11 TESTING

Test piping in accordance with Section 01666.

END OF SECTION

SECTION 15062

DUCTILE IRON PIPE

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of furnishing and installing ductile iron pipe and fittings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 - Submittals
- B. Section 02223 - Trenching, Backfilling, and Compacting
- C. Section 15010 - General Process and Onsite Utility Piping Provisions
- D. Section 15080 - Piping Accessories & Appurtenances
- E. Section 15094 - Hangers and Supports
- F. Section 15100 - Valves

1.3 REFERENCES

- A. Standards of the following agencies are referenced herein: American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), American Water Works Association (AWWA).
- B. Referenced standards shall be the latest revision.
- C. In case of conflict with referenced standards, the provisions of this section shall prevail.
- D. All potable water (1W) pipe, fittings, accessories, and fixtures shall be certified as “lead free” in accordance with the requirements set out in 22 CCR 116875.

1.4 SUBMITTALS

- A. In accordance with Section 01300.
- B. Catalog data sheets naming each product to be used identified by manufacturer and type number and additional documentation as required to demonstrate full compliance with this specification.

1.5 PRODUCT HANDLING

Handle pipe and fittings in a manner to insure delivery in a sound undamaged condition.

PART 2 MATERIALS

2.1 DUCTILE IRON PIPE

- A. Pipe shall conform to the following standards as applicable:
 - 1. AWWA C104: Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
 - 2. AWWA C111: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
 - 3. AWWA C115: Flanged Ductile-Iron Pipe with Threaded Flanges
 - 4. AWWA C150: Thickness Design of Ductile-Iron Pipe
 - 5. AWWA C151: Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
 - 6. AWWA C606: Grooved and Shouldered Joints
- B. Unless otherwise noted or required, pipe wall thickness for push-on joint and mechanical joint pipe shall be Pressure Class 350 psi for pipe 12 inches and smaller, and Pressure Class 250 for larger pipe.
- C. Unless otherwise noted, all underground and submerged pipes (for all DIP services, with the exception of sanitary sewer and raw sewage piping identified below) shall have a cement mortar lining with asphaltic seal coat and finish coat shall be in accordance with Section 09900 (system "D"). Unless noted otherwise, all exposed pipe shall have factory applied epoxy primer (6-8 mil DFT of Tnemec Series L140, Carboguard 61, or equal) and finish coats shall be applied in the field in accordance with Specification Section 09900 (system "D").
- D. Unless otherwise noted, all underground and submerged pipes for sanitary sewer and raw sewage piping services shall have a Protecto 401 ceramic epoxy lining with asphaltic seal coat and finish coat shall be in accordance with Section 09900 (system "D"). Unless noted otherwise, all exposed pipe shall have factory applied epoxy primer (6-8 mil DFT of

Tnemec Series L140, Carboguard 61, or equal) and finish coats shall be applied in the field in accordance with Specification Section 09900 (system "D").

2.2 FITTINGS AND SPECIALS (EXCEPT GROOVED)

- A. Fittings and specials shall be ductile iron and shall conform to the following standards as applicable:
 - 1. AWWA C104: Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
 - 2. AWWA C110: Ductile-Iron and Gray Iron Fittings, 3 In. Through 48 In., for Water and Other Liquids.
 - 3. AWWA C111: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - 4. AWWA C153: Ductile-Iron Compact Fittings, 3 In. Through 24 In. and 54 In. Through 64 In., for Water Service.
 - 5. AWWA C606: Grooved and Shouldered Joints.
- B. Unless otherwise noted or required, either standard or compact fittings may be used.
- C. Unless otherwise noted, all underground and submerged fittings (for all DIP services, with the exception of sanitary sewer and raw sewage piping identified below) shall have a cement mortar lining with asphaltic seal coat and field coating shall be in accordance with Section 09900 (system "D"). Unless noted otherwise, all exposed fittings shall have factory applied epoxy primer (6-8 mil DFT of Tnemec Series L140, Carboguard 61, or equal) and finish coats shall be applied in the field per Specification Section 09900 (system "D").
- D. Unless otherwise noted, all underground and submerged fittings for sanitary sewer and raw sewage piping shall have a Protecto 401 ceramic epoxy lining with asphaltic seal coat and field coating shall be in accordance with Section 09900 (system "D"). Unless noted otherwise, all exposed fittings shall have factory applied epoxy primer (6-8 mil DFT of Tnemec Series L140, Carboguard 61, or equal) and finish coats shall be applied in the field per Specification Section 09900 (system "D").
- E. Grooved fittings shall have center to end dimensions in accordance with AWWA C111, wall thickness in accordance with AWWA C153, and shall be rated for 350 psi for sizes 12-inch and under and 250 psi for larger sizes.

2.3 GROOVED JOINT COUPLINGS

- A. In accordance with AWWA C606, except as modified herein.
- B. Coupling body shall be ductile iron, ASTM A536.

- C. Bolts and nuts shall be made out of the following materials of construction based on the service location:
 - 1. Exposed Dry Environment: ASTM A307, Grade A, low carbon steel; with zinc phosphate coating per ASTM B633.
 - 2. Buried, Exposed Wet Environment, or Submerged: 304 SST, B8 Class 1 per ASTM A193 and A194; with lubricated anti-seize.
 - 3. Chemical or corrosive exposure: 316 SST, B8M Class 1 per ASTM A193 and A194, with lubricated anti-seize; wrapped with wax tape if buried.
 - 4. Coupled to SST, aluminum, or bronze equipment/piping/appurtenances: same material as equipment/piping/appurtenances.
 - 5. Structural supports: see Division 5.
 - 6. Lubrication shall be nickel based (copper free) anti-seize; manufactured by TRX-Synlube by Ramco, Anti-Seize by Ramco, Jusk IT Husky Lube O'Seal, or equal.

2.4 TYPE OF JOINTS

- A. Buried joints shall be push-on, mechanical joint, or flexible grooved joint unless otherwise shown or required for the installation.
- B. Exposed joints shall be flanged or rigid grooved unless otherwise shown or required for the installation.
- C. Unless otherwise noted or required, rigid grooved couplings may be substituted where flanged joints are shown on the drawings.

2.5 FLANGES

- A. AWWA C110 suitable for working pressures of 250 psi unless otherwise indicated, or required for the installation. Drilling pattern shall be Class 125 unless noted otherwise.
- B. Flanges for spool pieces shall be factory installed threaded flanges. Flanges for fittings shall be cast integrally with the fitting.

2.6 RESTRAINED MECHANICAL JOINTS

Where specified, called for on the Drawings, or otherwise required for thrust restraint, mechanical joints shall be made using retainer glands with set screws or clamping lugs. Restraint shall be made in America. Retainer glands shall be as manufactured by EBAA Iron; Tyler Pipe, Star Pipe Products, or equal.

2.7 RESTRAINED PUSH-ON JOINTS

Where specified, called for on the drawings, or otherwise required for thrust restraint, push-on joints shall be Flex-Ring as manufacturer by American Ductile Iron Pipe, TR Flex as manufactured by US Pipe, or equal. Restrained joint shall provide for joint deflection after assembly.

2.8 RUBBER GASKET FOR MECHANICAL OR PUSH-ON JOINT

Provide 1/8-inch thick SBR or Neoprene.

2.9 FLANGED GASKETS

Full face or ring, except that ring gaskets shall be used for sizes 14-inch and greater. Gaskets shall be 1/8"inch thick synthetic rubber (SBR or Neoprene) for test pressures up to 250 psi. Gasket to be Garlock Multi-Swell Style 3760, or approved equal.

For test pressures greater than 250 psi, provide suitable gasket as recommended by manufacturer.

2.10 BOLTS AND NUTS FOR FLANGES

- A. Bolts and nuts shall be made out of the following materials of construction based on the service location:
1. Exposed Dry Environment: ASTM A307, Grade A, low carbon steel; with zinc phosphate coating per ASTM B633.
 2. Buried, Exposed Wet Environment, or Submerged: 304 SST, B8 Class 1 per ASTM A193 and A194; with lubricated anti-seize.
 3. Chemical or corrosive exposure: 316 SST, B8M Class 1 per ASTM A193 and A194, with lubricated anti-seize; wrapped with wax tape if buried.
 4. Coupled to SST, aluminum, or bronze equipment/piping/appurtenances: same material as equipment/piping/appurtenances.
 5. Structural supports: see Division 5.
 6. Lubrication shall be nickel based (copper free) anti-seize; manufactured by TRX-Synlube by Ramco, Anti-Seize by Ramco, Jusk IT Husky Lube O'Seal, or equal.

2.11 FASTENERS EXCEPT GROOVED COUPLINGS

- A. General: In accordance AWWA C111 and appendices attached thereto.

B. All fasteners shall be made out of the following materials of construction based on the service location:

1. Exposed Dry Environment: ASTM A307, Grade A, low carbon steel; with zinc phosphate coating per ASTM B633.
2. Buried, Exposed Wet Environment, or Submerged: 304 SST, B8 Class 1 per ASTM A193 and A194; with lubricated anti-seize.
3. Chemical or corrosive exposure: 316 SST, B8M Class 1 per ASTM A193 and A194, with lubricated anti-seize; wrapped with wax tape if buried.
4. Coupled to SST, aluminum, or bronze equipment/piping/appurtenances: same material as equipment/piping/appurtenances.
5. Structural supports: see Division 5.
6. Lubrication shall be nickel based (copper free) anti-seize; manufactured by TRX-Synlube by Ramco, Anti-Seize by Ramco, Jusk IT Husky Lube O'Seal, or equal.

2.12 GROOVED FITTINGS

Cast iron, ASTM A48, Class 30-A, cement lined. Victaulic, Gustin-Bacon, or equal.

2.13 POLYETHYLENE ENCASEMENT

Buried piping, specials, and fittings shall be polyethylene encased, double wrapped - 8 mils thickness, sized to pipe diameter, AWWA-C105.

2.14 PROTECTO 401 (CERAMIC EPOXY)

A. Lining: Where specified or called for on the drawings, ductile iron pipe and fittings shall be lined with Protecto 401 ceramic epoxy. The material shall be an amine cured novalac epoxy containing at least 20% by volume of ceramic quartz pigment. The ceramic epoxy must meet the following properties:

1. 40 mils nominal dft
2. Permeability rating of 0.00 when tested according to Method A or ASTM E-96-66, Procedure A with test duration of 30 days.
3. Salt Spray results equal to 0.0 undercutting after 2-years, tested per ASTM B-117; <0.5 mm undercutting after 30-days, per ASTM G-95 cathodic disbondment 1.5-volts at 77-degrees Fahrenheit; no effect after 2-years (test per ASTM D-714-87) with 20% sulfuric acid, 140-degrees Fahrenheit 25% sodium hydroxide, and 160-degree Fahrenheit distilled water.
4. Abrasion resistance of <3mils loss after on-million cycles using European Standard EN 598, 1994 Section 7.8.

- B. Coating: Unless otherwise noted, all underground and submerged pipes and fittings shall have an asphaltic seal coat and finish coat shall be in accordance with Section 09900 (system "D"). Unless noted otherwise, all exposed pipe and fittings shall have factory applied epoxy primer (6-8 mil DFT of Tnemec Series L140, Carboguard 61, or equal) and finish coats shall be applied in the field in accordance with Specification Section 09900 (system "D").
- C. Protecto 401 shall be applied as indicated by the published specifications of the coating manufacturer.
- D. For systems using Protecto 401, all gaskets shall be full-face and match the inside diameter of the piping to protect the entire flange from damage. Full face Flange-Tyte, or equal.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with the drawings, applicable sections of these specifications, applicable sections of previously referenced AWWA standards, AWWA C600, and manufacturer's recommendations. In case of conflict, the drawings and specifications shall govern.
- B. Bell and Spigot Ductile Iron Pipe: Where bell and spigot joints are used for joining ductile iron pipe, the joints shall be made using rubber rings, US "Tyton", Clow "Super Bell-Tite" joint, or equal. Gasket seat, gasket, and spigot shall be thoroughly cleaned before assembly of joint. The entire procedure shall be in strict accordance with manufacturer's recommendations.
- C. Mechanical Joint Ductile Iron Pipe: Mechanical joints in ductile iron pipe shall be made as follows: Gland shall be placed on spigot end of pipe with lip extension toward the joint. The rubber gasket shall then be slipped on the pipe with its thick edge toward the gland. The gasket and joint surfaces shall then be thoroughly wetted using a soapy solution made with vegetable soap or similar soap as recommended by the manufacturer. The spigot end of the pipe shall then be inserted to full depth of the mechanical joint socket and the gasket pressed firmly into place in the bell in order to obtain an even "set" all around the joint. The gland shall then be moved into place, the bolts inserted and the nuts taken up tightly with fingers. The nuts shall then be tightened gradually by wrench a half turn at a time, moving wrench from one nut to another repeating until all nuts are uniformly tight. Final tightness shall be with a torque wrench as follows: three-quarter inch bolts 60 to 90 pounds torque.
- D. Flanged Pipe: Flanged joints shall be made up square, with even pressure on the gaskets, and shall be watertight.

- E. Grooved Coupling: Grooved couplings shall be prepared or painted as necessary to obtain a leak-free seal.
- F. Polyethylene Encasement for External Corrosion Protection for Buried Piping:
1. General: Provide polyethylene encasement for all buried Ductile Iron Pipe.
 2. Installation on Pipe
 - a. Pick up the pipe with a sling or pipe tongs. Slip a polyethylene tube which is approximately two feet longer than the pipe over the plain end and leave it bunched up accordion style.
 - b. Lower the pipe into the trench and make up the joint with the preceding pipe. Shallow bell holes are required to allow overlap of the tube at the joints.
 - c. Remove the sling or tong from the center of the pipe, raise the bell a few inches and slip the polyethylene tube along the pipe barrel, leaving approximately one foot of the tube bunched up at each end of the pipe for wrapping the joints.
 - d. Overlap each joint by first pulling one bunched-up tube over the bell, folding it around the adjacent plain end, and securing it in place with two or three wraps of the polyethylene adhesive tape. Complete the overlap by repeating the same procedure with the bunched-up tube on the adjacent pipe.
 - e. Take up the slack tube along the pipe barrel by folding it over the top of the pipe holding the fold in place with polyethylene adhesive tape.
 - f. Repair any rips, punctures or other damage to the polyethylene with tape or by cutting open a short length of tube, wrapping it around the pipe and securing with tape.
 3. Installation on Fittings, Valves and Piping Specialties
 - a. Fit bends, reducers and offsets with polyethylene tube in the same manner described above for pipe.
 - b. Wrap valves, tees, crosses and specialty items with a flat sheet obtained by splitting open a length of polyethylene tube. Pass the sheet under the valve or fitting and bring it up around the body. Join the seams by bringing the edges together, folding over twice and securing in place with tape.
 - c. Handle slack tube and overlapping at joints in the same manner described above for pipe.
 - d. Prepare openings for service taps, air reliefs, etc., by making an X-shaped cut in the polyethylene and temporarily folding back the edges. After installation is completed, replace the polyethylene and repair the cut with polyethylene adhesive tape.
 4. Backfilling

- a. Care shall be taken not to damage the polyethylene.
- b. Initial backfill material shall be free of rocks and debris which could puncture the polyethylene. If suitable backfill material is not available, felt roofing or similar material can be laid over the top of the pipe to protect the polyethylene.
- c. In general, backfilling shall be done in accordance with AWWA Standard C-600.

3.2 COATING

All exposed ductile iron pipe shall be have factory applied epoxy primer and finish coats shall be applied in the field as stated above and in Specifications Section 09900.

END OF SECTION

SECTION 15071

PLASTIC PIPE

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of furnishing and installing polyvinyl chloride pipe and fittings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 - Submittals
- B. Section 02223 - Trenching, Backfilling, and Compacting
- C. Section 15010 - General Process and Onsite Utility Piping Provisions
- D. Section 15094 - Hangers and Supports
- E. Section 15080 - Piping Accessories and Appurtenances
- F. Section 15100 - Valves

1.3 QUALITY ASSURANCE REFERENCES

This section contains references to some or all of the following documents, most recent edition. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

Reference	Title
ASTM D1248	Polyethylene Plastics Molding and Extrusion Materials.
ASTM D1784	Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
ASTM D1785	Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D2464	Threaded Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80

ASTM D2466	Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D2467	Socket-Type Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D2564	Solvent Cements for Polyvinyl Chloride (PVC) Plastic Pipe and Fittings
ASTM D3034	Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings
ASTM D4101	Propylene Plastic Injection and Extrusion Materials
ASTM F402	Practice for Safe Handling of Solvent Cements and Primers Used for Joining Thermoplastic Pipe and Fittings
AWWA C900	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings 4" through 12" for Water Transmission and Distribution
AWWA C905	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings 14" through 48" for Water Transmission and Distribution

All potable water (1W) pipe, fittings, accessories, and fixtures shall be certified as "lead free" in accordance with the requirements set out in 22 CCR 116875.

1.4 SUBMITTALS

In accordance with Section 01300.

PART 2 MATERIALS

2.1 PVC PRESSURE PIPE:

- A. General: PVC materials for pipe and fittings shall conform to ASTM D1784, Cell Classification 12454 type 1 grade 1. In addition, additives shall be less than 7% by weight. Pipe and fitting materials shall be specially formulated with sufficient UV protection additives to provide for long-term outdoor exposure with no deleterious effects. Flanges shall be one-piece solid design or two-part van stone type which utilize the tapered, serrated face and full face gasket technique for joining and are compatible with ANSI N16.5 Class 150 metal flanges. Unions shall be the O-ring seal type having interchangeable components with true union valves for maximum system versatility.
- B. Schedule 40, 80, and 120: Pipe in accordance with ASTM D1785. Schedule 80 PVC socket type fittings shall conform to ASTM D2467. Schedule 40 PVC fittings shall conform to ASTM D2466. PVC solvent weld cement for socket connections shall meet the requirements of ASTM D2564. Schedule 80 PVC threaded fittings shall conform to ASTM D2464.

Solvent cement shall be as recommended by the manufacturer for each service. Cement for hydroxide and hypochlorite solutions shall be IPS 724 or equal. Solvent welding is not permissible on pipes larger than 4-inches in diameter.

- C. C900 (Class as indicated in Section 15010): Pipe shall meet the requirements of AWWA C900, "Polyvinyl Chloride (PVC) Pressure Pipe". All Class 165 pipe shall meet the requirements of DR 25, Class 235 pipe shall meet the requirements of DR 18 and Class 305 the requirements of DR 14. All pipe shall be suitable for use as pressure conduit. Provisions must be made for expansion and contraction at each joint with an elastomeric ring. The bell shall consist of an integral wall section with a locked-in, solid cross section elastomeric ring which meets the requirements of ASTM F477. The bell section shall be designed to be at least as hydrostatically strong as the pipe wall and meet the requirements of AWWA C900.
- D. C905 (Class as indicated in Section 15010): Pipe shall meet the requirements of AWWA C905, "Polyvinyl Chloride (PVC) Water Transmission Pipe". All Class 165 pipe shall meet the requirements of DR 25, Class 235 pipe shall meet the requirements of DR 18 and Class 305 shall meet the requirements of DR 14. In addition, additives shall be less than 10% by weight. All pipe shall be suitable for use as pressure conduit and shall be cast iron pipe o.d. Provisions must be made for expansion and contraction at each joint with an elastomeric ring. The bell shall consist of an integral wall section with a locked-in, solid cross section elastomeric ring which meets the requirements of ASTM F477. The bell section shall be designed to be at least as hydrostatically strong as the pipe wall. All reclaimed water piping (RW, 3W) shall be purple in color.

Fittings for C900 and C905 pipe shall be either ductile iron or PVC as follows:

1. Ductile Iron Fittings: As specified in Section 15062.
2. PVC Fittings: In accordance with AWWA C907, 4-8 inch.
3. Fittings shall be double wrapped (8 mil) polyethylene encasement, sized to diameter, ANSI/AWWA – C1051/A21.5. Refer to Specification Section 15062.

E. Restrained Joint PVC Pipe

1. For pipes between 4" and 12" diameter:
 - a. Pipe shall be manufactured only from water distribution pipe and couplings conforming to AWWA C900. The restrained joint pipe system shall also meet all short and long term pressure test requirements of AWWA C900. Pipe, coupling, and locking splines shall be completely non-metallic to eliminate corrosion problems.
 - b. Nominal outside diameters and wall thicknesses of thrust-restrained pipe shall conform to the requirements of AWWA C900. Pipe shall be Class 235 (DR 18) or Class 305 (DR 14) furnished in standard lengths of 20 feet.
2. For pipes between 14" and 24" diameter:
 - a. Pipe shall be manufactured from water distribution pipe and couplings conforming to AWWA C905. The restrained joint pipe system shall also meet all short and long term pressure test requirements of AWWA C905. Pipe, coupling, and locking splines shall be completely non-metallic to eliminate corrosion problems.

- b. Nominal outside diameters and wall thicknesses of thrust-restrained pipe shall conform to the requirements of AWWA C905. Pipe shall be Class 235 (DR 18) or Class 165 (DR 25) furnished in standard lengths of 20 feet.
3. Pipe shall be joined using non-metallic couplings which, together, have been designed as an integral system for maximum reliability and interchangeability. High-strength flexible thermoplastic splines shall be inserted into mating precision-machined grooves in the pipe and coupling to provide full 360° restraint with evenly distributed loading. MJ Gland Adapters shall be used to anchor this restrained-joint PVC pipe to ductile iron accessories such as fittings and valves.
4. Pipe shall be white for potable water service (1W and 2W) and purple for reclaimed water service (3W).
5. Restrained joint PVC pipe and fittings shall be the CertainTeed Certa-Lok C900/RJ System, or approved equal.

F. Restrained PVC Pipe:

1. Where specified, called for on the Drawings, or otherwise required for thrust restraint, restrained joints shall be made using a bell restraint harness.
 - a. The restraint shall be manufactured of ductile iron conforming to ASTM A536. A back up ring shall be utilized behind the PVC bell. A restraint ring, incorporating a plurality of individually actuating gripping surfaces, shall be used to connect the bell ring and gripping ring.
 - b. Restraint shall be made in America and shall be as manufactured by EBAA Iron, Star Pipe Products, or equal.
2. Materials and Coatings:
 - a. Wedge and Wedge Assemblies, T-bolts, Bolts and Nuts:
 - 1) Exposed Dry Environment: ASTM A307, Grade A, low carbon steel; with zinc phosphate coating per ASTM B633.
 - 2) Buried, Exposed Wet Environment, or Submerged: 304 SST, B8 Class 1 per ASTM A193 and A194; with lubricated anti-seize.
 - 3) Chemical or corrosive exposure: 316 SST, B8M Class 1 per ASTM A193 and A194, with lubricated anti-seize; wrapped with wax tape if buried.
 - 4) Coupled to SST, aluminum, or bronze equipment/piping/ appurtenances: same material as equipment/piping/appurtenances.
 - 5) Lubrication shall be nickel based (copper free) anti-seize; manufactured by TRX-Synlube by Ramco, Anti-Seize by Ramco, Jusk IT Husky Lube O'Seal, or equal.

2.2 PERFORATED PVC PIPE

- A. Pipe shall be standard duty PVC pipe manufactured by IPEX, or equal. Pipe shall conform to the requirements of CSA B182.1, B182.2, and ASTM D3034 or ASTM F-679.
- B. Perforating shall consist of two rows of 15 mm holes positioned at 120° radially on the pipe, and spaced to provide a minimum total cross sectional hole area of 1,933 mm² per meter of length. Pipe shall be supplied with friction-fit bell ends.

2.3 PVC SEWER PIPE

- A. General: Pipe and fittings shall be made of PVC plastic having a cell classification of 12454, type I grade I, as defined in ASTM D1784 and shall have a SDR and minimum pipe stiffness as scheduled below. T-1 wall only is allowed. Additives and fillers including but not limited to stabilizers, antioxidants, lubricants, colorants, etc., shall not exceed 10 parts by weight per 100 of PVC resin in the compound.
- B. Pipe: PVC gravity sewer pipe and fittings shall conform to ASTM D3034 for diameters from 4-inches to 15-inches, and ASTM F679 for diameters from 18-inches to 30-inches, with integral-bell gasketed joints. Rubber gaskets shall be factory installed and conform to ASTM F 477. Pipe joints shall conform to ASTM D3212. Pipe shall be solid wall only, profile wall pipe is not allowed. Pipe thickness class shall be as follows:
 - 1. For depths of cover 12 feet and less, SDR-35 pipe shall be installed by the Contractor.
 - 2. For depths of cover greater than 12 feet, SDR-26 pipe shall be installed by the Contractor.
- C. Fittings: Pipe fittings shall be gasketed fittings matching the pipe SDR and conforming to ASTM D-2855 or ASTM F1336 as applicable. Fittings shall either be injection molded fittings as available or as specified for fiberglass wrapped C905 PVC fittings above. Fittings shall be as manufactured by IPEX or equal. Refer to ASTM D3034 for diameters from 4-inches to 15-inches and ASTM F679 for diameters from 18-inches to 30-inches, with integral-bell gasketed joints.
- D. Transition fitting: for piping connections with dissimilar outside diameter (for example, SDR to DIP), provide transition coupling. The coupling shall have follower flanges and a sleeve made of cast ductile iron per ASTM A-536. Flanges shall be color coded to identify general type of pipe (red for IPS size, Blue for ductile iron sizes, and gray for Cement sizes). Gasket shall be Buna N and NSF 61 rated with temperature range from -20 to 180 degrees F. The nuts and bolts shall be 304 SST. Coat fitting with fusion epoxy. Manufactured by Smith Blair Inc, model 441 Omni cast coupling, or equal.

2.4 DOUBLE CONTAINMENT PIPING SYSTEM

A. Manufacturers: One of the following or equal:

1. Harrington Industrial Plastics.
2. Guardian Systems, division of IPEX Inc.

B. Materials:

1. Compatible for continuous exposure to chemical service specified in pipe schedule at ambient temperatures and maximum pressure equal to the test pressure.
2. Prefabricated Fittings: Consisting of an inner (carrier) pipe elbow totally enclosed and spaced in an outer (containment) pipe elbow. Split fittings requiring field cutting, welding or joining shall not be used.
3. Inner Pipe: Schedule 80 PVC pipe, joined to fittings and each other by solvent welding. Provide pipe as specified under PVC pressure pipe, in accordance with Part 2.01.B.
4. Outer (containment) pipe shall consist of Schedule 40 PVC pipe. Provide pipe as specified under PVC pressure pipe, in accordance with Part 2.01.B.
5. Provide nonmetallic spacers on inner pipe to control sagging within containment pipe.

C. Design:

1. Expansion loops as required for expected ambient temperature range of 0 to 120 degrees Fahrenheit.

2.5 IRRIGATION PIPE (PIP)

- A. Pipe dimension, chemical, and physical requirements shall be conform to ANSI S376.1 and SCS 430-DD.
- B. Made with an integral bell to utilize a gasket for sealing, gaskets per ASTM F477 and gasket joints per ASTM D3139.
- C. Each male end shall be beveled, swagged or deburred to facilitate joining and shall be marked to reference proper insertion depth.

D. Provide SDR 32.5 (118psi) pressure rated pipe

2.6 CORRUGATED POLYETHYLENE STORM DRAIN PIPE

A. Manufacturers:

1. Advanced Drainage Systems, Inc.

B. Requirements:

1. N-12 WT IB Pipe (per AASHTO) with smooth interior and annular exterior corrugations
2. 4-inch through 10-inch diameter shall meet AASHTO M252, Type S
3. 12-inch through 60-inch diameter shall meet AASHTO M294, Type S or ASTM F2306
4. Mannings “n” value for use in design shall be 0.012

C. Materials:

1. Virgin material for pipe fitting production shall be HDPE with minimum requirements of cell classification 424420C for 4-inch through 10-inch diameters, and 435400C for 12-inch through 60-inch diameters (ASTM D3350, latest edition)
2. Carbon black content shall not exceed 4%
3. Virgin pipe material shall comply with the notched constant ligament-stress (NCLS) test as specified in Sections 9.5 and 5.1 of AASHTO M294 and ASTM F2306, respectively.

D. Joints:

1. Pipe shall be joined with the N-12 WT IB joint meeting requirements of AASHTO M252, AASHTO M294, or ASTM F2306
2. 4-inch through 60-inch diameter pipe shall be watertight according to the requirements of ASTM D3212.
3. Gaskets shall meet the requirements of ASTM F477
4. 12-inch through 60-inch diameters shall have an exterior bell wrap installed by the manufacturer

E. Fittings:

1. Fittings shall conform to AASHTO M252, AASHTO M294, or ASTM F2306.
2. Bell and spigot connections shall meet the watertight joint performance requirements of AASHTO M252, AASHTO M294, or ASTM F2306

F. Installation and Performance:

1. Installation shall be in accordance with ASTM D2321 and the manufacturer’s published guidelines
2. Minimum cover requirements per manufacturer’s published recommendations
3. Perform field watertightness performance verification per ASTM F2487.

2.7 CROSSLINKED POLYETHYLENE TUBING (PEX)

- A. For indoor use only.
- B. ASTM F876 and F877
- C. Certified to NSF standards 14 and 61 for potable water applications.
- D. Rated at 200°F at 80 psi, 180°F at 100 psi, and 73.4°F at 160 psi
- E. Copper crimp system fittings, per ASTM F2434

2.8 POLYETHYLENE TUBING (PE)

Tubing (Air Service): Polyethylene tubing shall be rated for 160 psi minimum, 5/8" diameter minimum. Fittings shall be compression type, Parker "Fast Tite" or equal.

Tubing (chemical acid service): Polyethylene tubing shall be rated for 80 psi minimum, 1" diameter minimum.

2.9 KYNAR/ FLEXIBLE POLYVINYLIDENE FLUORIDE TUBING (PVDF)

Tubing (chemical acid service): Polyethylene tubing shall be rated for 65 psi minimum, 1" diameter with minimum wall thickness 0.0625".

2.10 INDUSTRIAL HOSE

Provide a 50-foot long industrial hose with each hose valve installation, in accordance with Specification Section 15100.

PART 3 EXECUTION

3.1 INSTALLATION OF PIPE AND FITTINGS

- A. General: In accordance with manufacturer's recommendations, ASTM 2321 and Section 15010, whichever is more stringent.
- B. Pipe and fittings shall be of the sizes indicated. Clean pipe interior of all foreign matter before installing. Pipe shall be square cut with fine tooth saw or other cutter or knife designed for use with plastic pipe. Remove burrs by smoothing edges with a knife, file, or sandpaper. Replace any section of pipe found to be defective or damaged with new acceptable pipe. Handle pipe carefully to prevent gouging or scratching. Any length of

pipe having a gouge, scratch, or other permanent indentation more than 10 percent of the wall thickness in depth shall be rejected.

3.2 INSTALLATION OF SOLVENT WELD JOINT TYPE PIPE

In accordance with the recommendations of the pipe manufacturer and the following supplementary requirements:

- A. Do not solvent weld joints if it is raining, if atmospheric temperature is below 40 degrees F or above 90 degrees F, if the pipe is exposed to direct sunlight.
- B. Test fit dry pipe and fittings before applying cement. Pipe should enter socket without forcing at least one-third but not more than two-thirds the depth of socket. Fittings that are looser or tighter shall not be used. Thoroughly clean and dry the pipe end and socket of fitting with methyl ethyl ketone, acetone, or similar cleaner. Apply cement evenly to outside surface and end of pipe and inside surface of socket. Avoid excess application of cement but insure complete coverage of all bonding surfaces. Mark depth of socket on pipe to guide application of cement and insure full insertion of pipe. Insert pipe in socket, twisting pipe or fitting approximately ½ turn as pipe is being seated in socket. Make sure pipe is fully seated providing a bond between end of pipe and shoulder of socket. Immediately wipe excess cement from pipe leaving no more than a 1/8-inch fillet at fitting end. Hold assembled joint in place for approximately 15 seconds and allow to set for 30 minutes before moving. Avoid rough handling for 48 hours. Longer periods may be required in cold or wet weather.

3.3 INSTALLING DOUBLE CONTAINED PIPE

- A. Secondary containment joints solvent cemented using heavy body-slow set PVC cement ASTM D 2564 made in accordance with ASTM D 2855.
- B. Install piping in accordance with manufacturer's published instructions.
- C. Slope pipe continuously to drain to a low point. Pipe shall be continuously sloped to drain to a low point. Provide tee with minimum 3 inch riser pipe to grade for inspection and access at all low points. Provide threaded cap at top of riser pipe installed in a valve box.
- D. If no leak detection is required, ends of outer containment pipe shall be closed.

3.4 TESTING

Pressure and Mandrel Testing: Shall be in accordance with Section 01666 and 15010.

END OF SECTION

SECTION 15072

HIGH DENSITY POLYETHYLENE PRESSURE PIPE

PART 1 -- GENERAL

1.1 THE SUMMARY

- A. The CONTRACTOR shall provide high density polyethylene (HDPE) pressure pipe, complete and in place, in accordance with the Contract Documents.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

AWWA C906	Polyethylene (PE) Pressure Pipe and Fittings, 4 In Through 63 In, for Water Distribution and Transmission
ASTM D 3350	Polyethylene Plastics Pipe and Fittings Materials

1.3 CONTRACTOR SUBMITTALS

- A. Furnish Shop Drawings of pipe, fittings, and appurtenances in accordance with Section 01300 - Contractor Submittals.
- B. Certifications: Furnish a certified affidavit of compliance for pipe and other products or materials furnished under this Section:
 - 1. Hydrostatic proof test reports.
 - 2. Sustained pressure test reports.
 - 3. Burst strength test reports.
- C. Expenses incurred in making samples for certification of tests shall be borne by the CONTRACTOR as part of the WORK.

1.4 QUALITY ASSURANCE

- A. Each manufacturer shall have an approved in-house QA/QC program for compliance to the testing specifications and requirements of AWWA C906 for both pipe and fittings.
- B. Inspection: Pipe shall be subject to inspection at the place of manufacture in accordance with the provisions of the referenced standards as supplemented by the requirements herein. The CONTRACTOR shall notify the ENGINEER in writing of the manufacturing start date not less than 14 calendar days prior to the start of any phase of manufacture.

- C. During manufacture of the pipe, the ENGINEER shall be given access to areas where manufacturing is in process confirm compliance with the Specifications.
- D. Tests: Except as modified herein, materials used in the manufacture of the pipe shall be tested in accordance with the requirements of this Section and in the referenced standards, as applicable.
- E. The CONTRACTOR shall perform said material tests in accordance with the requirements of the Contract Documents. The ENGINEER shall have the right to witness testing conducted by the CONTRACTOR, provided that the CONTRACTOR's schedule will not be delayed for the convenience of the ENGINEER.
- F. In addition to those tests specifically required, the ENGINEER may request additional samples of any material for testing by the OWNER. The additional samples shall be furnished as part of the WORK.

PART 2 -- PRODUCTS

2.1 GENERAL

- A. Scope: The pipe shall be 10-inch nominal, meeting the specifications and requirements of AWWA C 906. Pipe shall be in iron pipe sizes (IPS).
- B. Materials: Pipe and fittings shall be made from prime virgin resins exhibiting a cell classification of PE 345444C as defined in ASTM D 3350, with an established hydrostatic-design basis of 1600 psi for water at 73 degrees F. The resin shall be listed by the PPI (Plastic Pipe Institute) in its pipe-grade registry Technical Report (TR) 4, "Listing of Plastic Pipe Compounds.
- C. Pipe and Fittings: The pressure rating shall be 160 psi, DR 13.5 or 200 psi. DR 11, as indicated on the drawings. Laying lengths shall be 40-ft or 50-ft standard. The fittings shall have equal or greater pressure rating than the pipe material.
- D. Joints: Pipe sections shall be joined by butt fusion in accordance with ASTM D3261 and the inner beads shall be removed.
- E. Marking: Pipe and fittings shall be marked as prescribed by AWWA C906. Pipe markings shall include nominal size, OD base (ie: 10-inch iron pipe sizing, IPS), dimension ratio, pressure class, AWWA C906, manufacturer's name, manufacturer's production code including day, month, and year extruded, and manufacturer's plant and extrusion line.

2.2 PLASTIC MARKING TAPE

- A. The pipeline shall be marked with a magnetically detectable blue marking tape labeled "Caution Sanitary Sewer Below." The tape shall be placed along the trench centerline between 18- and 24-inches above the pipe.

2.3 SPARE MATERIALS

- A. Contractor shall provide the following materials to the Owner for future emergency repairs:
 - 1. 200 feet of 10-inch DR11 HDPE pipe

2. 200 feet of 10-inch DR13.5 HDPE pipe
3. Six 10-inch HDPE DR11 fusion couplings
4. Six 10-inch HDPE DR11 flanged adaptors
5. Five 10-inch HDPE DR11 45-degree flanged bends
6. Five 10-inch HDPE DR11 45-degree plain end bends
7. Five 10-inch HDPE DR11 22.5-degree flanged bends
8. Five 10-inch HDPE DR11 22.5-degree plain end bends
9. Two 10-inch HDPE DR11 tees

PART 3 -- EXECUTION

3.1 GENERAL

- A. Laying, jointing, and testing for defects and for leakage shall be performed in the presence of the ENGINEER and shall be subject to approval before acceptance. All material found to be defective will be rejected and the CONTRACTOR shall promptly remove such materials from the Site.
- B. Installation shall conform to AWWA M23, instructions furnished by the pipe manufacturer, and to the supplementary requirements or modifications herein. Wherever the provisions of this Section and the aforementioned requirements are in conflict, the more stringent provision shall apply.

3.2 HANDLING AND STORAGE

- A. Handling: Pipe, fittings, and accessories shall be carefully inspected before and after installation and those found defective will be rejected. Pipe and fittings shall be free from fins and burrs. Before placing in position, clean pipe, fittings, and accessories, and maintain them in a clean condition. Proper methods shall be used for lowering sections of pipe into trenches. Under no circumstances shall pipe, fittings, or any other material be dropped or dumped into trenches.
- B. Storage: Pipe shall be stored, if possible, at the Site in unit packages provided by the manufacturer. Caution should be exercised to avoid compression damage or deformation to the pipe. Pipe shall be stored in such a way as to prevent sagging or bending, and it shall be protected from exposure to direct sunlight by covering with an opaque material that allows adequate air circulation above and around the pipe. Gaskets shall be stored in a cool, dark place out of the direct rays of the sun, preferably in original cartons.

3.3 TRENCHING AND BACKFILL

- A. Trench excavation and backfill shall conform to Section 02223 – Trenching, Backfilling, and Compaction.

3.4 JOINING

- A. Prior to installation of any pipe, the manufacturer shall provide training in the recommended butt fusion and saddle fusion procedures, testing procedures, and any other installation methods required by the WORK. Training shall include the CONTRACTOR's installation personnel, an OWNER's representative, the ENGINEER's representative, and any other personnel chosen by the OWNER. The CONTRACTOR shall record the names of trained personnel.
- B. On every day that butt fusion joints are to be made, the first fusion of the day shall be a test. The test fusion shall be allowed to cool completely, then fusion test straps shall be cut out. Test strap length shall be 12-inches (min) or 30 times the wall thickness with the fused area in the center and width shall be 1-inch (min) or 1.5 times the wall thickness. The CONTRACTOR shall bend the test strap until the ends of the strap touch. If the test strap fails at the joint, the CONTRACTOR shall perform a new test to be cooled completely and bent as before. The CONTRACTOR shall not commence installation of pipe until a test fusion has passed the bent strap test.

3.5 INSTALLATION

- A. Trench shall be graded in straight lines, taking care to avoid formation of any dips or low points. Pipe shall not be laid when the conditions of trench or weather are unsuitable. At the end of each day's work, open ends of pipe shall be closed temporarily with wood blocks or bulkheads.
- B. Pipe shall be cut by means of saws, power driven abrasive wheels, pipe cutters, or other manufacturer recommended methods that will produce a clean, square cut.
- C. Pipe shall be supported uniformly and firmly at its proper elevation. Wood support blocking will not be permitted. The full length of each section of pipe and fittings shall rest solidly on the soil, with recesses to accommodate joints and couplings. Anchors and supports shall be provided where necessary and where indicated for fastening WORK into place. Fittings shall be independently supported.
- D. Short lengths of pipe shall be used in and out of each rigid joint or rigid structure. Piping that does not allow sufficient space for proper installation of jointing shall be replaced.
- E. Joints shall be installed according to manufacturer's recommendations. Trenches shall be kept free of water until joints have been properly made. The maximum combined deflection at any coupling shall be in accordance with the manufacturer's recommendations.
- F. Maximum pipe bending radius shall be in conformance with the manufacturer's recommendation for the specific diameter and DR of the pipe. Whenever possible, accommodate changes in direction by bending the pipe in lieu of installing fittings, except as approved by the Engineer.

3.6 FIELD TESTING

- A. Field testing shall conform to the requirements of Section 01666- Pipe Testing.

END OF SECTION

SECTION 15080

PIPING ACCESSORIES AND APPURTENANCES

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of providing piping accessories and appurtenances.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300: Submittal
- B. Division 15: Mechanical
- C. Section 15010: General Process and Onsite Utility Piping Provisions
- D. Section 15400: Plumbing

1.3 QUALITY ASSURANCE

- A. Reference, American Society for Testing and Materials (ASTM).
- B. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
- C. All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.

1.4 SUBMITTALS

- A. Materials list and catalog data sheets naming each product to be used identified by manufacturer and type number.
- B. Grooved joint couplings and fittings shall be shown on drawings and product submittals, and shall be specifically identified with the applicable style or series designation.

PART 2 MATERIALS

2.1 FLEXIBLE COUPLINGS

A. Application

	Baker	Rockwell	Dresser
Iron pipe size O.D. pipe	200	411,521	38,90
Ductile iron	228	411, 431, 441	38, 53, 138, 153
Transition	212, 236	413, 433	162
Reducing	220, 240	415, 435	62
Flanged coupling adapter	601, 602, 603, 604	912, 913, 914, 916	127, 128

1. Rockwell International, 400 North Lexington, Pittsburg, PA 15208
2. Dresser Mfg., 41 Fisher Ave., Bradford, PA 16701
3. R.H. Baker & Co., 2929 Santa Fe Ave., Los Angeles, CA 90058, or equal.

B. Materials: Cast couplings shall be used wherever possible. Steel couplings with a minimum sleeve thickness of the connecting pipe wall or ¼-inch, whichever is greater, shall be used where cast couplings are not available.

1. Sleeve: Grey iron or steel.
2. Flanges: Malleable or ductile iron or high strength steel.
3. Bolts and Nuts: Low alloy, high strength, zinc coated when exposed, 304 stainless steel when buried, 316 stainless steel or below top of wall in water bearing structures.
4. Finish of Coupling: fusion epoxy coating.
5. Gaskets:
 - a. Synthetic rubber (Rockwell grade 60, Dresser 42) High-temperature, non-asbestos gasket for service above 212°F.

C. Wrap couplings, two feet beyond on either side, with geotextile fabric suitable to temperatures stated above.

D. Split-Sleeve couplings, with double-arched housing and O-ring gaskets may be used in lieu of sleeve-type. Couplings shall be restrained (FxF), expansion (ExE), or a combination (FxE) as required, manufactured by Victaulic Depend-O-Lok, Doraville, GA 30362.

2.2 FLANGED RUBBER FLEXIBLE CONNECTIONS

- A. The flexible connection shall be manufactured with a hypalon rubber tube with synthetic fabric reinforced rubber body and a neoprene cover. Nylon is unacceptable. A hypalon rubber coating shall be applied to the outside to provide resistance to deterioration. Steel wire reinforcement shall be imbedded in the body for additional strength.
- B. Flanges shall be constructed integrally with the body to resist stresses, drilled to ANSI B 16.5, class 150, and full faced to eliminate the use of gaskets. Retaining rings shall be galvanized and control rods shall be low alloy, corrosion resistant high strength.
- C. The flexible connections shall have a minimum design pressure rating of 50 psi, a minimum burst ratio of 4:1, and a minimum vacuum rating of 10" Hg.
- D. The flexible connections shall be single arch configuration. For restrained configurations, include control rods per manufacturer's recommendations, matching pipe class pressure and surge capacity.
- E. Flanged rubber flexible connections shall be Redflex™ Type J-1W and Type J-10 (concentric reducing type) as manufactured by the Red Valve Company, Inc. of Carnegie, PA 15106 or equal.
- F. For High Temperature Service – for all air piping, provide flanged rubber flexible connections and gaskets on air piping shall be suitable for temperatures up to 300°F.

2.3 FLEXIBLE METAL HOSE CONNECTORS

- A. NPT Union or 150 pound flanged end connections.
- B. Type 321 stainless steel hose and braid.
- C. Minimum 200 steady working pressure at room temperature, safety factor of 4:1.
- D. Anaconda Metal Hose Type PCM or SPCF, 18518 Susana Rd., Compton, California 90221, Flexonics MMT or FLG, 300 East Devon Ave., Bartlett, IL 60103, or equal.

2.4 TENSION ASSEMBLIES

- A. Welded
 - 1. Assemblies per AWWA M11, Section 13.10
 - 2. Rods shall be galvanized.

3. Buried assemblies shall receive two coats Koppers, Bitumastic 50, or equal.

B. Socket Clamps

1. Carbon steel half bands, bolts and nuts, galvanized.
2. Socket clamps, Grinnell Fig. 595, B-Line Systems Fig. B3134, or equal.
3. Socket clamp washers, Grinnell Fig. 594, B-Line Fig. B3134W, or equal.
4. Yoke, Grinnell Fig. 591.
5. Tee anchor strap, Grinnell Fig. 593, or equal.
6. Buried assemblies shall receive two coats Koppers, Bitumastic 50, or equal.
7. Grinnell Corporation, 155 Westminster Street, Providence, RI 02903; B-Line Systems, 509 West Monroe St., Highland, IL 62249, or equal.

2.5 GROOVED COUPLINGS AND FITTINGS

A. Couplings

1. All metal parts in contact with the stainless steel piping and fitting shall also be stainless steel. For all other pipe materials, housing shall be ductile iron conforming to ASTM A536, grade 65-45-12.
2. Gasket: ASTM D2000, one of the following, for the appropriate application:
 - a. Ethylene Propylene Diene (EPDM) - Grade "E"
 - b. Nitrile (Buna-N) - Grade "T"
 - c. Halogenated Butyl - Grade "M"
3. Bolts and nuts: heat treated carbon steel, ASTM A449 and A183.
4. Coating:
 - a. Exposed: enamel
 - b. Buried: two coats Koppers, Bitumastic 50, or equal, after assembly.
5. Application:
 - a. Grooved Steel Pipe (non-rigid connection): Victaulic 77 and W77, or engineer approved equal.
 - 1) For rigid connections through 12", coupling housings shall be cast with offsetting angle-pattern bolt pads to provide rigidity and system support and hanging in accordance with ANSI B31.1 and B31.9.
 - a) 2" through 6": Installation-Ready, for direct stab installation without field disassembly. Victaulic Style 107.

- b) Victaulic Zero-Flex Style 07.
 - 2) For sizes 14" through 24", Victaulic Style W07.
 - b. Grooved Cast Pipe (nonrigid connection): Victaulic 31 or engineer approved equal.
- B. Flange Adapters for Grooved Pipe
 - 1. Class 125 standard drilling.
 - 2. Housing shall be ductile iron conforming to ASTM A536, grade 65-45-12.
 - 3. Gasket, ASTM D2000, one of the following, for the appropriate application:
 - a. Ethylene Propylene Diene (EPDM) - Grade "E"
 - b. Nitrile (Buna-N) - Grade "S" or "T"
 - c. Halogenated Butyl - Grade "M"
 - 4. Coating:
 - a. Exposed: enamel.
 - b. Buried: Two coats Bitumastic 50, Koppers, or equal, after assembly.
 - 5. Application:
 - a. Grooved Steel Pipe: Victaulic 741, W741, and 743 or engineer approved equal.
 - b. Grooved Cast Pipe: Victaulic 341 or engineer approved equal.
- C. Cut and Rolled Grooves
 - 1. Pipe sized ¾ through 24-inch may be cut grooved.
 - 2. Roll groove pipe if wall thickness is less than minimum recommended by the manufacturer for cut-grooving.
 - 3. Cast pipe shall have rigid radius cut grooves.
- D. Collared and Shouldered Pipe
 - 1. In accordance with manufacturer's recommendations, Vic-Rings with Style 41 or 44 couplings as required for the application.
 - 2. Victaulic Co., 4901 Kesslersville Road, Easton, PA 18042

2.6 TRANSITION COUPLING ADAPTOR

- A. For piping connections with dissimilar outside diameter (for example, SDR to DIP), provide transition coupling.

- B. The coupling shall have follower flanges and a sleeve made of cast ductile iron per ASTM A-536.
- C. Flanges shall be color coded to identify general type of pipe (red for IPS size, Blue for ductile iron sizes, and gray for Cement sizes).
- D. Gasket shall be Buna N and NSF 61 rated with temperature range from -20 to 180 degrees F.
- E. The nuts and bolts shall be 304 SST.
- F. Coat fitting with fusion epoxy.
- G. Manufactured by Smith Blair Inc, model 441 Omni cast coupling, or equal.

2.7 PRESSURE GAUGES (PG)

- A. Liquid filled, glycerine or silicone.
- B. 2½- to 3½-inch dial, scale 20-50% greater than normal operating pressure, 270 degree movement.
- C. Stainless steel case and polycarbonate window.
- D. Provide gauges with Type 316 stainless steel socket and bellows or bourdon tube, depending on pressure range.
 - 1. Where the maximum pressure is less than or equal to 15 pounds per square inch the gauge shall use bellows as the measuring element.
 - 2. Where the maximum pressure is greater than 15 pounds per square inch, the measuring element shall be a bourdon tube.
- E. 2½ percent accuracy.
- F. ¼-inch NPT bottom connection.
- G. Mount gauges on diaphragm seals where indicated on the Drawings.
 - 1. Provide diaphragm seals with Type 316 stainless steel top housing, bottom housing, and bolt assemblies.
 - a. Bottom housing shall be fitted with a ¼-inch flushing connection.
 - b. This flushing connection shall be fitted with a Type 316 stainless steel close nipple and a brass shutoff cock.
 - c. Diaphragm Seal: Removable.

- 1) For pressure less than or equal to 15 pounds per square inch, provide a diaphragm seal.
 - 2) For pressures greater than 15 pounds per square inch, provide Type 316 stainless steel diaphragm seal.
- d. Fit diaphragm seal gauge assembly with a snubber.
 - e. Snubber shall have porous metal disc sized to dampen pressure fluctuations in the filled system.
 - f. Snubber shall be Stainless Steel.
 - g. Snubber filter disc shall be sized to prevent the gauge from pulsating.
 - h. Provide diaphragm seal gauge assemblies filled with silicone. Gauges used for chemical service shall utilize PTFE diaphragm seals and PVC gauge guard housings.
2. Pressure gauges, except gauges with diaphragm seals compatible with sewage service, shall have pulsation dampeners installed between the gauge and the shut-off valve.
 3. Pulsation Dampeners shall be Stainless Steel.

H. Annular Seal Pressure Sensors

1. Pressure Sensors are to be of the full flange design, to be retained between standard ANSI B16.1 Class 125/6.5 Class 150 pipeline flanges.
2. The outside diameter of the sensor shall match the outside diameter of the mating flange.
3. Sensor shall be flow through design with flexible elastomer sensing ring around the full circumference. The elastomer sensing ring shall be rigidly clamped between metal end cover flanges, and no part of the elastomeric sensing ring shall be exposed to the external face of the sensor. There shall be no dead ends or crevices and flow passage shall make the sensor self-cleaning.
4. The pressure sensing ring shall measure pressure for 360° around the full inside circumference of the pipeline. Flexible sensing ring shall have a cavity behind the ring filled with fluid to transfer pressure to the gauge.

I. Manufacturers

1. Pressure Gauges: One of the following or equal:
 - a. U.S. Gauge Division of Ametek, Inc. Solfrunt Gauges, Figure Number 1931T.
 - b. Dresser Industries, Inc., Ashcroft Figure Number 1379.
2. Diaphragm Seal: One of the following or equal:
 - a. For pressure less than or equal to 15 pounds per square inch:

- 1) Ashcroft, Type 301.
 - 2) Mansfield and Green, Type LG.
 - 3) For chemical service, Plast-O-Matic Series GGMT.
- b. For pressures greater than 15 pounds per square inch:
- 1) Ashcroft, Type 101.
 - 2) Mansfield and Green, Type RG.
 - 3) For chemical service, Plast-O-Matic Series GGMT.
3. Snubber: One of the following or equal:
- a. Chemiquip, Ashcroft
4. Pulsation Dampeners: One of the following or equal:
- a. Dresser Industries, Inc., Ashcroft Figure Number 1106S.
 - b. Operation and Maintenance Specialties, Charlotte, N. C., Ray Pressure Snubbers.
5. ¼-inch stainless steel cross handle cock, Ashcroft 7004; Marsh MFG, or equal.
6. Pressure Annual Seal
- a. Red Valve Series 40.
 - b. Ashcroft ISO-Ring.
 - c. Approved equal.

2.8 LINE SIZE PRESSURE SENSORS

- A. Full line size with flanged or threaded ends.
- B. Carbon steel body with flexible neoprene tube and liquid cavity.
- C. Rated at 200 psi with 2 percent accuracy.
- D. Gauge and liquid as specified in subsection 2.11 above.
- E. Red Valve Series 30 or 40, 500 No. Bell Ave., Carnegie, PA 15106; Ronningen-Petter “Iso-Spool” or “Iso-Ring”, Portage, MI 49081, or equal.

2.9 FLUSHING CONNECTION

- A. Cast bronze swivel inlet adapter, rocker lugs.

- B. 1-inch NPT inlet, hose thread outlet.
- C. DeSanno Foundry & Machine Co. No. 73, 1933 Peralta, Oakland, CA 94607; Champion No. 10, 1460 No. Naud St., Los Angeles, CA 90012, or equal.\

2.10 INDUSTRIAL HOSE

- A. Each hose valve shall be supplied with a coupled 50-foot long industrial hose.
- B. Hose shall be the same size (full line size) of hose valve, 1" or 1.5" diameter.
 - 1. Hose shall be oil resistant, reinforced two ply, modified nitrile tube and cover.
 - 2. Versigard synthetic rubber, RMA Class C. Reinforced with spiral synthetic yarn. Rated between -40 °F and 190 °F. Minimum pressure rating of 150 psi.
 - 3. Provided with threaded end connections and spray nozzle.
 - 4. GoodYear, Model 569-049 Sureline, or equal.

2.11 PIPELINE STRAINERS

- A. 2-inches and smaller
 - 1. Y-pattern.
 - 2. Bronze or cast iron body.
 - 3. 316 Stainless steel or monel screen, .045-inch perforations, 4 to 1 straining ratio.
 - 4. Muessco Model 11 or 351; Leslie Co., or equal.
- B. Grooved End Water Strainers
 - 1. 2-inch through 12 inch Y-type; 14 through 24 inch T-type.
 - 2. Ductile iron (Y-type) or factory-fabricated steel (T-type) body.
 - 3. 304 stainless steel frame and mesh basket.
 - 4. Coupled cover (through 12") or T-bolt hinged closure (14" through 24").
 - 5. Victaulic Company Style 732 and W730.
- C. Simplex Basket Style
 - 1. 8-inch flanged unless otherwise noted on the Drawings.
 - 2. Cast iron body.
 - 3. Stainless steel perforated screen, with a straining area at least 6 times the pipe cross sectional area, perforation size as noted on the Drawings.
 - 4. Quick open cover shall not require tools to remove the basket for cleaning.

5. Machined basket seats, Buna N seals.
6. Threaded drain, vent, and pressure taps as shown on the Drawings.
7. Eaton Hayward, Model 72, or equal.

2.12 MECHANICAL RUBBER SEAL

- A. Modular, mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and the wall opening.
- B. EPDM seal element suitable for service to 250 degrees F, except seal element shall be silicone or viton suitable for 300 degrees F for aeration piping.
- C. Composite pressure plates.
- D. 316 stainless steel nuts and bolts.
- E. Thunderline Link-Seal, or equal.
- F. All chemical feed seals shall be compatible with the chemicals to be used in the regular operation, maintenance, and cleaning of the feed system.

2.13 TAPPING SLEEVE

- A. Manufacturers: One of the following or equal.
 1. BTR Inc./Smith-Blair, Inc., Style 622 or 662.
 2. Romac Industries, Inc., Style FTS 420.
 3. Ford Metering Company, Model FTSC
- B. Material
 1. Tapping Sleeves: Steel construction, fusion bonded epoxy coating.
 2. Bolts and Nuts: Type 304 stainless steel.
 3. Nuts: Teflon coated.
 4. Gaskets: EPDM.
 5. Size of Tapped Boss: As indicated on the Drawings.

2.14 TAPPING VALVES

Tapping valve shall conform to AWWA C500. Tapping valves shall be manufactured by Mueller, or approved equal. Tapping valves shall have a Class 125, ANSI B16.1 inlet flange and a two inch (2") square wrench nut.

2.15 PIPE SADDLES

A. Manufacturers: One of the following or equal.

1. BTR Inc./Smith-Blair, Inc., Style 317
2. Romac Industries, Inc., Style 202S
3. Ford Metering Company, Model FC202

B. Materials:

1. Pipe Saddles: Ductile iron.
2. Straps, Bolts, and Nuts: Type 304 stainless steel with Teflon coating on nuts.
3. Gaskets: EPDM

2.16 LINE STOPPING

Where indicated on the drawings, provide tapping sleeve, tapping valve, and line stopping equipment to temporarily stop flow in pipe.

2.17 CORPORATION STOPS

In accordance with AWWA C 800.

A. Manufacturers: One of the following or equal.

1. Ford
2. Mueller Company

2.18 CURB STOPS

A. Manufacturers: One of the following or equal.

1. Ford
2. Mueller Company

B. Description: Round way solid tee head stops.

2.19 COCKS

- A. Gauge Cock:
 - 1. Manufacturers: One of the following or equal.
 - 2. Lunkenheimer Company, Figure 1178 or Figure 1180
- B. Air Cock:
 - 1. Manufacturers: One of the following or equal.
 - a. Whitey Research Tool Company, Model B-42S4
 - b. Hoke Inc., 7122G4B
- C. Plug Cock Manufacturers:
 - 1. One of the following or equal.
 - a. Lunkenheimer Company, Figure 454
- D. Plug Cock Design:
 - 1. Bronze, straightway pattern complete with lever.

2.20 TRENCH DRAIN (CAST-IN-PLACE TYPE)

- A. Description
 - 1. A system of pre-engineered components for forming concrete cast-in-place surface drainage trenches, catch basins and utility chases.
 - 2. System: consists of non-CFC expanded polystyrene (EPS) forms; embedded steel inlay rails; legs for alignment and float control; and grates with a non-rigid, longitudinal restrained, grate retention system.
- B. Components
 - 1. Forms
 - a. Forming System: Pre-manufactured using non-CFC EPS foam.
 - b. Forms: Pre-sloped or non-sloped form segments with 2.0 M (6.56 ft.) length standard and 1.0 M (3.28 ft.) or 0.5 M (1.64 ft.) lengths available.
 - c. Each segment is 305 mm (12 in.) wide trench with radius bottom and 356 mm (14 in.) grate seat width. Invert slope as shown on the Drawings.
 - 2. Rails

- a. Steel Components: Post fabrication hot dipped galvanized 50.8 mm x 50.8 mm x 4.76 mm (2.0 in. x 2.0 in. x 3/16 in.) A-36 steel angle rails. Rail length 2.0 M (6.56 ft.) standard with 1.0 M (3.28 ft.), and 0.5 M (1.64 ft.) long available.
 - b. No-float leg/alignment/grate retainer anchor lugs are located on 1.0 M (3.28 ft.) centers along the rails bisected by non-removable grate retaining/rail anchoring studs also on 1.0 M (3.28 ft.) centers.
 - c. Standard headed concrete anchors studs bisect these members providing a rail-anchoring device every 250 mm (9.84 in.).
 - d. Grate rails to provide a minimum of 1.25 square inches concrete bearing area per inch of trench length each side.
 - e. Grate retainers and rails to withstand the following loads:
 - 1) Vertical up – 1,000 lbs
 - 2) Transverse – 6,000 lbs
 - 3) Longitudinal – 6,000 lbs
 - f. Grate retainer performance is not to degrade with service loads or thermal cycling.
 - g. Galvanizing: ASTM A123-89a
 - h. Steel: ASTM A36/A36M-93a
3. Grates
- a. Ductile iron: ASTM A536-84 (1993).
 - b. Grates to have a minimum of 0.80 ft.²/L ft. open area and be flush with top of rails.
 - c. Grates to meet AASHTO M306-9 Grate/Manhole Proof Test.
4. Form Release: Non-petroleum based, which will not attack EPS.

C. Acceptable Manufacturers: Surface Drain System

- 1. Trench Former MD300: manufactured by
ABT Inc. P.O. Box 837, 259 Murdock Road
Troutman, NC 28166 (800) 438-6057

2.21 TRENCH DRAIN (PRECAST TYPE)

A. Trench Drain Channels

- 1. Trench drain channels shall be made of precast polymer concrete with radiused bottoms and nominal lengths of ½ or 1 meter. All channels shall interlock with tongue and groove connections with adjoining channels. Each channel shall have

horizontal anchoring ribs to mechanically lock the channel into the floor slab or pavement.

2. The 4-inch channels shall have available cut outs for 4-inch or 6-inch discharge and available 4-inch or 6-inch horizontal outlet end caps. Standard channels shall be a minimum 4-inches deep and shall have a built-in bottom slope of 0.6 percent. Piccolo trench drains shall be 2.70 inches deep with flat slope.
 3. The 8-inch channels shall have 4-inch or 6-inch horizontal outlet end caps. Standard channels shall be a minimum 9.5-inches deep and shall have a trapezoidal bottom.
- B. Channel Grates: Grates should be securely locked down with built-in channel lock blocks. Locking mechanism shall be designed so as to provide an obstruction-free trench for maintenance and cleaning as well as to prevent concrete from entering channels during installation.

Channel grates shall be installed as scheduled below:

1. Non-corrosive traffic* areas – Ductile iron, slotted, H2O rated.
2. Non-corrosive, pedestrian traffic - slotted, galvanized steel.
3. Corrosive traffic* areas - vinylester, slotted, load Class C.
4. Corrosive pedestrian traffic – vinylester slotted.

*Traffic includes fork lift travel.

Areas normally wet shall be considered corrosive areas.

- C. Catch Basins: Catch basins shall be precast polymer concrete with FRP grates. Any trench drains entering catch basins shall interlock fully with tongue and groove connections.
- D. Joint Sealers: To prevent leakage, joints between channels, catch basin connections, etc., shall be sealed with an adhesive recommended by the manufacturer.
- E. Manufacturer's: Trench drains shall be as manufactured by
1. ACO Polymer Products, Inc., Chagrin Falls, OH
 2. Polydrain ABT, Inc., Troutman, N.C.
 3. Or equal.

2.22 FLOOR DRAIN

- A. See Section 15400.

2.23 COATING SYSTEMS

- A. Application:
 - 1. Wedge and Wedge Assemblies, T-bolts, Bolts and Nuts:
 - a. Process through an iron-phosphate spray, rinse and drying in preparation for coating application.
 - b. The coating itself shall consist of two coats of liquid Xylan, with heat cure to follow each coat.
- B. Casting shall be surface pre-treated with an iron-phosphate spray, rinse, sealer before drying. The coating shall be electrostatically applied and heat cured. Coating shall be a polyester based powder to provide corrosion, impact and UV resistance.
- C. The coating system shall be EBAA Iron, Inc. Mega-Bond or approved equal.
- D. Where the coating systems of this section are utilized, no additional cathodic protection is required except for polyethylene encasement, which is required.

2.24 POLYETHYLENE ENCASEMENT

All buried metallic piping, specials, and fittings shall be polyethylene encased, double wrapped. 8 mils thickness, sized to pipe diameter, ANSI/AWWA-C105/A21.5. Ends taped off with vinyl pipe wrap tape 10-mil vinyl tape manufactured by Calpico Inc. (Calpico VI-10) or equal.

Polyethylene Encasement- "Clear" non-colored polyethylene film, in either tubular or sheet form. The polyethylene film shall have a minimum thickness of 8 mils and at no point shall not be less than 10 percent of the nominal thickness. Polyethylene film shall be manufactured from a Type 1, Class A raw polyethylene material conforming to "Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids" (ANSI/AWWA C-105/A21.5). Manufactured by Fee Spec's-LP378D Northtown, Fulton Enterprise Inc., Global Polymer Tech, Unisource, or equal.

PART 3 EXECUTION

3.1 FLEXIBLE COUPLINGS

- A. Install where shown on Drawings and where required for ease of installation or removal of pipe, subject to approval of Engineer.
- B. Pipelines 4 inches and larger extending from a concrete structure into earth shall have at least two flexible joints within 3 feet of the structure face.
- C. Provide tension assemblies as specified in subsection 2.05 of this Specification where necessary to prevent separation of pipe due to internal pressures.

3.2 GROOVED COUPLINGS AND FITTINGS

- A. Grooved systems may be used in lieu of flanged, welded or screwed joints for steel or cast pipe (grey or ductile) at Contractor's option, except for chemical service.
- B. Install per manufacturer's directions.
- C. The grooved coupling manufacturer's factory trained representative shall provide on-site training for contractor's field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the jobsite and review contractor is following best recommended practices in grooved product installation. (A distributor's representative is not considered qualified to conduct the training or jobsite visit(s).)

3.3 Hot Tapping

- A. Hot tapping piping is not permissible, unless approved by Engineer. If approved, tapping shall be done in accordance with American Petroleum Institute (API) recommended practice 2201.

END OF SECTION

SECTION 15094

HANGERS AND SUPPORTS

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of providing necessary materials and installation to properly support all pipe, electrical conduit, ductwork, miscellaneous hardware and their supporting foundation system. The final foundation design details shall be provided by the Contractor in a design-build format as described on the drawings and specification sections below.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 – Submittals
- B. Section 01610 – Seismic Design Criteria
- C. Section 01615 – Wind Design Criteria
- D. Section 02020 – Geotechnical Report
- E. Section 09900 – Painting and Finish Schedule
- F. Section 11010 - General Mechanical Equipment Provisions
- G. Section 14313 – Davit Crane
- H. Section 15010 - General Process and Onsite Piping Provisions

1.3 QUALITY ASSURANCE

Standards:

- A. AA - Aluminum Association
- B. AISC - American Institute of Steel Construction

- C. ASTM - American Society for Testing and Materials
- D. AWS - American Welding Society.

1.4 SUBMITTALS

- A. In accordance with Section 01300.
- B. Shop Drawings: Submit certified drawings showing all details of pipe, electrical conduit, ductwork and miscellaneous support devices. Shop drawings shall include all details of construction, anchor size, hanger rod sizes, bar sizes, weld sizes, mounting dimensions and overall space requirements.
 - 1. Submit manufacturer's literature to verify support of 5 times the weight or thrust of the piping without failure. Where standard tables are not available, provide calculations signed and stamped by a Civil or Structural Professional Engineer licensed to practice in the state where the project is located. All calculations shall be provided in English units.
 - 2. All exposed and above grade piping shall be vibrationally isolated and restrained by a Seismic Restraint System. Provide calculations in accordance with specification sections 01610, 01615 and 02020.
 - a. The Typical Details provided in the construction documents for supporting mechanical equipment, electrical equipment and distributed systems (i.e. piping, conduit, ducting, other) are to be used for general guidance, minimum requirements, and layout for support systems. Design for these support systems shall be provided in the submittal. The design shall include details and calculations stamped and signed by a Civil or Structural engineer registered in the State of California.
 - b. Submit layout drawing(s) showing where submitted supports will be used. Layout drawings shall document how the pipe support will be used to resist lateral loads, perpendicular and parallel to the pipe, the specific height and spacing in that area, where the support will connect to flanges (e.g. pipe friction cannot be used to resist lateral loads)- to ensure the calculated maximum loads/spacing provided are appropriate (and to ensure contractor is installing correct detail in appropriate location).
 - c. The Contractor shall provide shop drawings for foundation systems and above grade piping anchorage.
 - 3. Submit documents supporting manufacturer's published values (load capacities, max design loads, deflection from stress, etc.) in terms of how the values were obtained (independent testing laboratory, testing agency, or government agency).
- C. Manufacturer's Literature: Submit manufacturer's literature for all channels, clevis hooks, straps, hanger rod, anchors, fasteners, and related material used in the utility support systems.

PART 2 MATERIALS

2.1 HANGERS AND SUPPORTS

- A. Hangers and supports shall be factory fabricated units with published load limits and meet Manufacturer's Standardization Society of the Valve and Fittings Industry Standard Practice SP58.
- B. Provide hanger or support as indicated on drawings, or select an appropriate hanger or support as shown on the "PIPE SUPPORT DETAILS" Drawing.
- C. Hangers or supports shall be B-Line Systems, Inc.; Grinnell Corp., or equal.

2.2 FRAMING SUPPORT SYSTEMS

- A. As called out on the drawings and as required to provide adequate support, use framing systems as manufactured by B-Line Systems, Highland, IL 62249; Unistrut Corporation of Wayne, MI 48184; or equal.
- B. The load capacities of parts, connections and assemblies shall meet or exceed those published in the latest framing manufacturer's engineering catalog and supplementary bulletins.
- C. Unless otherwise noted on the drawings, all framing members and fittings in non-corrosive or dry areas shall be hot-dipped galvanized steel. Paint entire framing support system in accordance with specification section 09900. Nuts and screws shall be electro-galvanized. All painted channels and fittings shall be carefully cleaned and phosphated. Immediately after phosphating, a uniform coat of highly effective rust inhibiting acrylic enamel paint shall be applied by the electro-deposition process and thoroughly baked. Color shall be Unistrut "Perma-Green", B-Line "Dura-Green per Federal Standard 595a, color number 14109 (dark limit V-). The resulting finish will withstand 400 hours salt spray when tested in accordance with ASTM designation B-117.
- D. All framing members and fittings for humid, wet or corrosive areas shall be stainless steel or fiberglass. Cut ends of fiberglass shall be sealed per manufacturer's recommendations. Nuts and screws shall be stainless steel, fiberglass or nylon as approved by the Engineer.
- E. Continuous insert embedment channel shall be B-Line B52I; Unistrut P-3300 Series, Caine Strut No. C-3450/70, or equal.
- F. For stainless steel pipe, all pipe support materials, framing members, and fittings shall be stainless steel.

2.3 CABLE TRAYS

Shall be B-Line Series 444; Unistrut tray system 3L2 Series, Globetray HDS Series, in widths as shown on the Drawings and with 18-inch rung spacing. Tray shall be supported on six foot maximum centers and designed to support a safe uniform allowable load of 200 pounds per lineal foot. Side rails shall be 3- or 4-inch high, 0.0747" (14 gauge) galvanized steel.

2.4 MISCELLANEOUS METAL FABRICATIONS

As specified in Section 05500, all miscellaneous metals used for hangers and supports (in non-corrosive areas) shall be hot-dip galvanized in accordance with ASTM A123 and 304 stainless steel passivated (for corrosive and wet areas). Vent holes shall be provided in closed tube type members in an unobtrusive location as required to prevent any danger of explosion during the galvanizing process.

PART 3 EXECUTION

3.1 PIPE SUPPORTS AND HANGERS

A. General

1. Pipes and ductwork shall be supported as shown on the Drawings, otherwise use appropriate type of support.
 - a. The Typical Details provided in the construction documents for supporting mechanical equipment, electrical equipment and distributed systems (i.e. piping, conduit, ducting, other) are to be used for general guidance, minimum requirements, and layout for support systems. Design for these support systems shall be provided in the submittal. The design shall include details and calculations stamped and signed by a Civil or Structural engineer registered in the State of California.
 - b. Foundation design shall be per the 2019 California Building Code (CBC). See above references (Section 1.2) for additional design requirements. See Drawing Nos. S100 and S101 for additional design information. For bidding purposes, assume volume of concrete for 'TOP MAT FND' equals sixteen (16) cubic yards. For bidding purposes, assume the minimum reinforcing requirements are a concrete to reinforcing ratio equal to 0.005. In other words, for a fourteen inch (14") thick mat reinforcing spaced at twelve inches (12") would be required to be #6 @ 12" T&B EW.

For bidding purposes, assume four (4) construction joints.

Anchorage design. Foundation design (see above) must take into account anchorage design requirements.

Provide stamped, signed calculations and drawings, by a registered Civil or Structural Engineer in the State of California.

2. Supports shall be used to meet all criteria herein, regardless of whether or not indicated on the drawings. No pipe shall be left unsupported whenever a change in direction of line or flow takes place. At least one support shall be provided between every two couplings. Supports shall be provided for all valves, meters, or other metallic appurtenances.
3. Securely fasten all piping to building construction with approved hangers, supports, guides, anchors and sway braces to maintain pipe alignment and prevent sagging, noise and excessive strain due to uncontrolled movement under operating conditions.
4. Relocate any hangers as necessary to correct unsatisfactory conditions that may become evident when system is put into operation.
5. Supporting of piping by wire, rope, wood or other makeshift devices will not be permitted.
6. Burning of holes in beam flanges or narrow members will not be permitted.
7. All exposed and above grade piping shall be vibrationally isolated and restrained by a Seismic Restraint System. Provide stamped calculations in accordance with specification sections 01610, 01615 and 02020.
 - a. In addition to the above listed specification requirements, sway bracing of non-resiliently supported piping shall also be designed to ensure compliance with SMACNA Guidelines for Seismic Restraint of Mechanical Systems and fire protection piping per NFPA requirements.
 - b. Where supported by pipe hangers from the ceiling or where lateral displacement of pipe is probable, pipelines shall be seismically braced laterally at every 20 feet (minimum), and braced longitudinally and laterally every 40 feet (minimum) and at 90 degree bends. The minimum seismic bracing shall consist of 3/8-inch steel plate welded to pipe hanger, 1/2-inch diameter all threaded rod, 1/2-inch diameter flexible connector and eye rod inserted in the ceiling. Design shall be based on most restrictive requirement.
 - c. For above grade piping foundation system, see 1.b above.
8. Fasten hanger rods to structural steel members with suitable beam clamps.
9. Protect pipe insulation at every hanger, support or guide of insulated piping with inserts and shields.

B. Manifolding

1. Parallel runs of piping, except for fire protection piping may be supported on trapeze hangers, spaced as required for the smallest pipe carried.
2. Piping in chases shall be supported on channel framing.

3. Channel framing shall be selected to support 5 times the weight or thrust of the piping without failure in accordance with the manufacturer's standard ratings. Submit details for approval.
 - a. Where standard tables are not available, provide calculations signed and stamped by a Civil or Structural Professional Engineer licensed to practice in the state where the project is located. All calculations shall be provided in English units.

C. Support Hanger Spacing

1. Maximum spacing for horizontal piping supports shall be as follows:

Material	Size	Spacing
Steel Pipe and Stainless Steel Pipe	1" and smaller	5 feet
	1-1/4" to 2"	7 feet
	Larger than 2"	10 feet
Copper Pipe	1" and smaller	5 feet
	1-1/4" and larger	8 feet
PVC Pipe	1" and smaller	4 feet
	1-1/4" to 2"	4-1/2 feet
	2-1/2" to 3-1/2"	5 feet
	4" to 5"	6 feet
	6" and larger	7 feet
Ductile iron pipe	All sizes	8 feet

2. Where building structure does not permit the specified spacing the Contractor shall provide additional adequate support. Location and details shall be submitted for approval.

3.2 ELECTRICAL CONDUIT SUPPORT

See Division 16 for additional requirements, the most stringent of the listed spacing shall apply.

3.3 MISCELLANEOUS HARDWARE

Support as shown. When not shown, support as required to form a solid, rigid, strong installation satisfactory to the Engineer.

3.4 GALVANIZING TOUCH-UP

Cold Galvanize all field cut bare metal not designated to be painted.

END OF SECTION

SECTION 15100

VALVES

PART 1 GENERAL

1.1 DESCRIPTION

The work of this section consists of furnishing and installing valves used to throttle, isolate, and control flow in piping systems. The specification is broken into six basic valve types: general, water, wastewater/sludge, air, chemical, and specialty valves.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300: Submittals
- B. Section 15400: Plumbing
- C. Division 15: Piping Materials

1.3 QUALITY ASSURANCE

Reference, American Society for Testing and Materials (ASTM).

1.4 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01300.
- B. Materials list and catalog data sheets naming each product to be used identified by manufacturer and type number.
- C. Submit Operations and Maintenance Manuals for approval for all valves, in accordance with Section 01680.

PART 2 MATERIALS

2.1 VALVES - GENERAL

- A. All valve construction, materials, and pressure ratings shall be selected to suit the system in which installed. Pressure rating and manufacturer's name shall be cast on each valve body. Where specified, valves shall be supplied fully packed with Teflon impregnated packing. Where possible, valves shall be of one manufacturer.
- B. Stems of all bronze valves shall be silicon bronze or similar alloy to prevent de-zincification. Alloy shall have minimum tensile strength of 60,000 psi, minimum yield point of 24,000 psi per ASTM B584.
- C. Valves shall be furnished full line size unless specifically called out to be of reduced size. Flanges for valves may be raised or plain face. Flanges for valves for water working pressures of 175 psi or less shall be faced and drilled to 125 lb. standard dimensions.
- D. Within buildings, all isolation valves (SOV) 2" and smaller shall be 1/4 turn ball valves. SOVs 2-1/2" and larger shall be butterfly valves.
- E. Valves installed immediately adjacent to flanged equipment and flanged specialties shall be flanged, regardless of size.
- F. Valves in welded piping shall be flanged, regardless of size.
- G. Where valves are designed to have power operators, the operator shall be installed and tested at the factory prior to shipment to the job site.
- H. For project with larger than 12-inch diameter valves:
 - 1. Provide one portable mechanical valve operator (drill and tripod) for, per details below.
 - 2. Where valves over 12-inch diameter are required to be supplied with handwheel, provide spare AWWA 2-inch square operating nut with ground level position indication or weld nut directly to handwheel for use in conjunction mechanical valve operator.
- I. The naming of a manufacturer in this specification is not an indication that the manufacturer's standard equipment is acceptable in lieu of the specified component features. Naming is only an indication that the manufacturer may have the capability of engineering and supplying a system as specified.

2.2 VALVES FOR WATER SERVICE

A. BALL VALVES (PBV) AND (BV)

1. Standard ball valves are indicated by letters BV. These are to be in compliance with SST BV spec below. Alternative materials are only acceptable if specifically indicated on drawings, such as plastic ball valves (PBV) and shall be in compliance with spec below.
2. Plastic Ball Valves (PBV) - sizes 4-inches and smaller: true union design, PVC Type 1, Grade 1, Teflon seats and Viton or EPDM “O” rings, full ports, 150 psi at 73°F water. Valves used for sodium hypochlorite shall be suitable for this service (drilled or modified as needed). Hayward, Chemtrol TU series, Hills-McCanna “McCannaplast”, or equal.
3. Stainless steel Ball Valves (BV) - sizes 2” and smaller: shall have full ports and screwed ends. Stainless Steel body. TFE seats and seals. Type 316 stainless steel trim. Jamesbury; Hills-McCanna “McCannaflo”, Worcester, or equal.
4. Stainless steel Ball Valves (BV) Larger than 2”:
 - a. Ball: Full port, single piece, solid. Solid 316, or 17-4 PH stainless steel conforming to requirements of ASTM A 351 Grade CF8M, or ASTM A 351 Grade CB7CU.
 - b. Stem: Blow-out proof (when assembled) using T-shaped configuration for positive retention. 304, 316, or 17-4 PH stainless steel.
 - c. Body: Three-piece, vertically split, end entry. Cast 316 stainless steel conforming to requirements of ASTM A 351 Grade CF8M
 - d. Seat: Cartridge design consisting of a seat ring with reinforced teflon or PEEK seat insert, and body seal. Spring loaded seats to assure ball/seat contact at low pressure.
 - e. Stem Seat: Thrust washer packing ring, two-rings for tight seal.
 - f. Jamesbury; Hills-McCanna “McCannaflo”, Worcester, or equal.
5. Three-Way stainless steel Diversion Ball Valves (BV) – size 2” and smaller: shall have (bronze body, chrome plated, and) stainless steel body and ball, reinforced TFE seats and seals with blow-out proof stem design. Apollo series 700-640 (700-600 bronze); Watts B-6780-MI, Worcester, or equal.

2.3 VALVES FOR WASTEWATER

A. PLUG VALVES (PV)

1. General: Plug valves shall be of the non-lubricated, eccentric-type, rated for 200 psi working pressure for valves 12-inches and smaller for all valves

associated with the primary pump station and the force main. Valves on the primary pump station and force main shall be full port area and matching or exceeding the round geometry of the force main interior diameter. If full port area is less than 100 percent of the pipe flow area and geometry, oversize the valve one pipe size increment and include appropriate reducers and restraint. All other plug valves shall be of the non-lubricated, eccentric-type, rated for 150 psi working pressure (including the storage return pump valves and the throttling valve on the Equalization Tank outlet),

2. Connections: Screwed, flanged, grooved, or mechanical joint as shown on the drawings or required for the installation. Above grade valves 6-inch and larger shall be flanged, unless otherwise noted. Flanges shall be faced and drilled to the requirements of ANSI B16.1, Class 125.
3. Materials
 - a. Body: Cast iron, ASTM A126, Class B.
 - b. Seat: Welded, 90% pure nickel overlay (1/8-inch minimum).
 - c. Bearings: Type 316 stainless steel ASTM A743, permanently lubricated.
 - d. Plug: Cast iron, ASTM A126, Class B or ASTM A536 Grade 65-45-12.
 - e. Plug Facing: Chloroprene Neoprene, Acrylonitrile Butadiene Buna-N, or EPDM.
 - f. Shaft Seals: Shall be V-ring or U-cup packing that is either externally adjustable or self-adjusting.
4. Operators
 - a. Unless otherwise shown or required, operators on exposed valves shall have open and closed position stops, position indicator, type as follows:
 - 1) 3-inches and smaller: fixed lever
 - 2) 4-inches: lever on 2-inch square operating nut
 - 3) 6-inches and larger: enclosed worm gear with hand-wheel. Maximum 80 lb. rim pull to actuate the valve at its full bi-directional operating pressure.
 - 4) Chain-wheel actuators shall be provided where shown on drawings.
 - b. Unless otherwise shown or required, all buried valves shall have gear operators with 2-inch square nut inputs and shall be sealed against water intrusion. Exposed nuts and bolts on buried actuators shall be stainless steel. Buried valves shall have plugs that open upward. Where shown on the drawings, provide stem extension and above ground gear handwheel operator.
5. Primary pump station and force main plug valves shall be Milliken 611, Val-Matic Cam-Centric 100% with ductile iron for high pressure, or equal. All other

plug valves (including the storage return pump valves and the throttling valve on the Equalization Tank outlet) shall be DeZurik, or equal.

B. CHECK VALVES (CV), (PCV)

1. Swing Check Valves (CV) - 2½-inch and smaller: bronze, screwed cap, bronze disc, Y-pattern, 200 psi working pressure, screwed ends. Crane Co. No. 37; Stockham B-319, or equal. Solder ends: Stockham B-309. Flanged ends: Stockham G-931
2. Swing Check Valves (CV) - 3-inch and larger:
 - a. General: Swing check valves shall be non-slam variety, rated for sewage service, 200 psi working pressure, and equipped with outside lever and weight. Valves shall have lever on side of valve with adjustable counter-weight and be equipped with an oil cushion cylinder to assist with closing of valve slowly. Oil discharge from cylinder shall be adjustable to help reduce surge transients. Provide primary control for discharge of oil from cylinder with optional secondary internal cushion adjustment to provide additional control over last 10-20% of disc travel. Provide hydrostatic test results to demonstrate zero leakage at maximum working pressure. Provide fusion bonded epoxy or powder coating/lining on body.
 - b. Connections: Flanged (flanges to mate to ANSI B16.1, Class 125 bolt pattern.)
 - c. Materials:
 - 1) Body: Cast iron, ASTM A126, Class B
 - 2) Disc: Cast iron, ASTM A126, Class B
 - 3) Cover: Steel plate, ASTM A36
 - 4) Steel hinge shaft: Type 303 stainless steel
 - 5) Body seat: Type 316 stainless steel for 12-inch and smaller and bronze for valves larger than 12-inch.
 - 6) Renewable Seat: Composition, Thiokol
 - d. Coating: Fusion bonded epoxy.
3. Swing check valves shall be Apco/DeZurik Model CVS 6000, GA Model 25-DXH, or equal.

C. BUTTERFLY VALVES (BFV) sizes less than 3 inches

1. 200 psi wog, full lug style, iron body, field replaceable EPDM seat, 416 stainless steel stem, aluminum bronze disc, or nylon coated ductile iron disc, no painting of disc to stem connections 12" and under, 2" through 6" - lever lock operated: Stockham, or Bray Series 31.

D. AIR VALVES FOR WASTEWATER SERVICE

1. General:
 - a. Air valves shall be of the size shown on the drawings with flanged or screwed ends to suit the installation as shown on the drawings. Valves shall be fabricated stainless steel, cast iron body. Valves shall be designed for working pressure of 150 psi unless noted otherwise. Valve seals shall be suitable for the pressure range. All valves that are scheduled on less than 50 psi pipelines shall have soft seats and valves that are on over 50 psi pipelines shall have standard seats, to minimize leaking.
 - b. Where shown on the Drawings, air pollution control barrels shall be provided at each sewage air release valve location. Unless otherwise indicated on the Drawings, the air purification absorbers shall provide at least a max recommended flow rate of 100 CFM, contain at least 150 lbs of virgin, high activity, activated carbon, and include a removable lid. The media removal capacity must be guaranteed to achieve H₂S removal with an outlet concentration less than 0.25 ppm (with an average inlet concentration of 200 ppm). The barrels shall be the General Carbon Corporation Model: The General (55 Gallon), or equal.
2. Sewage Air Release Valves (SARV): Valves shall be designed to vent accumulating air while the system is in operation and under pressure. Valve shall be fabricated of stainless steel. A.R.I. Model D-020, or equal.
3. Sewage Air and Vacuum Valve (SAVV): Valves shall be designed to pass large quantities of air either out of or into the pipeline during filling or draining operations.
4. Combination Sewage Air Valve (SCAV): Valve shall perform both as an air release valve and as an air and vacuum valve as described above. The valves shall provide controlled venting to prevent water hammer and surges in the pipelines
 - a. The SCAV valves shall be stainless steel or ductile body, and shall be threaded-end (NPT) for 3" or less as noted on the Drawings. The internal float, stem, and spring mechanism shall be stainless steel the upper float shall be polypropylene with reinforced nylon-EPDM-SST plug assembly. Valve shall be suited for continuous operation in sewage applications with a duration of 6 months or longer between required cleanings. For 2" and smaller A.R.I Model D-026, as shown on the drawings, or equal. Provide necessary isolation valves and fittings for flushing with clean water and draining the valves for maintenance purposes. Provide a vent cap with insect screen mounted to top of vacuum valve.
5. Manufacturer: A.R.I., Vent-o-mat; or equal.

E. PRESSURE REDUCING VALVES (PRV) (Solenoid Controlled)

1. General: Pressure reducing valve shall be a hydraulically operated, diaphragm actuated, wye pattern and shall maintain a constant downstream pressure regardless of the inlet pressure variations. A two way solenoid will override the pressure reducing function to close the main valve when the solenoid is de-energized. The entire actuator assembly consisting of the main valve cover, diaphragm, washer plates, stem, bearing, main valve spring and shut-off plate, must be removable as a unit for ease of maintenance. The stainless steel stem shall be guided in the center for a minimum of 100% of the stem travel. The bronze housed stem bearing shall have a replaceable, reinforced teflon insert.
2. Materials
 - a. Body and Cover: Cast Iron, ASTM A48-64
 - b. Seat Ring: Stainless Steel, 303, ASTM A296-55
 - c. Stem: Stainless Steel Polished
 - d. Bearing: Forged Brass, ASTM B124
 - e. Diaphragm: BUNA-N
 - f. Tubing: Copper Tube, ASTM B75
 - g. Coating: Corrosion Resistant Paint (Section 09900)
3. Valve and Accessories: The pilot control system shall be supplied with inlet and outlet isolation valves, an inlet wye strainer, and a valve position indicator. The seat passageway shall be unobstructed and shall not contain spokes or webs to interfere with fluid flow. The pressure reducing pilot valve shall be adjustable, bronze bodied, direct acting, spring loaded and normally open. Valve ends shall be screwed or flanged as shown on the drawings. NEMA classifications detailed on the drawings.
4. Manufacturer: The valve shall be the Ames model A910-15; CLA-VAL 93-01, or equal.

F. GATE VALVES (GV)

1. Manufacturer Design (3 – 12 inch): Use of an OS&Y or NRS (exposed) or NRS (buried), full port, designed for 250 psi working pressure, suitable for activated sludge, return activated sludge, and municipal sewage sludge for on-off service. Valve shall also comply with AWWA C509 Resilient-Seated Gate Valves for Water Supply Service.
2. Manufacturer Design (14 - 24 inch): Use of a NRS, full port, with bonded SBR ductile iron gate, designed for 200 psi working pressure, suitable for activated sludge, return activated sludge, and municipal sewage sludge for on-off service. Valve shall also comply with AWWA C509 Resilient-Seated Gate Valves for Water Supply Service.

3. Connections: Flanged, with CL-150 ANSI B16.1 bolt pattern.
4. Materials:
 - a. Body: Cast Iron ASTM A126.
 - b. Gate: Cast Iron
 - c. Seat: Styrene Butadiene Rubber (SBR)
 - d. Stem: Forged bronze
 - e. Stem O Ring: Rubber
 - f. Hand Wheel: Cast Iron (exposed)
5. Coatings: Fusion bonded epoxy on both interior and exterior surfaces
6. Manufacturer shall be DeZurik, Mueller, American Flow Control, or equal.

2.4 VALVES FOR CHEMICAL SERVICE

All valves for the Chemical Feed System shall be in accordance with specification section 13322.

2.5 SPECIALTY VALVES

A. FLOOR DRAINS

1. See Section 15400.

B. CLEANOUT

1. See Section 15400.

2.6 VALVE ACCESSORIES

A. VALVE BOXES (VB)

1. Inside dimension of concrete box shall accommodate valve body with a minimum of 4-inches clear on all sides of valve.
2. Cast iron face and traffic weight lid, labeled for service used.
3. Brooks 3RT; Christy G5, or equal.

PART 3 EXECUTION

3.1 GENERAL

All valves and gates shall be installed in the manner and location shown on the plans and in strict accordance with manufacturer's recommendations.

3.2 BURIED

- A. Buried valves with operating nuts shall be provided with covered valve boxes at grade. Where operating nut would otherwise be more than 30-inches below grade, stem extensions shall be provided to bring operating nut 6 to 12 inches below grade.
- B. Buried valves shall be coated with Polyamidoamine or Protective Coal Tar coating per Section 09900. All buried nuts, bolts, and washers shall be Type 316 stainless steel.

3.3 PLUG VALVES

Unless otherwise approved by the Engineer, plug valves shall be installed with shaft horizontal, seat upstream and plug opening upward.

3.4 HOSE VALVES

Hose valves shall be installed in locations shown on the plans. Unless otherwise dimensioned, hose valves set adjacent to structures shall be located three inches from the wall of the structure. Hose valve outlets shall face away from the structures. Hose valves on the potable water system shall have vacuum breakers.

END OF SECTION

SECTION 15110

FIBER CONDUIT AND RELATED INFRASTRUCTURE (FOR FUTURE FIBER ALONG THE PIPE ROUTE)

1.0 General Description

These Technical Specifications described below set forth the minimum requirements for the quantity and quality of work to be provided hereunder. The items to be purchased shall meet or exceed the specifications attached hereto. As used herein, the term "work" refers to the articles, equipment, materials, supplies and labor as specified, designated or otherwise required by the specifications. Additional terms, conditions and requirements pertaining to the methods and manner of performing the work are described elsewhere in the specifications.

Except where specified to the contrary herein, all work shall be new and shall be supplied with the equipment and accessories indicated as standard equipment in manufacturer's published descriptions, owner's manuals, and other literature for said work. No advantage shall be taken by the bidder in omitting any unspecified minor article that goes into making the unit complete.

2.0 Scope

Contractor shall place Three (3) 1-1/4 inch conduits underground a distance of approximately 34,200 horizontal feet extending from San Juan Highway/First Street to the east end of the 42-inch casing pipe on the Hollister WWTP site. Contractor shall provide and install pull boxes where necessary due to change of direction, and at regular intervals of 500 lineal feet maximum. Contractor shall use secure and weatherproof materials and methods. Conduit routing shown on site plans is the desired route - Contractor shall determine ideal routing for the conduit to best avoid existing utilities and conditions as approved by the engineer. Pull boxes shown on site plans are minimum desired quantity and locations — Contractor shall determine total number of pull boxes that are needed and include in the bid.

3.0 Standards

3.1 Materials

a. Conduit shall be three (3) 1-1/4 inch diameter HDPE, smooth wall, schedule 40, with one copier detection wire integral to the wall of one of the ducts or otherwise attached to one duct. Each conduit shall be a different color. A pull rope shall be installed in each conduit.

c. Pull boxes shall be N40 by Christy with N4OT lids and B40X10 Extensions suitable for conduit depth shown in drawings. Pull boxes shall be H20 traffic rated.

- d. Underground fiber enclosures will be required for junction splices in pull boxes. Use 3M 2178 Series Inline enclosure or equivalent.
- f. All locations will require splice boxes, splice boxes shall be Aria Dual Door AWM wall-mount or equal.

3.2 Approved Equals

Request for approved equals shall be supported by complete technical documentation which shall include descriptive literature, pictures of the proposed equal, and instructions for operations.

4.0 Submittals

Bidder shall:

- Submit manufacturer's statement of certification that materials meet or exceed these specifications.
- Submit brochures of proposed equipment.
- Submit drawing of proposed installation showing key components.

5.0 Delivery and Storage

Delivery and storage of all equipment and materials shall be the responsibility of the contractor.

6.0 Installation

6.1 Installation in Streets, Right-of-Way, open field

- a. Conduit infrastructure shall be placed within the vehicular Right-of-Way and shall not be placed under curb, gutter, or sidewalk except where running perpendicular to curb, gutter or sidewalk.
- b. minimum depth coverage shall be 24 inches from finished surface. Contractor shall install conduits at depths necessary to clear all utilities and obstructions.
- c. Warning tape is required at all trenches, however slurry is not required when trenching in unimproved surfaces.
- d. Final asphalt restoration may be completed when enough work has accumulated to make the process more efficient or as directed By the City. Roadways must be fully open to traffic at the end of each work day and temporary repairs must be safe at all times.

7.0 Warranty

Contractor shall warrant all work and materials for a period of one (1) year from project completion unless otherwise specified.

8.0 Products

Fiber optic cable conduits and all associated materials, labor and hardware, as specified herein in these plans and specifications.

SECTION 15142

WALL PIPES, SEEP RINGS, AND PENETRATIONS

PART 1 GENERAL

1.1 DESCRIPTION

This section includes materials, installation, and testing of steel and cast-iron wall pipes and sleeves (including wall collars and seepage rings), and penetrations.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 - Submittals
- B. Section 03100 - Concrete
- C. Section 09900 - Painting and Finish Schedule
- D. Section 15010 - General Process Piping Provisions

1.3 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01300.
- B. Submit detail drawings for fabricated steel or cast-iron wall and floor pipes and sleeves, wall flanges, seep rings, and sealing materials. Show dimensions and wall thicknesses.
- C. Show flange sizes and the appropriate ANSI or AWWA flange dimensional standard where flanged end wall pipes or penetrations are used.
- D. List coating systems to be applied, manufacturer, and dry thickness of coatings. Call out coatings where coatings are to be applied.
- E. List materials of construction, with ASTM material reference and grade.

- F. Submit manufacturer's instructions for installing rubber annular hydrostatic sealing devices.
- G. Submit six copies of the results of the leakage test for cast-iron sleeves having shrink-fit steel collars or collar halves bottomed in a groove and steel sleeves having welded steel collars.

PART 2 MATERIALS

2.1 GENERAL

- A. Use either cast-iron or fabricated steel wall sleeves when containing rubber annular hydrostatic sealing devices through which piping passes. Use only cast-iron penetrations and anchors when connecting to cast-iron and ductile-iron pipe. Use only fabricated steel penetrations and anchors when connecting to steel pipe.
- B. Cast-iron flanges shall conform to ANSI B16.1, Class 125 or 250, to match the flange on the connecting pipe.
- C. Steel flanges shall conform to AWWA C207, Class D. Flanges shall be flat face. Flanges shall match the flange on the connecting pipe.
- D. Gaskets for flanges shall be as specified in the detail piping specification.
- E. Bolts and nuts for flanges shall be as specified in the detail piping specifications with the following additions: buried or submerged service shall be 316 stainless steel, exposed service shall be galvanized.

2.2 CAST-IRON WALL FLANGES, ANCHORS, AND SLEEVES

- A. Provide cast- or ductile-iron wall pipes with ends as shown in the drawings for connection to adjacent PVC and ductile-iron pipe, or for containing pipes where they pass through concrete walls, ceilings, and floor slabs. Provide seepage ring on wall pipes and sleeves passing through concrete walls and slabs which are to be watertight. Locate collars such that the collar is at the center of the wall or floor slab, unless otherwise shown in the drawings.
- B. Wall pipes and sleeves shall be of the following types:
 - 1. Pipe or sleeve with integrally cast seep ring.
 - 2. Pipe or sleeve with steel collar halves bottomed in a groove provided in the pipe or sleeve.

3. Minimum wall thickness for pipes and sleeves having integrally cast seep rings shall be as shown in the following table:

Pipe or Sleeve Size (inches)	Minimum Wall Thickness (inches)
3	0.48
4	0.52
6	0.55
8	0.60
10	0.68
12	0.75
14	0.66
16	0.70
18	0.75
20	0.80
24 or greater	0.89

- C. Minimum wall thickness of pipes or sleeves having shrink-fit collars shall be Class 52. Cut shrink-fit collars from a 1/4-inch-thick steel ring. Attach the collar to a cast-iron pipe or sleeve by heating the steel collar and allowing it to shrink over the pipe at the necessary location. Provide an epoxy bond (Keysite 740 or 742 or Scotchkote 302) between the pipe and collar. Sandblast the area of the pipe to be epoxy coated per SSPC SP-10.
- D. Wall pipes or sleeves having steel collar halves bottomed in a groove shall be ductile iron Class 54 minimum unless otherwise shown. Wall flanges shall consist of 1/4-inch-thick steel seep ring halves for pipes through 24-inch and 3/8-inch-thick halves for pipe 30 inches and larger, bottomed in a groove provided on the pipe. The pipe groove shall be machine cut to a depth of 1/16 to 5/64 inch to provide a press fit for the seep ring. Seep ring halves shall be welded together after fit into groove but shall not be welded to pipe. Seep rings shall be sealed completely around the pipe with silicon sealant manufactured by Dow-Corning No. 790, General Electric Silpruf, or equal.
- E. The material used in cast- or ductile-iron wall flanges, wall sleeves, and wall penetrations shall conform to ASTM A 395, A 436, A 536, A 48 (Class 35), or A 126 (Class B).
- F. Pressure test at least one of each size of cast-iron pipes or sleeves having shrink-fit steel collars or collar halves installed in a groove in the pipe at the place of fabrication to demonstrate watertightness of the seal between the collar and the sleeve. The test shall be at a pressure of 20 psig for four hours duration and shall show zero leakage.

2.3 FABRICATED STEEL WALL FLANGES, ANCHORS, AND SLEEVES

- A. Provide fabricated steel wall pipes and sleeves with ends as shown in the drawings for connection to adjacent steel or concrete pipes, or for containing pipes, where they pass through concrete walls. Provide seepage ring or wall flange on wall pipes and sleeves passing through concrete walls and slabs which are to be watertight. Wall thickness shall be the same as the pipe wall thickness when connecting to steel pipe. Minimum wall thickness for sleeves containing pipes shall be standard weight per ANSI B36.10 for sleeves 72 inches and smaller and 1/2-inch for sleeves greater than 72 inches through 96 inches.
- B. Wall flanges shall be in the form of a steel wall collar welded to the steel sleeve or penetration. Cut welded wall collars from a 1/4-inch steel ring. Attach the collar to a steel wall pipe or sleeve with full circle, 3/16-inch fillet welds. Welding procedures shall be in accordance with ANSI B31.3, Chapter V.
- C. Steel pipe used in fabricating wall sleeves containing pipes shall comply with ASTI4 53 (Type E or 5), Grade B; ASTI4 A 135, Grade B; ASTM A139, Grade B; or API 5L or 5LX. Wall pipes connecting to steel pipe shall be of the same material as the connecting pipe. Wall collar material shall comply with ASTM A105, A181, or A182.
- D. Pressure test at least one of each size of fabricated steel wall sleeve or penetration and collar assemblies at the place of fabrication to demonstrate watertightness of the seal between the collar and the sleeve. The test shall be at a pressure of 20 psig for four hours duration and shall show zero leakage.

2.4 RUBBER ANNULAR HYDROSTATIC SEALING DEVICES

- A. Rubber annular hydrostatic sealing devices shall be of the modular mechanical type, utilizing interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe sleeve and the passing pipe. Assemble links to form a continuous rubber belt around the pipe, with a pressure plate under each bolthead and nut.
- B. Materials of construction shall be as follows:

Compound	Material
Pressure Plate	Carbon
Bolts and Nuts for Links	Zinc Phosphated Carbon Steel (exposed service) 316 Stainless Steel (submerged or buried)
Sealing Element	EPDM Rubber

- C. The size of the wall sleeve needed to accommodate the passing pipe shall be as recommended by the rubber annular seal manufacturer.

- D. Provide centering blocks in 25% of the sealing elements on pipelines larger than 12 inches in diameter.
- E. The rubber annular hydrostatic sealing devices shall be Link Seal as manufactured by Thunderline Corporation or equal.

2.5 BOLTS AND NUTS FOR FLANGED-END WALL PIPES

Use bolts and nuts as specified for the piping connected to the wall pipe. See Section 15010.

2.6 POLYETHYLENE FOAM FILLER FOR PIPE PENETRATIONS

Packing foam shall be an extruded closed-cell polyethylene foam rod, such as Minicel backer rod, manufactured by Industrial Systems Department, Plastic Products Group of Hercules, Inc., Middletown, Delaware; Ethafoam, as manufactured by Dow Chemical Company, Midland, Michigan; or equal. The rod shall be 1/2 inch larger in diameter than the annular space.

2.7 PAINTING AND COATING

- A. Coat penetrations and sleeves exposed, above ground, or in vaults and structures in accordance with Section 09900, Systems A or D unless fusion-bonded epoxy coatings are shown in the drawings or specified elsewhere.
- B. Coat submerged sleeves and penetrations per Section 09900, System A unless fusion-bonded epoxy coatings are shown in the drawings or specified elsewhere.
- C. Coat buried sleeves and penetrations with fusion-bonded epoxy in accordance with Section 09900.

PART 3 EXECUTION

3.1 LOCATION OF PIPES AND SLEEVES

- A. Provide a wall or floor pipe where shown in the drawings and wherever piping passes through walls or floors of tanks or channels in which the water surface is above the pipe penetration.
- B. Provide a floor sleeve where shown in the drawings and wherever plastic pipe, steel, or stainless-steel pipe 3 inches and smaller or stainless steel or copper tubing passes through a floor or slab. Provide a rubber annular sealing device in the annular space between the sleeve and the passing pipe or tubing.

- C. Provide wall sleeves where shown in the drawings and wherever plastic pipe, steel or stainless-steel pipe 3 inches and smaller, or stainless-steel or copper tubing passes through a wall. Provide a single rubber annular seal when the wall is 8 inches thick or less. Provide two rubber annular seals (one at each end of the sleeve) when the wall is more than 8 inches thick. Pack the annular space with polyethylene foam filler and fill the ends of the penetration with 2 inches of elastomeric sealant on both sides of the structure.
- D. Where sleeves are installed in which water or soil is on one or both sides of the channel or wall, provide two rubber annular seals (one at each end of the sleeve).
- E. Where pipes pass through walls or slabs and no sleeves or wall or floor pipe with seep ring is provided, pack the annular space with polyethylene foam filler and fill the ends of the penetration with 2 inches of elastomeric sealant on both sides of the structure.

3.2 INSTALLATION IN EXISTING CONCRETE WALLS AND SLABS

Core drill holes 2 inches larger in diameter than the diameter of the wall flange or collar. Install wall pipe and collar assembly axially aligned with the piping to which it will be connected or will contain. Pack the void space between the sleeve and concrete with grout. See Section 03100 for grouting specification.

3.3 INSTALLATION IN NEW CONCRETE WALLS AND SLABS

Install wall pipes and sleeves in walls before placing concrete. Do not allow any portion of the pipe or sleeve to touch any of the reinforcing steel. Install wall pipe or sleeve and collar assembly axially aligned with the piping to which it will be attached or will contain. Provide supports to prevent the pipe or sleeve from displacing or deforming while the concrete is being poured and is curing.

3.4 INSTALLATION IN DRY FLOORS AND SLABS

Install pipe sleeves and spools in concrete floors and slabs which do not have water over them such that the sleeve or pipe extends from the bottom of the floor or slab to 2 inches above the floor or slab unless shown otherwise in the drawings.

3.5 INSTALLATION OF WALL PIPES HAVING FLANGED END CONNECTIONS

- A. Check alignment before grouting in place or pouring concrete. Realign if the sleeve is not properly aligned.
- B. Install flanged end wall sleeves or penetrations with bolt holes of the end flanges straddling the horizontal and vertical centerlines of the sleeve.

C. Lubricate flange bolts with oil and graphite prior to installation.

3.6 QUALIFICATIONS OF WELDERS

Welder qualifications shall be in accordance with AWS B2.1.

3.7 INSTALLATION OF RUBBER ANNULAR HYDROSTATIC SEALING DEVICES

Install in accordance with the manufacturer's instructions.

3.8 FIELD TESTING

Check each wall penetration for leakage at the time the hydraulic structure is tested for leakage; see Section 03100. Penetrations shall show zero visible leakage.

END OF SECTION

SECTION 15400

PLUMBING

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Plumbing Fixtures
- B. Plumbing Specialties
- C. Plumbing Equipment

1.2 RELATED SECTIONS

- A. Section 01300 – Submittals
- B. Section 11604 – Safety Equipment

1.3 REFERENCES

- A. National Electrical Manufacturers Association (NEMA).
- B. Plumbing and Drainage Institute (PDI).
- C. International Association of Plumbing and Mechanical Officials:
- D. Uniform Plumbing Code (UPC)

1.4 SYSTEM DESCRIPTION

System Requirements:

- A. Includes in plumbing system fixtures; vent, drain, and water piping; connections; cleanouts; fittings, accessories and testing for complete and functional system.

- B. Except in details, piping is indicated on the Drawings in diagrammatic form. Sizes and locations are indicated on the Drawings, however, not every offset and fitting, nor every structural difficulty that will be encountered in the Work has been indicated.
- C. As part of the Work, modify piping alignment indicated on the Drawings as necessary to avoid structural or mechanical obstructions and to clear the work of other trades.
- D. Furnish such parts and pieces necessary to provide a complete and operational system.

1.5 QUALITY ASSURANCE

Regulatory Requirements:

- A. Perform work under this Section in accordance with the Uniform Plumbing code issued by the International Association of Plumbing and Mechanical Officials, and in accordance with applicable laws and regulations, including requirements for accessibility, energy, water conservation, and health including related requirements for water fountains and coolers.
- B. Where provisions specified in these Specifications or the design indicated on the Drawings are in conflict with the Uniform Plumbing Code or laws or regulations, the code and the laws or regulations take precedence over the specified provisions and design.

1.6 MANUFACTURES

The plumbing equipment schedules are shown on the drawings. The following is a list of additional equipment approved for use on this project:

- A. Lavatories, Water Closets, Urinals, Showers: Eljer, American Standard, Kohler, Crane/UR
- B. Shower Valves: Symmons, Powers, Moen, Bradley
- C. Thermostatic Mixing Valves: Symmons, Powers, Leonard, Lawler
- D. Sink: Eljer, Kohler American Standard, Crane, Just, Elkay, Designers Choice
- E. Electric Water Cooler: Haws, Halsey Taylor, Oasis, Sunroc, Elkay
- F. Roof Drain, Floor Drain, Sanitary Floor Drain, Wall Carriers, Cleanouts, Water Hammer Arrestors: Josam, J.R. Smith, Ancon, Rockford, Wade, Zurn, Watts
- G. Water Heaters: Rheem/Ruud, Morflo/American, Lochinvar, A.O. Smith, Precision, Teledyne Laars, Weben-Jarco, Bock, Bradford White, State.

- H. Faucets: Symmons, Delta, Chicago Faucet Co., T&S Brass and Bronze Works, Cambridge Brass, Powers, Bradley, Kohler, Sloan
- I. Flush Valves: Zurn, Sloan
- J. Pumps: Grundfos, Hydromatic, Paco, Bell & Gosset, Amtrol, Armstrong, Taco
- K. Expansion Tanks: Amtrol, Watts, John Wood Co. (ASME ONLY)
- L. Trap and Supplies: McGuire, Brass Craft, Eastman, CS&B
- M. Water Closet Seats: Church, Bemis, Olsonite.
- N. Trap Primer Valves: Precision Plumbing Products, Mifab
- O. Shower Enclosures: Aqua Glass, Lasco, Aqua Bath, Crane, Fiat
- P. Emergency Fixtures: Haws, Bradley, Chicago, Encon
- Q. Flexible Gas Connections: Dormont, T&S Brass and Bronze Works
- R. Insulation Kits (for P-traps and supplies): Truebro, McGuire, Plumberex
- S. Hosebibbs: Chicago, Woodford, Mifab, Nibco
- T. Wall Hydrants: Woodford, Wade, Zurn
- U. Neutralization Tanks: Orion, Schott, Nalgene, Enfield
- V. Laboratory Turrets, Faucets: Chicago Faucet Co., T&S Brass and Bronze Works, Cambridge Brass, Orion (DI water only)
- W. Wash Sink: Bradley model WF2503
- X. Electric Water Heater: Eemax Model EX 180

1.7 SUBMITTALS

Also refer to Section 01300. Before beginning work, provide shop drawings on the following items:

- A. Plumbing Fixtures

- B. Drains
- C. Pumps
- D. Storage Tanks
- E. Plumbing Specialties
- F. Other items as directed by the Owner

PART 2 MATERIALS

2.1 MATERIALS

- A. General: Manufactured Units: Fixture fittings and piping which are exposed shall be heavy-duty chrome.
- B. Accessories:
 - 1. Stops:
 - a. Fixtures, except showers, shall have stops at the fixtures' service.
 - b. Stops shall be chrome-plated straight pattern compression stops or chrome-plated angle pattern compression stops.
 - 2. Drain Piping and fittings:
 - a. Per specification section 15010.

2.2 PLUMBING FIXTURES AND DEVICES

- A. General: Furnish and install all plumbing fixtures as indicated below. All fixtures shall be white and be of the same manufacturer unless otherwise noted. All fixtures to have accessible stops and all faucets shall have renewable seats, discs, and metal indexed handles. All fixture trim shall be chrome plated and by the same manufacturer unless otherwise noted.
- B. Cleanouts:
 - 1. Floor cleanouts (FCO) in finished floors shall be Wade W-6000-Z series with nickel bronze cover and frame, adjustable top, and tapered bronze plug. Cleanouts in concrete floors shall be provided with standard tractor type covers. Cleanouts in carpeted areas shall be provided with carpet flange top. Cleanouts in tile floors shall be provided with square or round tops for tile or terrazzo as required.

2. Wall cleanouts (WCO) shall be Wade W-8560-E series with 8480-R. Cast iron tee with countersunk brass plug drilled for cover screw and round stainless steel access cover.
 3. Exterior Floor Cleanouts (FCO) in Unfinished Floor Areas: Same as floor cleanouts specified for finished areas, except heavy-duty scoriated cast-iron top suitable for heavy traffic conditions.
 - a. Manufacturers (one of the following or equal):
 - 1) Josam Company, 56040-5.
 - 2) Zurn Industries Inc., Z-1400-HD.
 4. Yard Cleanouts (YCO) in Asphalt or Ground Areas: Floor cleanouts in unfinished floor areas specified before, for encasement in a concrete pad as indicated on the Drawings and flush with grade.
 5. Provide membrane clamps for cleanouts installed in surfaces have waterproofing membranes installed.
- C. Fixture Specifications: Certain fixtures for process areas are specified below. Also refer to the fixture schedules on the plans for additional fixtures required for non-process areas of the project.
1. Water Closet (Chemical Building): Kohler "Highcliff" Model #K-4368, 1.6 gallon per flush 17-1/2" high vitreous china siphon jet, elongated water closet with 1-1/2" top spud and bolt caps.
 2. Seat: Church Model #9500 SSC white heavy duty solid high impact plastic elongated open front seat less cover complete with #3145 stainless steel hinge posts with combination self-sustaining and concealed check.
 3. Flush Valve: Sloan Royal Model #111 exposed closet flush valve, chrome plated with metal oscillating non-hold-open ADA compliant handle, dual filtered bypass, 1" I.P.S. screw driver Bak-Chek angle stop with free spinning vandal resistant cap, sweat solder adapter with cast set screw wall flange, adjustable tailpiece, high back pressure vacuum breaker flush connection and spud coupling for 1-1/2" top spud with wall and spud flanges. 1.6 gallon flush.
- D. Floor Drains in Non-Process Areas and Buildings: Wade Series Model #W-1100-STD " size as indicated on the drawings, outlet cast iron floor drain with flange, integral reversible clamping collar, seepage openings, and adjustable 6" round nickel bronze strainer with vandal resistant screws. Provide deep seal trap (p-trap) and trap primer connection.
- E. Sanitary Floor Drain: Wade Model #W-9142, 12" x 12" x 8" cast iron sanitary floor drain with A.R.E. (acid resisting enamel) interior, aluminum dome strainer or flat strainer with funnel (for equipment drains), seepage flange, and nickel bronze hinged top. Provide deep seal trap (p-trap) and trap primer connection (suffix -6). Provide 3/4 grate (suffix -16) or as specified on drawings.

- F. Floor Drains and Equipment Drains in Process Areas or Buildings:
1. Equipment and Floor Drains: Provide with adjustable strainer head, floor level grate, 4-inch diameter funnel extension and provided with no-hub outlet and nickel bronze top.
 - a. Manufacturers (one of the following or equal):
 - 1) Josam Company, 30000-A, combination drip drain, less clamping collar.
 - 2) Zurn Industries Inc., ZN-415 strainer.
 2. Funnel Extension:
 - a. Manufacturers (one of the following or equal):
 - 1) Josam Company, E-2.
 - 2) Zurn Industries Inc., Zn-238.
 3. Other floor drains with no-hub outlet and nickel bronze Type B strainer:
 - a. Manufacturers (one of the following or equal):
 - 1) Josam Company, 30000-A universal floor drain with adjustable strainer, less clamping collar.
 - 2) Zurn Industries, Inc., ZN-415.
- G. Strainers with 3-inch drains shall be 6-inch diameter, and strainers with 4-inch drains shall be 8-inch diameter.
- H. Heavy-Duty Floor Drains with Sedimentation Bucket:
1. 12-inches square with coated cast-iron body, grate, and slotted sediment bucket.
 - a. Manufacturers (one of the following or equal):
 - 1) Josam Company, 35570.
 - 2) Zurn Industries Inc., ZN-610.
- I. Floor Sinks for Indirect Wastes:
1. Full, half, or quarter grate, 12-inches square by 6-inches deep, acid resisting enamel interior and exterior, no-hub outlet, pipe size as indicated on the Drawings.
 - a. Manufacturers (one of the following or equal):
 - 1) Josam Company, 49030.
 - 2) Zurn Industries Inc., ZN-345-6.

- J. Trap Primer Valve (TPV-1): Precision Plumbing Products Model #PR-500 "Prime Rite" brass automatic drip trap primer valve with 1/2" NPT connections. Note: Maximum four floor drain traps per valve.
- K. Roof Drain (RD): Wade Model #W-3000-42-52-53 cast iron roof drain with flange, flashing ring with gravel stop and cast iron mushroom dome, provide optional deck clamp and bearing pan. (Provide extension as required to accommodate roof thickness.)
- L. Overflow Roof Drain (ORD): Same as R.D. except Wade Model #W-3000-D-42-52-53 with 2" solid dam.
- M. Sink Hose Bibb (all other hose bib see specification section 15100): Chicago Faucet Co. Model #387 polished chrome plated 3/4" with vandal proof lock shield removable tee handle and Chicago model #E27 vacuum breaker.
- N. Wall Hydrant Type Hose Bibb (all other hose bib see specification section 15100): Zurn Model #Z-1350-5-12, 3/4" anti-siphon moderate climate narrow wall hydrant with stainless steel box and cover with bronze body, top inlet connection, cylinder lock, and integral backflow preventer. Note: this fixture requires a minimum 4" wall.
- O. Thermostatic Mixing Valve TMV-1 (Without Cabinet): Symmons "Tempcontrol" Model #5-400A-P-W-RC 3/4" inlets, 1" outlet mixing valve with check stops, removable cartridge with strainer, stainless steel piston, liquid fill thermal motor with bellows, volume control shut off valve, dial thermometer and all fittings and unions. Provide polish chrome finish, wall mounting bracket and spare cartridges for un-interrupted service. 20 GPM at 5 psi pressure drop.
- P. Eyewash: Per Section 11604.
- Q. Wash Sink For Process Areas: Bradley model WF2503, 36" semi-circular, off line vent with supplies from below, standard height, foot control valve, manual mixing valve, metal clad liquid soap dispenser, terreon bowl, soap stone gray, paper towel dispenser.
- R. Sample Sink For Process Areas: Floor Mounted Service Sink: 20" by 24", 4 support legs, White color and resistant to fading and abrasion. Sink shall have 1.5 inch drain opening. Manufactured by Florestone Products Inc, or equal. Provide faucet that delivers 0.5 gpm; JR Smith, Zurn, or equal.

2.3 PLUMBING SPECIALTIES

- A. All water heaters shall be equipped with self-closing temperature and pressure relief valves. Approved manufacturers: Watts, Conbraco, Wilkins.
- B. All water heaters shall be provided with a thermometer.

- C. Water hammer arrestors shall be all stainless steel construction, bellows assembly type. Bellows shall be nested and welded. Unit shall be tested and certified in accordance with PDI-WH201 and by A.S.S.E. to Standard 1010.
- D. Trap primer valves shall be equivalent to Precision Plumbing Products Model #PR-500 with distribution unit as required.
- E. Expansion tanks shall have a steel outer shell, pre-charged air chamber with standard air valve, stainless steel system connection, heavy-duty butyl diaphragm and rigid polypropylene liner.

PART 3 EXECUTION

3.1 GENERAL

All changes in the plumbing work made after letting of the contract, in order to comply with the applicable codes or requirements of the plumbing inspectors, Health inspectors, Utility Regulatory Agency and similar shall be made without additional cost to the Owner.

Should the Plumbing Contractor or any of the Subcontractors perform any work that does not comply with the requirements of the applicable Building Codes, State Laws, Local Ordinances and Industry Standards, he shall bear all costs arising in correcting the deficiencies, as approved by the Engineer.

3.2 PREPARATION

- A. Rough-in fixtures and accessories in accordance with the dimensions supplied by the manufacturers of the fixtures.
- B. General:
 - 1. Mount fixtures and accessories without cutting of finish surface.
 - 2. Make cross connections between piping for domestic water supply and piping for contaminated sources only by means of appropriate connection devices that prevent backflow from the contaminated sources to the domestic water supply.

Provide connection devices approved by the Public Health authorities having jurisdiction over the Work.
 - 3. Conceal plumbing piping unless otherwise indicated on the Drawings or specified in the Specifications.
 - 4. Furnish and install vents required in drainage piping as part of the plumbing system, in accordance with Laws and Regulations.

5. Insulate hot water piping.
- C. Piping:
1. In accordance with specification section 15010.
 2. Encase in concrete underground piping under structures.
 3. Support aboveground horizontal piping at not more than 5 foot spacing.
 4. Above Ground Vertical Piping:
 - a. Install vertical piping in chases in the wall where the wall is plastered; where the wall is not plastered, vertical piping may be installed in chases in the wall or may be run exposed.
 - b. Support vertical pipes at the base and at each floor.
 5. Fittings:
 - a. Make junctions with sanitary tees or with wyes, with brass screw plug cleanouts at accessible locations at changes in direction.
 - b. Make changes in pipe size with reducing fittings.
 - c. Make changes in direction by use of 45 degree wyes, half wyes, long sweep ¼ bends, 1/5, 1/6 1//8, or 1/16 bends, except that sanitary tees may be used on vertical stacks; short ¼ bends or elbows 3-inches in size or larger may be used on drain or waste lines where the change in direction of flow is from horizontal to vertical, and on the discharge from water closets.
 - d. Cleanouts: Same size as the pipe, except that cleanout plugs larger than 4-inches will not be required.
- D. Plumbing Piping Accessories:
1. Provide cleanouts of the same size as the size of the waste and drain piping on which cleanouts are installed, up to 4-inches in diameter. Provide cleanouts 4-inches in diameter on waste and drain piping larger than 4-inches diameter.
 2. Provide traps at all fixture and equipment connections to the sanitary drainage system. Install traps as near to the fixtures as possible.
 3. Sizes of equipment drains and of floor drains shall be as indicated on the Drawings.
 4. When indicated on the Drawings, cut holes in heavy-duty floor drain grate for a drain pipe from equipment or other source.

3.3 FIELD QUALITY CONTROL

- A. Test lines as specified and in accordance with Uniform Plumbing Code.

- B. Test water piping with water under a pressure of 100 pounds per square inch.
- C. Repair and correct defective work disclosed by testing. Repeat testing until defective work is corrected.

3.4 CLEANING

Flush piping and leave clean, as required by Public Health authorities having jurisdiction over the Work.

3.5 INSTALLATION

- A. Secure each water line where it penetrates partitions to serve fixtures, shower arms, hose bibbs and similar items. Wrap all piping in block walls or penetrating concrete with 10 mil polyethylene tape or covering with polysleeve.
- B. Set hose bibbs 18 inches above finished grade, unless otherwise indicated. Adjust height as required to line-up bottom or top edge of wall hydrants with masonry seams where applicable. Grout water-tight any wall penetrations with non-shrinking grout. Wall hydrants shall be installed level and square with face flush with finished wall face. Thoroughly clean after installation.
- C. Seal fixtures to walls, floors, and counters using a sanitary type, one part, mildew resistant white 100% silicone sealant.
- D. Cleanouts shall be installed in accessible locations. Wall cleanout access covers shall be installed above bottom course of tile when installed in tiled walls. Floor and ground cleanouts shall be installed with covers set flush to finished grade or floor.
- E. During construction, floor drains, fixtures, and equipment shall be provided with adequate protection against damage and sealed against entrance of construction debris. Floors shall not be washed into floor drains as part of the construction clean-up process.

3.6 PLUMBING SPECIALTY INSTALLATION

- A. Extend discharge of temperature and pressure relief valve full size to daylight with elbow down between 6" and 18" above finished grade or as indicated on plans.
- B. Temperature and pressure relief valves shall be installed such that the sensing element is within 6" of the high water level of the tank. Extend discharge of temperature and pressure relief valve full size to daylight with elbow down between 6" and 18" above finished grade or as indicated on plans.

- C. Install each thermometer in a 304 stainless steel bimetal type thermowell with the entire sensing element in the flow of water and a min. pipe size of 1-1/4" for entire length of element. Provide extension necks for insulation piping. Operating ranges shall be selected to assure nominal temperature readings at the midpoint thereof.
- D. Provide a water hammer arrestor on all cold water lines serving fixtures using flush valves, solenoid valves or quick closing devices, sized in accordance with P.D.I. Standard WH-201 for the total number of fixtures served. Provide access door as required.
- E. Provide trap primers on floor drains where noted with approved trap primer valve connections. Provide ball valve for isolation of trap primer valve. Provide access doors as required. When possible, trap primer valves shall be located behind the same access panel as shock absorber. Install trap seal primer valves with valve outlet piping pitched down toward drain trap a minimum of 1/8" inch per foot (1 percent) and connect to floor drain body, trap, or inlet fitting.
- F. Provide an expansion tank sized in accordance with manufacturer's recommendations for all hot water heating vessels which store hot water.

3.7 FLASHINGS

- A. All vent stacks passing through the roof shall be flashed with 4 lb. per square foot lead sheets extending around the pipe 8" in all directions at the roof surface and turned down 2" into the pipe opening.
- B. Provide 4 lb. per square foot lead sheets for all roof drains and overflow roof drains (minimum 24" x 24" cut for drain and clamped at collar). Coordinate installation with roofer.

END OF SECTION

SECTION 16010
GENERAL ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.1 DESCRIPTION

Work included:

- A. Materials, installation and testing of the electrical system.

1.2 RELATED WORK

- A. Section 01010: General Construction Information and Requirements
- B. Section 01300: Submittals.
- C. Section 01680: Operation and Maintenance Manuals

1.3 REGULATORY AGENCIES AND STANDARDS

- A. Regulatory Agencies: Installation, materials, equipment and workmanship shall conform to the latest provisions of the following agencies:
 - 1. National Fire Protection Association (NFPA) Standard 70 - National Electrical Code (NEC).
 - 2. Occupational Safety and Health Act (OSHA).
 - 3. California Building Code (CBC).
 - 4. Local authorities having lawful jurisdiction pertaining to the work required.
 - 5. California Code of Regulations (CCR), Title 24, Part 3, California Electrical Code (CEC).
- B. Underwriters' Laboratories, Inc. (UL): Materials, appliances, equipment and devices shall conform to the applicable UL standards.
- C. Standards: Where referenced in these specifications or on the drawings, the publications and standards of the following organizations apply:
 - 1. American Society of Testing and Materials (ASTM).

2. National Electrical Manufacturers Association (NEMA).
3. National Fire Protection Association (NFPA).
4. American National Standards Institute (ANSI).
5. Institute of Electrical and Electronics Engineers (IEEE).
6. Insulated Cable Engineers Association (ICEA).
7. Association of Edison Illuminating Companies (AEIC).
8. American Association of State Highway and Transportation Officials (AASHTO).

1.4 PERMANENT UTILITY COMPANY REQUIREMENTS AND FEES

- A. There are no utility company interfaces, requirements, or fees.

1.5 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01300.

1.6 OPERATION AND MAINTENANCE MANUALS

- A. Submit operation and maintenance manuals in accordance with Section 01680.

1.7 RECORD DRAWINGS

- A. During progress of job, keep up-to-date, one set of electrical drawings stamped with "As-Built". Show the following by dimension from readily obtained base lines.
 1. Exact location, type and function of concealed control equipment and devices.
 2. Exact size, elevations and locations of underground conduits.
 3. Show the dimensions, location and routing of electrical work which will become permanently concealed.
 4. Show complete routing and sizing of any revisions to the systems shown.
 5. Color coding of each individual control conductor.
- B. Maintain "As-Built" drawings in an up-to-date fashion in conjunction with the actual progress of installation. The as-built drawings shall be a full sized set of drawings marked to reflect deviations, modifications and changes. Keep the as-built drawings at the project site and updated daily.

- C. At completion of project, deliver completed one set of "As-Built" drawings to the Owner's Representative. If, upon review, the as-built drawings are found to contain errors and/or omissions, they will be returned to the contractor for correction. The Contractor shall correct and return the as-built drawings to the Owner for approval within ten calendar days from the time the drawings are returned to the Contractor.

1.8 MANUFACTURER'S SERVICES

Where individual specification sections require manufacturer's services, provide a qualified individual that is directly employed by the manufacturer or system integrator to perform these services. Sales representatives, contractors, distributors, independent parties, etc., are not acceptable to provide manufacturer's services and shall not be used.

PART 2 MATERIALS

2.1 GENERAL

- A. Similar materials and equipment shall be the product of a single manufacturer.
- B. Provide and install equipment and materials shown on the drawings and as specified unless noted as "Not in Contract", "Future" or as "Existing to Remain". Any work shown on the plans and not in the specifications, or vice versa, shall be provided and installed as if indicated in both. Provide only products which are new, undamaged and in the original cartons or containers.
- C. Materials and equipment shall be the standard products of manufacturers regularly engaged in the production of such material and shall be the manufacturer's current design. Items shall essentially duplicate equipment that has been in satisfactory use at least two years prior to bid opening.
- D. Materials and equipment shall be suitable for storage, installation and operation in an ambient of 0°C to 40°C up to an elevation of 3,300 feet above sea level, except where more stringent conditions are stated in individual equipment specifications.
- E. Factory finished electrical equipment, wireways and panels with manufacturer's standard primer and enamel topcoats, unless stated otherwise in the individual equipment specifications. Provide 1 pint of the equipment manufacturer's touch-up paint per 500 square feet of painted surface for repair of damaged enamel topcoats.

2.2 TESTING LABORATORY APPROVALS

- A. Electrical equipment (overall assemblies), materials and devices shall be listed, certified or found acceptable by an OSHA certified Nationally Recognized Testing Laboratory.

Results of tests and inspections by the testing laboratory shall be submitted for review and approval to the local authorities having jurisdiction upon request. In testing the equipment, the following shall be considered:

1. Suitability for installation and use in conformity with the provisions of the NEC.
 2. Mechanical strength and durability, including, for parts designed to enclose and protect other equipment, the adequacy of the protection thus provided.
 3. Wire bending and connection space.
 4. Electrical insulation.
 5. Heating effects under normal conditions of use and also under abnormal conditions likely to arise in service.
 6. Arcing effects.
 7. Classification by type, size, voltage, current capacity and specific use.
 8. Other factors which contribute to the practical safeguarding of persons using or likely to come in contact with the equipment.
- B. Recognized testing laboratories are as follows:
1. Underwriters Laboratories, Inc. (UL).
 2. Electrical Testing Laboratories (ETL).
 3. Other testing laboratories certified by OSHA as a Nationally Recognized Testing Laboratory (NRTL).
- C. Provide the testing laboratory label on equipment material and devices.

2.3 WARRANTY

Equipment materials and installation shall be guaranteed for a period of one year after the date of acceptance of the work by the Owner. Repair or remove and replace any and all work that is found to be defective in workmanship and/or materials within said one year periods, without expense whatsoever to the Owner, ordinary wear and tear and unusual abuse or neglect excepted.

PART 3 EXECUTION

3.1 INSTALLATION

- A. At equipment, terminate wires and cables at the proper termination point per the manufacturer's recommendations. The drawings indicate connections for typical equipment only. If the equipment or connections are different from what is shown, provide the

modifications necessary for a safe and properly operating installation in accordance with the equipment manufacturer's recommendations.

- B. The drawings diagrammatically indicate the desired location and arrangement of outlets, conduit runs, equipment and other items. Field determine and coordinate exact location based on physical size and arrangement of equipment, finished elevations and obstructions.
- C. Work or equipment not indicated or specified which is necessary for the complete and proper operation of the Electrical systems shall be accomplished without additional cost to the Owner.
- D. Install equipment and materials per the manufacturer's recommendations.
- E. Install equipment and devices level and plumb.
- F. Should Contractor feel there is a need to deviate from the electrical drawings and specifications, submit written details and reasons to the Owner's Representative for review prior to making any deviation.

3.2 ADJUSTMENTS AND TOUCH-UPS

- A. Prior to energizing equipment, verify and ensure that all connections and terminations are correct for proper operation. Prior to energizing, make any corrections required for proper operation.
- B. Operating mechanisms, door latches, and other movable components shall be adjusted so mechanical movement is free and correct.
- C. Touch up all finished surfaces that are scratched or marred to match the original surface.

3.3 INSPECTION AND TESTING

- A. Refer to Section 16030 for additional requirements.

3.4 EQUIPMENT CLEANING

Prior to testing and energizing, thoroughly clean the exterior and interior of all equipment and enclosures including device boxes, switchboards, switchgear, devices, pullboxes, junction boxes, panelboards, motor control centers, light fixtures, underground pull boxes, manholes, etc. Vacuum the interior to remove all debris, dust, scrap wire and wrappings. After vacuuming, remove remaining dust with a dry, lint-free cloth.

- A. Do not use compressed air to blow out debris, as this is likely to spread contamination.

3.5 OPERATIONAL TESTS

After energization of equipment, verify that all circuit breakers, protective and control devices function properly. Perform required adjustments to obtain correct operation.

3.6 NAMEPLATES

- A. Provide nameplates on equipment, devices, panels and field mounted instruments (pressure switches, limit switches, etc.) to identify each item with its respective service or function. Use black-on-white laminated plastic (white lettering on black background), with beveled edges and engraved lettering not less than 1/4 inch high unless otherwise noted. Attach with 1/4-inch-long No. 4 Phillips, round head, coarse thread, Type 410 stainless steel, thread-cutting screws with blunt point unless otherwise specified. For exterior nameplates, provide silicon seal for screw penetrations. For cast iron enclosures mount nameplates with Seton Tuff-Bond #TB2 adhesive.
- B. Provide nameplates for internal devices of equipment (control relays, contactors, timers, terminal blocks, etc.). Mount nameplates adjacent to, not on, the device.
- C. Provide nameplates for field mounted devices and instruments, such as pressure switches, limit switches, flow meters, etc. Identify the name of the device and its unique identifier:

Examples:	Pressure Switch	Limit Switch
	PS-1	LS-1

- 1. Where it is impractical to attach laminated nameplates to field devices, provide 19 gauge, 2 inch square brass tags with 1/4 inch black filled engraving. Provide Seton Standard Brass Valve tags or equivalent. Attach tags with No. 16 brass jack chain.
- D. Provide single, dedicated nameplates for devices mounted within and on equipment. Provide as a minimum a single dedicated nameplate for each device (relay, switch, terminal block, meter, etc.). Nameplate shall agree with identification on manufacturer's drawing. On devices mounted in front compartment doors, provide each device with two nameplates, one on the front and one on the back of the front compartment door. The nameplates mounted on the back of the door shall be stick-on type.

3.7 REMOVAL OR RELOCATION OF MATERIALS AND EQUIPMENT

- A. Unless otherwise noted, remove existing electrical materials and equipment from areas indicated for demolition or where equipment is relocated. Remove materials no longer used, such as studs, straps and conduits. Remove or cut off concealed or embedded conduit, boxes, or other materials and equipment to a point at least 3/4 inch below the final finished surface. Remove existing unused wires. Where anchor bolts cannot be physically removed, cut or torch off as much as possible, and grind down remaining portion flush and smooth with existing surface.

- B. Repair affected surfaces to conform to the type, quality and finish of the surrounding surface.

3.8 DETERMINATION OF UNDERGROUND CONDUIT AND UTILITIES LOCATIONS

Locations of existing underground conduits shown on the drawings have not been verified. A minimum of 30 days prior to excavations, determine underground conduit and utility locations and buried depths for existing underground utilities and conduits shown on the drawings.

END OF SECTION

SECTION 16011
POWER SYSTEM ANALYSIS

PART 1 GENERAL

1.1 DESCRIPTION

Work included:

- A. Work in this section includes providing a Power System Analysis for the electrical distribution system. The analysis shall include a Short Circuit Study, Protective Device Evaluation, Protective Device Coordination Study and an Arc Flash Hazard Analysis Study for both the Normal and Emergency power systems.
- B. The contractor shall provide short circuit and arc flash studies for the generator providing power with no utility power being available.
- C. The contractor shall provide short circuit and arc flash studies for the utility providing power for their reported available fault current.
- D. The contractor shall provide protective device coordination studies and equipment and protective device short circuit rating adequacy tabulations for the utility providing power for the utility reported available fault current for the complete facility.
- E. The contractor shall provide protective device coordination studies for the generator providing power to the complete facility.

1.2 REGULATORY AGENCIES AND STANDARDS

Power System Analysis shall conform to the latest provisions of the following agencies:

- A. American National Standards Institute (ANSI):
 - 1. ANSI Standard Z535 – Series of Standards for Safety Signs & Tags
- B. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - 1. IEEE Standard 141 – Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems.
 - 2. IEEE Standard 242 - Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.

3. IEEE Standard 399 – Recommended Practice for Industrial and Commercial Power System Analysis.
 4. IEEE Standard 1584 - Guide for Performing Arc-Flash Hazard Calculations .
- C. National Fire Protection Association (NFPA)
1. NFPA 70 - National Electrical Code, latest edition
 2. NFPA 70E – Standard for Electrical Safety in the Workplace.

1.3 SUBMITTALS

- A. Submit Power System Analysis in accordance with Sections 01300 and 16010.
- B. Submit a preliminary report for review and approval as part of the distribution equipment shop drawing submittal and/or prior to the release of equipment drawings for manufacturing. If formal completion of the studies may cause delay in equipment manufacturing, approval from the Engineer may be obtained for preliminary submittal of sufficient study data to ensure that the selection of devices and protection characteristics will be satisfactory.
- C. Include the following sections in the report:
1. Executive summary of the results of the Short Circuit, Protective Device Evaluation, and Protective Device Coordination Studies.
 2. Descriptions, purpose, basis and scope of the power system analysis.
 3. One-line diagram showing switchgear, switchboard, and panelboard busses with protective devices name and rating, circuits cable size and length, transformers kVA, voltage, and impedance rating, motors HP rating, generator kW rating, and any other associated electrical distribution system equipment and devices as shown on contract drawing one-line diagrams.
 4. Short circuit calculations including input and output data including a definition of terms and guide for interpretation of the computer printout.
 5. Table comparing the calculated short circuit and equipment withstand rating.
 6. Protective device time versus current coordination (TCC) curves with associated one line diagram identifying the plotted devices with proposed settings on industry standard graph paper or computer generated graphs.
 7. Summary table of distribution equipment with protective device manufacturer, model, functions and trip settings derived from the TCC curves.
 8. Arc Flash Hazard Analysis with incident energy and arc flash protection boundary calculations.
 9. Four printed facsimile of arc flash hazard warning labels.

10. Comments and recommendations for system improvements, where needed.
- D. Update the preliminary report at the end of construction to account for any and all changes made during the course of the project. Incorporate feeder lengths, equipment modifications, actual overcurrent protective device settings, etc. into the final report. The final report is intended to be an accurate, “as-built”, representation of the final installation. The final report will be reviewed, and it will be returned as “Revise and Resubmit” where any instances of apparent discrepancies between the actual installation and the data provided in the report are found.
 - E. In addition to the hard copies of the report, include a USB flash drive containing the PDF version of the report . Submit the final report a minimum of six (6) weeks prior to request for substantial completion. After review and approval by the Engineer and Owner Representative, Contractor shall furnish and install the Arc Flash Hazard warning stickers on the electrical equipment prior to final inspection.

1.4 ELECTRONIC SUBMITTALS

- A. For both preliminary and final report submissions, provide a full electronic copy of the system model. Include with the model a copy of any device libraries utilized within the model. Furnish the study model complete with all study scenarios, operating configurations, etc.
- B. After final acceptance, submit the final study model and any associated device libraries. The Owner will retain all rights and privileges with respect to the use of the study model.

1.5 QUALIFICATIONS

- A. The Short Circuit, Protective Device Coordination and Arc Flash Hazard Analysis studies shall be conducted under the supervision and approval of a California Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies. The Registered Professional Electrical Engineer shall be a full-time employee of a firm that provides electrical engineering services.
- B. Include the electrical engineering services organization and registered engineer’s qualifications in the report submittals.

1.6 CLOSEOUT SUBMITTALS

Provide a table of the final protective device settings for inclusion in the Operation and Maintenance Manuals.

PART 2 MATERIALS

2.1 COMPUTER SOFTWARE

Power System Analysis studies shall utilize the following commercially available computer software programs or approved equivalent:

- A. Power*Tools, SKM Systems Analysis, Inc.
- B. EasyPower, ESA International LLC.
- C. Paladin Designbase, Power Analytics Corporation.
- D. ETAP, Operation Technology, Inc.

2.2 COMPUTER SOFTWARE PROGRAM REQUIREMENTS

- A. Comply with IEEE 399.
- B. Analytical features of fault-current-study computer software program shall include "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.
- C. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.
 - 1. Optional Features:
 - a. Arcing faults.
 - b. Simultaneous faults.
 - c. Explicit negative sequence.
 - d. Mutual coupling in zero sequence.

PART 3 EXECUTION

3.1 STUDY SCOPE

The Short Circuit, Protective Device Coordination and Arc Flash Hazard Analysis studies shall begin at the utility company's feeder protective device to the main switchgear or switchboard and include all electrical equipment and protective devices down to and including all feeder circuit breakers and motor starters in the motor control centers and power distribution panelboards as shown on the contract drawing one-line diagrams. Normal and Emergency power system

connections and those which result in maximum fault condition shall be adequately covered in the study.

3.2 DATA COLLECTION

- A. Contractor shall furnish all field data as required for the Power System Analysis studies. The individual performing the Short Circuit, Protective Device Coordination and Arc Flash Hazard Analysis studies shall furnish the Contractor with a listing of required data immediately after award of the contract. The Contractor shall expedite collection of the data to eliminate unnecessary delays and assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to the release of the equipment for manufacturing.
- B. Source combination may include present and future utility supplies, motors, and generators.
- C. Load data utilized may include existing and proposed loads obtained from contract documents provided by Contractor.
- D. Include fault contribution of existing motors in the study if shown on one-line diagrams. The Contractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.

3.3 SHORT-CIRCUIT AND PROTECTIVE DEVICE EVALUATION STUDY

- A. Use actual conductor impedances if known. If unknown, use typical conductor impedances based on the latest edition of IEEE 141.
- B. Transformer design impedances and standard X/R ratios shall be used when test values are not available.
- C. Provide the following:
 - 1. Calculation methods and assumptions.
 - 2. Selected base per unit quantities.
 - 3. One-line diagram of the system being evaluated with available fault at each bus and interrupting rating of devices noted.
 - 4. Source impedance data, including electric utility system and motor fault contribution characteristics.
 - 5. Typical calculations.
 - 6. Tables of calculated quantities.
 - 7. Results, conclusions, and recommendations.

- D. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each:
 - 1. Electric utility's supply termination point.
 - 2. Incoming switchgear.
 - 3. Unit substation primary and secondary terminals.
 - 4. Low voltage switchgear.
 - 5. Switchboards
 - 6. Motor control centers.
 - 7. Standby generators and automatic transfer switches.
 - 8. Panelboards.
 - 9. All items shown on the contract drawing one-line diagrams.
 - 10. Other significant locations throughout the system.
- E. For grounded systems, provide a bolted line-to-ground fault current study for areas as defined for the three-phase bolted fault short-circuit study.
- F. Protective Device Evaluation:
 - 1. Evaluate equipment and protective devices and compare to short circuit ratings.
 - 2. Adequacy of equipment bus bracing to withstand short-circuit stresses.
 - 3. Adequacy of transformer windings to withstand short-circuit stresses.
 - 4. Cable and busway sizes for ability to withstand short-circuit heating.
 - 5. Notify Engineer and Owner in writing, of existing, circuit protective devices improperly rated for the calculated available fault current.

3.4 PROTECTIVE DEVICE COORDINATION STUDY

- A. Proposed protective device coordination time-current curves shall be graphically displayed on log-log scale paper.
- B. Include on each curve sheet a complete title and one-line diagram with legend identifying the specific portion of the system covered.
- C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which device is exposed.

- D. Identify device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
- E. Plot the following characteristics on the curve sheets, where applicable:
 - 1. Electric utility's protective device.
 - 2. Medium voltage equipment relays.
 - 3. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
 - 4. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands.
 - 5. Transformer full-load current, magnetizing inrush current, and ANSI transformer withstand parameters.
 - 6. Conductor damage curves.
 - 7. Ground fault protective devices, as applicable.
 - 8. Pertinent motor starting characteristics and motor damage points.
 - 9. Pertinent generator short-circuit decrement curve and generator damage point.
 - 10. Other system load protective devices for branch and feeder circuit breakers in each motor control center.
 - 11. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.
 - 12. Provide selective coordination of emergency system(s) overcurrent devices with all supply side overcurrent protective devices.

3.5 ARC FLASH HAZARD ANALYSIS

- A. Perform the Arc Flash Hazard Analysis in accordance with IEEE 1584 and NFPA70E based upon results from the Short Circuit Current Study and overcurrent device settings provided in the Protective Device Coordination Study. Alternative methods shall be presented for approval in the preliminary study submittal.
- B. Include in the Arc-Flash Hazard Analysis all locations covered in the Short Circuit Current and Protective Device Coordination studies.
- C. Calculate the flash protection boundary and the incident energy at all locations covered in the Short Circuit Current and Protective Device Coordination studies.
- D. Indicate the safe working distances for the calculated fault locations based upon the calculated arc flash boundary considering an incident energy level of 1.2 cal/cm².

- E. Include in the Arc Flash Hazard Analysis calculations for maximum and minimum contributions of fault current magnitude. The minimum calculation shall assume that the utility contribution is at a minimum with minimum motor load. Conversely, the maximum calculation shall assume a maximum contribution from the utility with all motors to be operating under full-load conditions.
- F. Include both line and load side of the main breaker into the arc flash calculations.
- G. Base the arc flash calculations on actual overcurrent protective device clearing time. Maximum clearing time will be capped at 2 seconds per IEEE 1584.

3.6 REPORT SECTIONS

- A. Input Data:
 - 1. Utility three-phase and line-to-ground available contribution with associated X/R ratios.
 - 2. Short-circuit reactance of rotating machines with associated X/R ratios.
 - 3. Cable type, construction, size, # per phase, length, impedance and conduit type.
 - 4. Bus duct type, size, length, and impedance.
 - 5. Transformer primary & secondary voltages, winding configurations, kVA rating, impedance, and X/R ratio.
 - 6. Reactor inductance and continuous ampere rating.
 - 7. Aerial line type, construction, conductor spacing, size, # per phase, and length.
- B. Short-Circuit Data:
 - 1. Source fault impedance and generator contributions.
 - 2. X to R ratios.
 - 3. Asymmetry factors.
 - 4. Motor contributions.
 - 5. Short circuit kVA.
 - 6. Symmetrical and asymmetrical fault currents.
- C. Recommended Protective Device and Settings:
 - 1. Phase and Ground Relays:
 - a. Current transformer ratio.
 - b. Current setting.

- c. Time setting.
 - d. Instantaneous setting.
 - e. Specialty non-overcurrent device settings.
 - f. Recommendations on improved relaying systems, if applicable.
2. Circuit Breakers:
- a. Adjustable pickups and time delays (long time, short time, ground).
 - b. Adjustable time-current characteristic.
 - c. Adjustable instantaneous pickup.
 - d. Recommendations on improved trip systems, if applicable.
- D. Incident energy and flash protection boundary calculations.
- 1. Arcing fault magnitude.
 - 2. Device clearing time.
 - 3. Duration of arc.
 - 4. Arc flash boundary.
 - 5. Working distance.
 - 6. Incident energy.
 - 7. Hazard Risk Category.
 - 8. Recommendations for arc flash energy reduction.

3.7 FIELD ADJUSTMENT

- A. Provide the services of a qualified testing agency and the necessary tools and equipment to test, calibrate and adjust the protective relays and circuit breaker trip devices as recommended in the settings table provided by the coordination study. Field adjustments to be completed by the Contractor.
- B. Make minor modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies.
- C. Notify Engineer and Owner Representative in writing of any required major equipment modifications.

3.8 ARC FLASH WARNING LABELS

- A. Provide one 3.5” x 5” thermal transfer type label of high adhesion polyester that is rated for outdoor use, UV, water and abrasion resistant for each electrical equipment included in the analysis.
- B. The label shall have an orange header with the wording: WARNING, ARC FLASH HAZARD, and shall include at a minimum the following information:
 - 1. Location or equipment designation
 - 2. Nominal voltage
 - 3. Flash protection boundary
 - 4. Hazard risk category
 - 5. Incident energy
 - 6. Working distance
 - 7. Engineering report number, revision number and issue date
- C. Where the electrical equipment was not included as part of the analysis, a generic warning label per NFPA 70 shall be provided.
- D. Machine print all labels with thermal transfer printers or equivalent, field markings will not be accepted.
- E. Field install labels so as to be clearly visible to qualified persons per NFPA 70.

3.9 ARC FLASH TRAINING

Provide training for a minimum of ten Owner personnel at the project site on the potential arc flash hazards associated with working on energized equipment (minimum of 4 hours excluding travel time). Maintenance procedures in accordance with the requirements of NFPA 70E shall be provided in the training manuals. The training shall be certified for continuing education units (CEUs) by the International Association for Continuing Education Training (IACET).

END OF SECTION

SECTION 16012

SEISMIC RESTRAINT FOR ELECTRICAL EQUIPMENT

PART 1 GENERAL

1.1 DESCRIPTION

Work included:

- A. Seismic restraint devices for electrical equipment.

1.2 RELATED WORK

- A. Section 01300: Submittals
- B. Section 01610: Seismic Design Criteria
- C. Section 01615: Wind Design Criteria
- D. Section 02020: Geotechnical Report

When it applies, this section is referenced in other sections of the specifications.

1.3 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01300.
- B. Submit seismic anchoring calculations with equipment and raceway submittals. Calculations and determination of anchor types shall be performed and stamped by a licensed structural engineer registered in the State of California. Engineer shall either be employed by the equipment manufacturer or the equipment manufacturer shall hire an independent consultant to perform these services.
- C. Submit equipment anchoring methods. Include anchoring locations, anchor types and minimum anchor embedment depths.
- D. Submit catalog cuts of anchors.
- E. Submit recommended torque values for bolting.

PART 2 MATERIALS

2.1 SEISMIC ANCHORING AND RESTRAINTS

In accordance with Specification Section 01610 and 01615.

PART 3 EXECUTION

3.1 EQUIPMENT AND RACEWAYS

Install equipment anchors and raceway supports in accordance with the final shop drawings and manufacturer's recommendations. Properly torque all bolts to the recommended values.

END OF SECTION

SECTION 16015
EQUIPMENT DRAWINGS/DIAGRAMS

PART 1 GENERAL

1.1 DESCRIPTION

Work included:

- A. Equipment drawings.

1.2 SUBMITTALS

- A. Submit drawings in accordance with Section 01300 and Section 16010.
- B. With AutoCad drawings, submit electronic files of all drawings developed for this project.
- C. Provide Adobe Acrobat .pdf files of all drawings. Drawings shall be sized for 11"x17" sheets.

PART 2 MATERIALS

2.1 GENERAL

- A. Design and provide equipment fabrication drawings for all electrical equipment.
- B. Design and provide one-line diagrams, schematic diagrams, connection diagrams and interconnection diagrams for all electrical equipment. For overcurrent protective relay circuits and switchgear provide three-line diagrams. Design shall provide safe, reliable and proper operation of equipment and field devices.
- C. MCC: Diagrams shall show all equipment in the electrical system including field devices (circuit breakers, relays, overcurrent relays, SF6 circuit breakers, field jumpers, substation transformers, etc).
- D. Prior to beginning the drawings, contact the Owner's Representative to discuss drawing formats and wiring requirements.

- E. Provide a drawing identifying and describing all symbols and abbreviations used. This drawing shall be the first sheet in the drawing set. Provide the following on this sheet.
1. On the same sheet provide notes which describe the operation state of equipment as shown on the diagrams. Example: Diagrams are shown with no SF6 gas pressure, breaker open, spring mechanism discharged and all circuits de-energized.
 2. Provide unique symbols for each of the following:
 - a. Equipment terminal blocks (open square with a black dot in center or other unique symbol). Equipment terminal blocks are all terminal blocks located within the equipment.
 - b. Field equipment and device terminal blocks (open hexagon with a black dot in the center or other unique symbol). Field equipment and device terminal blocks are terminal blocks located remote from the equipment.
 - c. Device terminals (open circle or other unique symbol). Device terminals are terminals located on devices such as relays, pilot lights, etc.
 3. On the same sheet, or second sheet if required due to space limitations, provide a drawing index with drawing numbers and descriptions of all sheets and drawing revision numbers. List every sheet individually. When sheets are re-issued, include drawing revision numbers.
- F. Identify each device, terminal block, terminal block terminal and piece of equipment by a unique number or number-letter combination. The identifier shall be indicated on a bill of material and on all drawings.
- G. Conductor Identification (Wire Numbers)
1. Conductor Identification: Provide a unique identifier for each conductor. Identify each conductor by a consecutive unique number, letter, or number-letter combination. The identification shall be numeric, alphabetic, or alphanumeric, with a minimum of 8 characters. The first 4 characters shall describe the major device being controlled (example: CB1, CB2, XFR1, etc.) and the next 4 characters shall be a unique number. Prior to designating numbers, contact the Owner's Representative to discuss nomenclature. Each conductor shall have the same identification at all terminals and tie points. Conductors connected to the same terminal or tie point shall have the same identification.
 2. Where color-coded conductors are used, indicate on the diagrams the color code of the conductors.
 3. Show the wire number and color coding on all diagrams.
 4. Conductor identifiers (unique name) shall only be used once for the entire project. There shall not be other conductors on the project with the same identifiers.
- H. Device Identifier

1. Device and equipment identifiers shall only be used once for the entire project. As an example, if there are thirty power fail relays used on a project, each relay shall have a unique identifier associated with it.
 2. Identify each device by a consecutive unique number, letter, or number-letter combination. The identification shall be numeric, alphabetic, or alphanumeric, with a minimum of 8 characters. The first 4 characters shall describe the major device being controlled (example: CB1, CB2, XFR1, etc.) and the next 4 characters shall be a unique number. Prior to designating numbers, contact the Owner's Representative to discuss nomenclature.
 3. On all diagrams and drawings for all devices, show the device identifier next to the device at each location for where the device occurs.
- I. Nameplates: Provide a nameplate schedule indicating sizes, nomenclature and mounting methods for all nameplates.
- J. Diagrams:
1. Show relays, alarms, switches and similar symbols on the schematic diagram with all utilities turned off (electric power, air, gas, oil, water, lubrication, etc.) and with the equipment at its normal starting position.
 2. Diagrams shall show all equipment in the electrical system including field devices and internal wiring of sub-assemblies. Diagrams of sub-assemblies may be furnished on separate sheets.
 3. Indicate device terminals, device terminal numbers, and terminal blocks including terminal block and terminal numbers for all devices and terminal blocks on all diagrams.
 4. Indicate the polarities of all devices (current transformers, power supplies, etc.).
- K. Field Devices:
1. Show field wiring as dashed lines.
 2. All contacts, terminal blocks, terminal block numbers and terminal numbers and wire numbers for remote devices shall be clearly identified and shown on one-line, three-lines and schematic diagrams. For field devices show the field device terminal block and field device terminal number designation for all field conductors being landed at the field device.
 3. Obtain and review manufacturer's submittals and instruction manuals for field devices. Determine connection points.
 4. At the completion of construction, update drawings to reflect field wiring identifier. Show field wiring color coding, cable tag designation, and field wire conductor number.
- L. Indicate values and polarity of all devices.

2.2 DRAWING FORMAT

- A. Title Block: Provide drawings with title blocks indicating the following:
 - 1. Project name.
 - 2. Sheet description.
 - 3. Sheet number.
 - 4. Scale.
 - 5. Revision date and number.
 - 6. Equipment manufacturer's name, address and phone number of location where equipment was fabricated.
 - 7. Name of designer or engineer who prepared the document.
 - 8. Manufacturer's serial number for equipment.
 - 9. Manufacturer's project number for equipment.
- B. Drawing Size: Maximum sheet size shall be 22 inches by 34 inches, minimum sheet size shall be 11 inches by 17 inches, except as allowed by the engineer.
- C. Lettering Height: Minimum size lettering height shall be 1/8 inch for 22 inches by 34 inches sheets, 1/16-inch-high for 11 inch by 17-inch sheet sizes.

2.3 CAD DRAWINGS

Prepare all drawings using AutoCAD version 2020 as produced by Auto Desk, Inc.

2.4 EQUIPMENT FABRICATION DRAWINGS

- A. Provide scaled drawings that show the physical dimensions, materials and construction of equipment and location of all devices.
- B. Draw equipment, enclosures, panels, components, and devices to scale.
- C. Indicate the physical location of all components.
- D. Provide detailed descriptions of equipment, including weights, dimensions, foundation requirements, installation and anchoring requirements and heat dissipation.
- E. Provide complete dimensional plan views indicating sizes and clearances required for all equipment. Clearly dimension conduit entry requirements.

- F. Provide scaled, dimensioned elevation views of equipment and panels. Provide exterior elevation views for all sides. Where equipment has multiple sections such as switchgear, motor control centers, switchboards, etc., provide views of each section and cubicle space. Both external and internal views shall be provided. Views shall indicate the physical arrangement of all devices being mounted (relays, switches, indicating lights, nameplates, etc.). The following views for each enclosure, panel, section, and compartment shall be provided:
1. Front enclosure face.
 2. Back side of front enclosure.
 3. Rear of enclosure, exterior elevation.
 4. Right and left sides of interior compartments.
 5. Back of interior compartment.
 6. Front and back face of interior hinged panels.
 7. Tops or bottoms of compartments if used to mount devices.
- G. For switchgear provide internal front-to-back section views indicating bussing, partitions, circuit breakers, insulations, auxiliary sections, etc. Provide internal front-to-back section views for each cubicle.

2.5 ONE-LINE DIAGRAMS

- A. Provide one-line diagrams drawn to a format similar to the one-line diagrams shown in the contract documents.
- B. One-line diagrams shall present sufficient data to describe the system. Symbols used shall be in accordance with ANSI/IEEE Standard 315. As a minimum, the following items shall be shown on the one-line diagrams.
1. Power sources including voltages, ampacities, and phases.
 2. Sizes, types, and ampacities of all equipment and devices.
 3. Capacities, voltages, impedance, connections, and grounding methods of transformers.
 4. Identification and quantity of protective devices (relays, fuses, and circuit breakers, etc.).
 5. Instrument transformer characteristics.
 6. Type and location of surge arresters and capacitors.
 7. Identification of all loads.
 8. Identification of any other distribution system equipment.

9. Type of relays, phases and grounds.
10. Test blocks.

2.6 SCHEMATIC DIAGRAMS

- A. Provide and design schematic drawings showing all devices, circuits, device terminals, terminal blocks and conductor terminations. Drawings shall be drawn with all devices shown on horizontal lines. Horizontal lines shall be drawn between two vertical lines, with the vertical lines representing the control power sources. Actuating coils of devices shall be shown on the right-hand side. All contacts (except overload relay contacts) shall be shown between the coils and the left vertical line.
- B. Indicate and describe the purpose or function of all devices adjacent to the symbols.
- C. On the right-hand side of the diagram, for each horizontal line, describe the control purpose of that horizontal line.
- D. On the left hand side of the diagram, next to and to the left of the vertical line, sequentially number the horizontal lines from top to bottom.
- E. Relay Coils: Provide a cross-referencing system for each relay coil so that associated contacts may be readily located on the diagram. On the right side of the diagram, at the same horizontal level as the relay coils, indicate the line numbers of where the associated contacts occur. Where a relay contact appears on a sheet separate from the one on which the coil is shown, describe the purpose of the contact on the sheet where the contact is shown.
- F. Descriptive terms for command and status functions shall be in the present or past tense. For example, "Close CB-CB Opened". Do not use terms such as "CB open".
- G. Indicate terminal block numbers, terminal block terminal numbers and device terminal numbers.
- H. Show contacts of multiple contact devices, e.g., selector switches, on the line of the schematic diagram where they are connected in a circuit. Indicate a mechanical connection between the multiple contacts by a dotted line or arrow. This does not apply to control relays, starters, or contactors.
- I. Additional charts or diagrams shall be used to indicate the position of multiple contact devices such as drum, cam, control and selector switches and 86 relays. Provide charts or diagrams on each sheet where these types of devices occur.
- J. Where the internal wiring diagrams of sub-assemblies are furnished on separate sheets, show as a rectangle in the elementary diagram with all external points identified and cross-

referenced to the separate sheet(s) of the control circuit. Coils and contacts internal to the sub-assemblies shall be shown in the rectangle connected to their terminal points.

2.7 INTERCONNECTION DIAGRAMS

- A. Interconnection diagrams – Prepare and provide interconnection diagrams depicting all cable requirements together with their actual terminations. Interconnection diagrams shall indicate wiring between equipment panels, terminal boxes, pull boxes, remotely mounted devices, motor starters, etc. The diagrams shall interface with the manufacturer’s internal connection diagrams for panels. The diagrams shall indicate the terminations to terminal blocks of field devices at each end of the cable, the raceway and cable number, the number of conductors in the cable, the size of wire, and the number of spare conductors. For each termination, indicate the terminal number, wire color, and wire number as it appears on the wire marker. All terminal blocks, including spares, shall be indicated on the diagrams. Interconnection diagrams shall be provided prior to installation of equipment.
- B. Provide interconnection diagrams showing the physical routing of wiring between terminals of equipment and devices. Interconnection diagrams shall show the physical arrangement of terminal blocks, devices and device terminal blocks as it would appear to a person serving the equipment. Terminal blocks shall be shown in sequential physical order including all spares.
- C. Show conductors as a continuous line between their termination point. Show the direction of conductor entry into devices and conductor bundles.
- D. Interconnection Diagrams: Furnish Interconnection diagrams for each field wired cable and conductor.
- E. Interconnection diagrams shall show connection point descriptions and field routing only. This includes terminal blocks, field wiring with numbers, junction boxes, conduit material with sizes, and conduit numbers.
- F. Each conduit in the Conduit and Wire Schedule shall be shown on at least one interconnection diagram. Multiple conduits may be shown on a single interconnect and a conduit may appear on multiple interconnects.
- G. All terminations points on the diagram shall be shown with the actual equipment identification terminal number or letter.
- H. Interconnections between equipment shall be shown terminal to terminal with conduit lines in between. Wires within the same conduit shall be bundled and shown as a single line and labeled with the conduit name and wire fill. If not all wires within a conduit are used on a particular interconnection diagram, then the fill shall be noted as XX of XXX wires.

- I. Conduit shall be shown as routed through junction boxes and pull boxes. Wire fill leading into a pull box shall be equal to the combined outgoing conduit wire fill.
- J. Indicate wire number and wire color for all terminations. Spare wires may be shown as a list of wire numbers located near the end point of the wire.
- K. The diagrams shall show all other Contract and Supplier drawing numbers, for reference, that are associated with each device that is interconnected. Attached with each interconnect, a copy of all the support documents used in preparing interconnects. This includes current issues of panel schematics, connection diagrams, terminal block diagrams, submittals, contract drawings, vendor drawings and all other data used to develop the interconnection diagram as noted in the "Reference Documents" corner of interconnect drawings.
- L. Provide a notes section on each interconnect drawing. In the note section list any variances from the Contract conduit schedule necessary for completing the interconnections. Change orders regarding wire fill, conduit schedule and errors in plans regarding conduits and wires may not be processed until interconnect drawings have been received for such work.
- M. Update interconnection drawings to show as-built conditions after start-up and prior to project completion.
- N. Field wiring shall not start before the interconnection drawing have been submitted by the Contractor and approved by the Engineer.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 16030
ELECTRICAL TESTS

PART 1 GENERAL

1.1 DESCRIPTION

Work Included

- A. Electrical testing of the electrical system.
- B. Carry out tests indicated herein for individual items of materials and equipment in other Sections. Testing shall be done in accordance with the manufacturer's instructions, these Specifications, and applicable NETA Acceptance Testing Specifications, NEMA, ANSI, NFPA, and ASTM Standards.

1.2 RELATED SECTIONS

- A. Section 16150 – Electric Motors
- B. Section 16155 – Low Voltage Motor Control
- C. Section 16157 – Variable Frequency Drive Systems
- D. Section 16160 – Panelboards
- E. Sections 16450 – Grounding
- F. Section 16460 – Transformers Dry-Type
- G. Section 16950 – Control Panels

1.3 SUBMITTALS

Submit electrical test result study in accordance with Sections 01300 and 16010. Submit test results 20 days prior to energizing tested equipment.

- A. Submit complete system test procedures for review. Test procedures shall include but not be limited to:

1. Detailed procedures in sufficient detail to verify conformance with these Specifications.
 2. Incorporation of the Test Record Sheets included at the end of this Section.
 3. Detailed comprehensive testing schedule including:
 4. Each major piece of electrical distribution equipment.
 5. Each major electrical subsystem.
 6. Duration of each test.
 7. Milestone test completion date.
 8. Ambient Conditions at time of test
 9. Date of test results submittals following completion of the tests.
 10. Names and qualifications of the individual(s) responsible for performing the testing.
- B. Appendix, including test forms.
- C. Following completion of the test submit the completed test results to the Engineer for review. The results shall include a dedicated section with the “as-left” settings of all devices, relays, circuit breakers, etc.
- D. Test result shall be submitted in one submittal
- E. Test reports shall be based on NETA’s latest Acceptance Testing Specifications having a sign-off, pass/fail data filed for each line item covered by NETA’s Acceptance Testing Specifications latest edition.

1.4 OPERATION AND MAINTENANCE MANUALS

Include the Electrical Test Result Study within the operation and maintenance manuals. Operation and Maintenance Manuals shall be in accordance with Section 01680 and Section 16010.

1.5 TESTING ORGANIZATION QUALIFICATIONS

- A. Testing organization shall be corporately and financially independent of the supplier, producer and installer of the equipment.
- B. Testing organization shall meet Federal OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907, 1910 and 1936. Membership in the National Electrical Testing Association constitutes proof of meeting such criteria.
- C. Testing organization shall provide all materials, equipment, labor and technical supervision to perform inspections and tests.
- D. Acceptable Testing organizations are:

1. Power Systems Testing Company
2. Electrical Reliability Services, Inc.
3. Apparatus Testing and Engineering

1.6 APPLICABLE CODES, STANDARDS AND REFERENCES

- A. All inspections and tests shall be in accordance with the following codes and standards except as provided otherwise herein:
1. National Electrical Manufacturer's Association - NEMA
 2. American Society for Testing and Materials - ASTM
 3. Institute of Electrical and Electronic Engineers - IEEE
 4. International Electrical Testing Association - NETA Acceptance Testing Specifications - ATS-1991
 5. American National Standards Institute - ANSI C2: National Electrical Safety Code
 6. State and local codes and ordinances
 7. Insulated Cable Engineers Association - ICEA
 8. Association of Edison Illuminating Companies - AEIC
 9. Occupational Safety and Health Administration - OSHA
 10. National Fire Protection Association - NFPA
- B. Inspections and tests shall utilize the following references:
1. Project design specifications.
 2. Project design drawings.
 3. Project power system analysis study.
 4. Manufacturer's instruction manuals applicable to each particular apparatus.
- C. Inspections and tests shall be in accordance with the latest edition of the International Electrical Testing Association Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.7 SAFETY AND PRECAUTIONS

- A. Safety practices shall include, but are not limited to, the following requirements:
1. Occupational Safety and Health Act.

2. Accident Prevention Manual for Industrial Operations, National Safety Council.
 3. Applicable state and local safety operating procedures.
 4. Owner's safety practices.
 5. National Fire Protection Association - NFPA 70E
 6. American National Standards for Personnel Protection
- B. All tests shall be performed with apparatus de-energized. Exceptions must be thoroughly reviewed to identify safety hazards and devise adequate safeguards.
- C. The testing firm shall have a designated safety representative on the project to supervise the testing operations with respect to safety.

1.8 SCHEDULING

Perform Electrical Tests after electrical installation is 90 % completed.

1.9 LIST OF ITEMS TO BE TESTED

Test the following items:

- A. Wires and Cables
- B. Electric Motors
- C. Motor Control Center
- D. Variable Frequency Drives
- E. Panelboards
- F. Grounding
- G. Transformers
- H. Control Panels
- I. Any other equipment shown on one-line diagrams.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

3.1 SWITCHGEAR AND SWITCHBOARD ASSEMBLIES

A. Visual and Mechanical Inspection.

1. Inspect for physical, electrical and mechanical condition.
2. Compare equipment nameplate information with latest one-line diagram and report discrepancies.
3. Check for proper anchorage, required area clearances, physical damage and proper alignment.
4. Inspect all doors, panels and sections for paint, dents, scratches, fit and missing hardware.
5. Verify that fuse and/or circuit breaker sizes and types correspond to drawings.
6. Verify that current and potential transformer ratios correspond to drawings.
7. Inspect all bus connections for high resistance. Use low-resistance ohmmeter or check tightness of bolted bus joints by using a calibrated torque wrench. Refer to manufacturer's instructions or Table BTV for proper torque levels.
8. Test all electrical and mechanical interlock systems for proper operation and sequencing.
9. Closure attempt shall be made on locked open devices. Opening attempt shall be made on locked closed devices.
10. Clean entire switchgear using manufacturer's approved methods and materials.
11. Inspect insulators for evidence of physical damage or contaminated surfaces.
12. Verify proper barrier and shutter installation and operation.
13. Lubrication
 - a. Verify appropriate contact lubricant on moving current carrying parts.
 - b. Verify appropriate lubrication on moving and sliding surfaces.
14. Exercise all active components.
15. Inspect all mechanical indicating devices for proper operation.

B. Electrical Tests

1. Perform test on all instrument transformers in accordance with Instrument Transformer paragraphs.
2. Perform ground-resistance tests in accordance with Grounding Systems paragraphs.
3. Perform insulation-resistance test on each bus section, phase-to-phase and phase-to-ground for one (1) minute. Test voltages and minimum resistances shall be in accordance with Table SS-1.
4. Perform insulation-resistance test on control wiring. Do not perform this test on wiring connected to solid-state components.
5. Perform control wiring performance test. Use the elementary diagrams of the switchgear to identify each remote control and protective device. Conduct tests to verify satisfactory performance of each control feature.
6. Perform secondary voltage energization test on all control power circuits and potential circuits as detailed below. Check voltage levels at each point on terminal boards and at each terminal on devices.
7. Perform current injection tests on the entire current circuit in each section of switchgear.
 - a. Perform current test by primary injection, where possible, with magnitudes such that a minimum of 1.0 ampere flows in the secondary circuit.
 - b. Where primary injection is impractical, utilize secondary injection with a minimum current of 1.0 ampere.
 - c. Test current at each device.
8. Determine accuracy of all meters per Metering and Instrumentation paragraphs. Verify multipliers.
9. Control Power Transformers - Dry Type
 - a. Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring and overall general condition.
 - b. Verify proper primary and secondary fuse ratings or circuit breakers.
 - c. Verify proper interlock function and contact operation.
 - d. Perform insulation-resistance tests. Perform measurement from winding-to-winding and windings-to-ground. Test voltage and minimum resistances shall be in accordance with Table T-3. Results shall be temperature corrected in accordance with Table T-4.
 - e. Perform secondary wiring integrity test. Disconnect transformer at secondary terminals and connect secondary wiring to proper secondary voltage. Check potential at all devices.
 - f. Verify proper secondary voltage by energizing primary winding with system voltage. Measure secondary voltage with the secondary wiring disconnected.

10. Potential Transformer Circuits
 - a. Perform secondary wiring integrity test. Disconnect transformer at secondary terminals and connect secondary wiring to proper secondary voltage. Check for proper potential at all devices.
 - b. Verify secondary voltage by energizing primary winding with system voltage. Measure secondary voltage with the secondary wiring disconnected.
11. Test circuit breakers in accordance with Circuit Breaker paragraphs.

C. Test Values

1. Bolt-torque levels shall be in accordance with Table BTV, unless otherwise specified by manufacturer.
2. Insulation-resistance test shall be performed in accordance with Table SS-1. Values of insulation resistance less than this table or manufacture's minimum should be investigated.

Table SS-1 Switchgear Insulation-Resistance Test Voltages		
Voltage Rating	Minimum dc Test Voltage	Recommended Minimum Insulation Resistance In Megohms
0 – 250V	500 V	50
251 – 600V	1000 V	100

3.2 CABLES - LOW-VOLTAGE - 600 V MAXIMUM

A. Visual and Mechanical Inspection

1. Inspect cables for physical damage and proper connection in accordance with single-line diagram.
2. Test cable mechanical connections to manufacturer's recommended values using a calibrated torque wrench. In the absence of manufacturer's data use Table BTV.
3. Check cable color coding with applicable engineer's specifications and National Electrical Code standards.

B. Electrical Tests

1. Perform insulation-resistance test on each conductor with respect to ground and adjacent conductors. Applied potential shall be 1000 volts dc for 1 minute.
2. Perform continuity test to insure proper cable connection.
3. Test Values: Evaluate results by comparison with cables of same length and type. Investigate any values less than 50 megohms.

3.3 METAL-ENCLOSED BUS

A. Visual and Mechanical Inspection

1. Inspect bus for physical damage and proper connection in accordance with single-line diagram.
2. Inspect for proper bracing, suspension alignment and enclosure ground.
3. Check tightness of bolted joints by using calibrated torque wrench in accordance with manufacturer's published data or Table BTV.
4. Check for proper physical orientation per manufacturer's labels to ensure proper cooling. Perform continuity tests on each conductor to verify that proper phase relationships exist.
5. Check outdoor busway for removal of "weep-hole" plugs, if applicable and the proper installation of joint shield.

B. Electrical Tests

1. Measure insulation resistance of each bus run phase-to-phase and phase-to-ground for one (1) minute in accordance with Table IR.
2. Perform ac or dc overpotential tests on each bus run phase-to-phase and phase-to-ground. Potential application shall be for one (1) minute and in accordance with Table SS-2.
3. Perform contact-resistance test on each connection point of uninsulated bus. On insulated bus, measure resistance of bus section and compare values with adjacent phases.

C. Test Values

1. Bus bolt-torque values shall be in accordance with manufacturer's recommendations or Table BTV.
2. Insulation-resistance test voltages and resistance values shall be in accordance with manufacturer's specifications or Table IR.
3. Overpotential test shall be evaluated as pass/fail.

3.4 CIRCUIT BREAKERS - LOW-VOLTAGE - INSULATED-CASE

A. Visual and Mechanical Inspection

1. Check circuit breaker for proper mounting and compare nameplate data to drawings and specifications.
2. Operate circuit breaker to ensure smooth operation.

3. Inspect case for cracks or other defects.
4. Check tightness of connections using calibrated torque wrench. Refer to manufacturer's instructions or Table BTV for proper torque levels.

B. Electrical Tests

1. Perform a contact-resistance test.
2. Perform a insulation-resistance test at 1000 volts dc from pole to pole and from each pole to ground with breaker closed and across open contacts of each phase.
3. Determine long-time minimum pickup current by primary current injection where practical.
4. Perform long-time delay time-current characteristic test by passing three hundred percent (300%) rated current through each pole separately. Record trip time.
5. Determine short time pickup and delay by primary current injection.
6. Determine ground-fault pickup and time delay by primary current injections.
7. Determine instantaneous pickup current by primary injection using run-up or pulse method.

C. Test Values

1. Compare contact resistance or millivolt drop values to adjacent poles and similar breakers. Investigate deviations of more than fifty percent (50%). Investigate any value exceeding manufacturer's recommendations.
2. Insulation resistance shall not be less than 100 megohms.
3. Trip characteristic of breakers shall fall within manufacturer's published time-current characteristic tolerance band, including adjustment factors.
4. All trip times shall fall within Table ICO. Circuit breakers exceeding specified trip time at three hundred percent (300%) of pickup shall be tagged defective.
5. Instantaneous pickup values shall be within values shown on Table ICI.

Table ICO Insulated-Case Circuit Breaker Overcurrent Trip Test (At 300% of Rated Continuous Current of Circuit Breaker)		
Maximum Breaker Voltage Volts	Range of Related Continuous Current Amperes	Maximum Trip Time in Seconds*
240	15-45	50
240	50-100	70
600	15-45	70
600	50-100	125
240	110-225	200

240	250-400	300
600	110-225	250
600	250-400	300
600	450-600	350
600	700-1200	500
600	1400-2500	600
600	3000-5000	650

*For integrally-fused circuit breakers, trip times may be substantially longer if tested with the fuses replaced by solid links (shorting bars).

Table ICI Insulated-Case Circuit Breaker Instantaneous Trip Tolerances		
Frame Size, Amperes	Tolerances of High and Low Settings	
	High	Low
<250	+40% -25%	+40% -30%
>400	+25%	+30%

3.5 CIRCUIT BREAKERS - LOW-VOLTAGE - POWER

A. Visual and Mechanical Inspection

1. Inspect for physical damage and compare nameplate data with drawings and specifications.
2. Perform mechanical operation test in accordance with manufacturer's instructions.
3. Check cell fit and element alignment and proper operation of racking interlocks.
4. Check tightness of connections using calibrated torque wrench. Refer to manufacturer's instructions or Table BTV for proper torque levels.
5. Check arc chutes for damage.
6. Clean entire circuit breaker using approved methods and materials.
7. Lubricate as required.

B. Electrical Tests

1. Perform a contact-resistance test.
2. Perform an insulation-resistance test at 1000 volts dc from pole-to-pole and from each pole-to-ground with breaker closed and across open contacts of each phase.
3. Determine long-time minimum pickup current by primary current injection.

4. Determine long-time delay by primary injection.
5. Determine short-time pickup and delay by primary current injection.
6. Determine ground-fault pickup and delay by primary current injection.
7. Determine instantaneous pickup value by primary current injection.
8. Make adjustments for final settings in accordance with breaker setting sheet.
9. Activate auxiliary protective devices, such as ground-fault or under voltage relays, to ensure operation of shunt trip devices. Check the operation of electrically-operated breakers in their cubicle.
10. Check charging mechanism.

C. Test Values

1. Compare contact resistance or millivolt drop values to adjacent poles and similar breakers. Investigate deviations of more than fifty percent (50%).
2. Insulation resistance shall not be less than 100 megohms. Investigate values less than 100 megohms.
3. Trip characteristics of breakers when adjusted to setting sheet parameters shall fall within manufacturer's published time-current tolerance band.

3.6 INSTRUMENT TRANSFORMERS

A. Visual and Mechanical Inspection

1. Inspect for physical damage and nameplate information for compliance with drawings and specifications.
2. Verify proper connection of transformers with system requirements.
3. Verify tightness of all bolted connections and assure that adequate clearances exist between primary circuits and secondary circuit wiring.
4. Verify that all required grounding and shorting connections provide good contact.
5. Test proper operation of transformer withdrawal mechanism (tip out) and grounding operation when applicable.
6. Verify proper primary and secondary fuse sizes for potential transformers.

B. Electrical Tests - Current Transformers

1. Perform insulation-resistance test of the current transformer and wiring-to-ground at 1000V dc. Do not perform this test on solid-state devices.
2. Perform a polarity test of each current transformer.

3. Perform a ratio-verification test using the voltage or current method in accordance with ANSI C57.13.1.
4. Perform an excitation test on transformers used for relaying applications in accordance with ANSI C57.13.1.
5. Measure relaying circuit burdens at transformer terminals and determine the total burden in ohms at 60Hz.
6. When applicable, perform insulation-resistance and dielectric withstand tests on the primary winding with secondary grounded. Test voltages shall be per Table SS-1 and ITD respectively.

C. Electrical Tests - Voltage Transformers

1. Perform insulation-resistance tests winding-to-winding and windings-to-ground. Test voltages shall be applied for one (1) minute in accordance with Table SS-1. Do not perform this test with solid-state devices connected.
2. Perform a polarity test on each transformer to verify the polarity marks or H1-X1 relationship as applicable.
3. Perform a ratio test using a transformer-turns-ratio test set or by voltage comparison method.
4. Perform a dielectric withstand test on the primary windings with the secondary windings connected-to-ground. The dielectric voltage shall be in accordance with Table ITD and applied for one (1) minute.

D. Test Values

1. Insulation-resistance measurement on any instrument transformer shall be not less than that shown in Table SS-1.
2. Perform a burden/saturation calculation on current transformers supplying relaying circuits.
3. Ratio accuracies shall be within 0.5% of nameplate or manufacturer's specifications.
4. Withstand tests shall be evaluated as pass/fail.

Table ITD Instrument Transformer Dielectric Test Voltage			
Nominal System Voltage	Test BIL (kV)	Dielectric Withstandability Field Test Voltage (kV)	
		AC	DC
2.4	45	11.3	15
4.8	60	14.3	19
13.8	95	25.5	34
13.8	110	25.5	34

25	125	30.0	40
25	150	37.5	50

Table is derived from paragraph 8.8.2 and tables 2 and 7 of ANSI/IEEE C57.13, "Standard Requirements for Instrument Transformers."

3.7 METERING AND INSTRUMENTATION

A. Visual and Mechanical Inspection

1. Examine all devices for broken parts, shipping damage, and tightness of connections.
2. Verify that meter types, scales, and connections are in accordance with drawings and specifications.

B. Electrical Tests

1. Determine accuracy of meters at 25/50/75/100% of full scale for each metered parameter.
2. Calibrate meters to one-half percent (0.5%).
3. Verify all instrument multipliers.

3.8 GROUNDING SYSTEMS

A. Visual and Mechanical Inspection: Inspect ground system for compliance with drawings and specifications.

B. Electrical Tests (Small Systems): Perform ground-impedance measurements utilizing the fall-of-potential method per ANSI/IEEE Standard 81 "IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System." Instrumentation utilized shall be as defined in Section 12 of the above guide and shall be specifically designed for ground impedance testing. Provide sufficient spacing so that plotted curves flatten in the 62% area of the distance between the item under test and the current electrode.

C. Test Values: The main ground electrode system impedance-to-ground should be no greater than five (5) ohms for commercial or industrial systems and one (1) ohm or less for generating stations, transmission stations, large industrial systems and data processing facilities.

3.9 GROUND-FAULT SYSTEMS (NEC 230-95)

A. Visual and Mechanical Inspection

1. Inspect for physical damage and compliance with drawings and specifications.
2. Inspect neutral main bonding connection to assure:
 - a. Zero-sequence sensing system is grounded.
 - b. Ground-strap sensing systems are grounded through sensing device.
 - c. Ground connection is made ahead of neutral disconnect link on zero-sequence sensing systems.
 - d. Grounded conductor (neutral) is solidly grounded.
3. Inspect control power transformer to ensure adequate capacity for system.
4. Manually operate monitor panels (if present) for:
 - a. Trip test
 - b. No trip test
 - c. Nonautomatic reset
5. Record proper operation and test sequence.
6. Set pickup and time-delay settings in accordance with the settings provided by the owner/user's electrical engineer.

B. Electrical Tests

1. Measure system neutral insulation resistance to ensure no shunt ground paths exist. Remove neutral-ground disconnect link. Measure neutral insulation resistance and replace link.
2. Determine the relay pickup current by current injection at the sensor and operate the circuit interrupting device.
3. Test the relay timing by injecting three hundred percent (300%) of pickup current, or as specified by manufacturer.
4. Test the system operation at fifty-seven percent (57%) rated control voltage, if applicable.
5. Test zone interlock systems by simultaneous sensor current injection and monitoring zone blocking function.
6. On multiple source, tie breaker, etc., systems, devise a simulation scheme that fully proves correct operation.

C. Test Parameters

1. System neutral insulation shall be a minimum of one hundred (100) ohms, preferably one (1) megohm or greater.

2. Relay timing shall be in accordance with manufacturer's published time-current characteristic curves but in no case longer than one (1) second for fault currents equal to or greater than 3,000 amperes.
3. Relay pickup value shall be within +/-10% of setting and in no case greater than 1200A.

3.10 AC MOTORS

A. Visual and Mechanical Inspection

1. Inspect for physical damage and compare nameplate data with drawings and specifications.
2. Inspect for proper anchorage, mounting, grounding, connection, and lubrication.
3. When applicable, perform special tests such as air gap spacing and pedestal alignment.
4. Check for unusual mechanical or electrical noise or signs of overheating during initial test run.

B. Electrical Tests - Induction Motors

1. Perform insulation-resistance tests in accordance with ANSI/IEEE Standard 43.
2. Motor 200 HP and Less - Test duration shall be one minute with resistances tabulated at thirty and sixty seconds. Calculate the dielectric absorption ratio.
3. Perform insulation-resistance test on pedestal per manufacturer instructions.
4. Test motor starter prior to energizing the motor.
5. Check that the motor space heater circuit is in proper operating condition and in accordance with drawings and specifications.
6. Check all protective devices in accordance with other sections of these specifications.
7. Perform a rotation test to ensure proper shaft direction.
8. Measure running current and evaluate relative to load conditions and nameplate full-load amperes.
9. Perform vibration tests: Motors Larger than 200 HP - Perform vibration base-line test. Amplitude shall be plotted versus frequency. For motors 200 HP and less perform vibration and amplitude test.

C. Test Values

1. Perform insulation-resistance tests at the test voltage listed in Table IR. Investigate dielectric absorption ratios less than 1.4 and polarization index ratios less than 1.5 for Class A insulation and 2.0 for Class B insulation.

2. Vibration amplitudes shall not exceed values shown in Table MAV.
3. Salient pole voltage drop should be equal for each pole. Investigate values that differ by more than ten percent (10%).

Table MAV	
Maximum Allowable Vibration Per NEMA MG-1	
Speed RPM	Amplitude Inches Peak-to-Peak
3000 and above	0.001
1500-2999	0.0015
1000-1499	0.002
999 and below	0.0025

3.11 LOW-VOLTAGE MOTOR CONTROL CENTERS

A. Visual and Mechanical Inspection

1. Inspect for physical damage, proper anchorage, and grounding.
2. Inspect equipment for compliance with drawings and specifications.
3. Motor-running protection:
 - a. Compare overload heater rating with motor full-load current rating to verify proper sizing. (Adjust as necessary if power factor correction capacitors are connected on load side of heaters.)
4. Check tightness of bolted connections using calibrated torque wrench.

B. Electrical Tests

1. Insulation tests:
 - a. Measure insulation resistance of each bus section phase-to-phase and phase-to-ground for one (1) minute. Test voltage shall be in accordance with Table IR.
 - b. Measure insulation resistance of each starter section phase-to-phase and phase-to-ground with the starter contacts closed and the protective device open. Test voltage shall be in accordance with Table IR.
 - c. Measure insulation resistance of each control circuit with respect to ground. Refer to Table SS-1. Do not perform this test on wiring connected to solid-state components.
2. Test motor overload units by injecting current through overload unit and monitoring trip time at three hundred percent (300%) of motor full-load current.
3. Test molded-case breakers per Low Voltage Insulated Case Circuit Breakers paragraphs.

4. Perform operational tests by initiating control devices to affect proper operation.
5. Determine accuracy of all meters per Metering and Instrumentation paragraphs.
6. Test protective devices in accordance with Protective Relay paragraphs.

C. Test Values

1. Bolt-torque levels shall be in accordance with Table BTV unless otherwise specified by manufacturer.
2. Insulation-resistance test results shall conform with Table IR.
3. Control wiring-insulation test voltage shall be 1000V dc. Do not perform this test on wiring connected to solid-state components.
4. Perform overload tests at three hundred percent (300%) of motor full-load current. Trip times shall be in accordance with manufacturer's tolerances. Investigate values in excess of one hundred twenty (120) seconds.

**Table BTV
U.S. Standard
Bolt Torque Values for Bus Connections**

Heat-Treated Steel – Cadmium or Zinc-Plated				
Grade	SAE 1 & 2	SAE 5	SAE 6	SAE 8
Minimum Tensile Strength (P.S.I.)	64K	105K	133K	150K
Bolt Diameter (Inches)	Torque (Foot Pounds)			
1/4	4.0	5.6	8.0	8.4
5/16	7.2	11.2	15.2	17.6
3/8	12.0	20.0	27.2	29.6
7/16	19.2	32.0	44.0	48.0
1/2	29.6	48.0	68.0	73.6
9/16	42.4	70.4	96.0	105.6
5/8	59.2	96.0	133.6	144.0
3/4	96.0	160.0	224.0	236.8
7/8	152.0	241.6	352.0	378.4
1	225.6	372.8	528.0	571.2

Silicon Bronze Fasteners*		
Torque (Foot Pounds)		
Diameter	Non-Lubricated	Lubricated
5/16	15	10
3/8	20	14
1/2	40	25
5/8	55	40
3/4	70	60

*Bronze alloy bolts shall have a minimum tensile strength of 70,000 pounds per square inch.

Aluminum Alloy Fasteners**	
Torque (Foot Pounds)	
Diameter	Lubricated
5/16	8.0
3/8	11.2
1/2	20.0
5/8	32.0
3/4	48.0

**Aluminum alloy bolts shall have a minimum tensile strength of 55,000 pounds per square inch.

Stainless Steel Fasteners***	
Torque (Foot Pounds)	
Diameter	Uncoated
5/16	14
3/8	25
1/2	45
5/8	60
3/4	90

***Bolts, cap screws, nuts, flat washers, locknuts: 18-8 alloy

Belleville washers: 302 alloy

Table IR		
Insulation-Resistance Test Voltages for Electrical Apparatus		
Maximum Voltage Rating of Equipment	Minimum Test Voltage, dc	Recommended Minimum Insulation Resistance in Megohms
250 V	500 V	25
600 V	1,000 V	100
5,000 V	2,500 V	1,000
8,000 V	2,500 V	2,000
15,000 V	2,500 V	5,000
25,000 V	5,000 V	20,000

Table IRC				
Insulation-Resistance Temperature Conversion Factors For Conversion of Test Temperature to 20°C				
Temperature of Apparatus		Multiplier for Apparatus Containing		
°C	°F	Immersed Oil Insulations	Solid Insulations	
0	32	0.25	0.40	
5	41	0.36	0.45	
10	50	0.50	0.50	
15	59	0.75	0.75	
20	68	1.00	1.00	
25	77	1.40	1.30	
30	86	1.98	1.60	
35	95	2.80	2.05	
40	104	3.95	2.50	
45	113	5.60	3.25	
50	122	7.85	4.00	
55	131	11.20	5.20	
60	140	15.85	6.40	
65	149	22.40	8.70	
70	158	31.75	10.00	
75	167	44.70	13.00	
80	176	63.50	16.00	

Table OTV				
Overpotential Test Voltages For Electrical Apparatus Other Than Inductive Equipment				
Nominal System (Line) Voltage* (kV)	Insulation Class	AC Factory Test (kV)	Maximum Field Applied AC Test (kV)	Maximum Field Applied DC Test (kV)
4.8	5.0	19	11.4	16.1
14.4	15.0	34	20.4	28.8
25.0	25.0	50	30.0	42.4

*Intermediate voltage ratings are placed in the next higher insulation class.

END OF SECTION

SECTION 16051

MISCELLANEOUS ELECTRICAL DEVICES AND MATERIALS

PART 1 GENERAL

1.1 DESCRIPTION

Work included:

- A. This section includes materials and installation of miscellaneous electrical devices and equipment.

1.2 RELATED WORK

Section 16010: General Electrical Requirements.

1.3 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01300 and Section 16010.
- B. Submit catalog cuts indicating ratings and characteristics including voltage ratings, continuous current ratings, conduit entry restrictions and enclosure type and dimensions.

1.4 OPERATION AND MAINTENANCE MANUALS

Submit operation and maintenance manuals in accordance with Section 01680 and Section 16010.

PART 2 MATERIALS

2.1 GENERAL

Miscellaneous electrical devices shall comply with Section 16010.

2.2 DISCONNECT SWITCHES

- A. Provide non-fusible or fusible disconnect switches with ampere rating and number of poles as indicated on the drawings. Switches for use on circuits 240 volts and below shall be NEMA general duty Type GD. Switches for use on 277/480-volts circuits shall be NEMA

heavy-duty Type HD. Provide mechanisms with quick-make and quick-break operating handles and provisions for padlocking in the "OFF" position. Provide an interlock to prevent unauthorized opening of the hinged cover when the switch is in the "ON" position and an interlock to prevent closing the switch mechanism with the hinged cover open.

Provide disconnect switch enclosures rated for the following locations, unless otherwise noted on the drawings:

1. Interior, dry: NEMA Type 1
 2. Interior, damp, wet and corrosive: NEMA 4X Stainless Steel
 3. Exterior: NEMA Type 3R raintight
 4. Exterior, corrosive: NEMA 4X Stainless Steel
 5. Classified locations: NEMA 7/9 corrosion-resistant
- B. Provide disconnect switch with 2 normally open (2NO) auxiliary contacts.
- C. Where fusible switches are indicated on the drawings, provide fusible switches with rejection feature. Fuses shall be time-delay, Class RK-5 with 200,000-amperes RMS symmetrical interrupting rating and continuous ampere rating as shown on the drawings. For HVAC equipment, size fuses per the manufacturer's recommendation. For 480-volt service provide 600-volt rated fuses and for 208 or 240 volt service provide 250 volt rated fuses.
- D. Provide nameplates on disconnect switches as specified in Section 16010. Indicate load served, voltage, phases and the feeding power source.

Example: EXHAUST FAN EF-1
 480V, 3Ø
 FED FROM PNL L8.

2.3 PUSHBUTTONS, SELECTOR SWITCHES AND INDICATING LIGHTS

- A. Remote-mounted pushbuttons, selector switches and indicating lights located outdoors and in areas identified as "Corrosive Area" shall be heavy duty, NEMA Type 13, with synthetic rubber boots and include any special gasketing required to make the complete station watertight. Provide NEMA type 4X watertight, corrosion-resistant enclosures constructed of stainless steel or glass polyester.
- B. Remote-mounted pushbuttons, selector switches, and indicating lights located indoors shall be heavy duty, NEMA Type 13 with NEMA Type 12 enclosures.
- C. Install provisions for locking pushbuttons and selector switches in the OFF position wherever lockout provisions are indicated.

D. Provide Allen-Bradley Bulletin 800H; Square D Class 9001, Type SK; or equal.

2.4 ENCLOSED CIRCUIT BREAKER

A. Provide molded-case type with quick-make and quick-break toggle mechanism, inverse time trip characteristics and trip-free operation on overload or short circuit. Automatic tripping shall be indicated by a handle position between the manual OFF and ON position. Provide trip ratings and number of poles as indicated on the drawings. Provide provisions for padlocking external disconnect handles in the OFF position. Provide circuit breakers with copper conductor compression lugs. Provide terminal pads if required for lug mounting.

B. Enclose circuit breakers within a NEMA 1 enclosure. Provide equipment ground bar kit.

2.5 NON-SHRINK GROUT

Provide Sika SikaGrout 212 grout or equivalent.

2.6 SURGE-PROTECTIVE DEVICES

A. The surge-protective devices (SPD) shall be listed in accordance with the latest edition of UL 1449.

B. The maximum continuous operating voltage (MCOV) of all components shall not be less than 125% for a 120V system and 115% for 220, 240, 277, and 480V systems.

C. The SPD shall have minimum 10 year warranty.

D. Provide SPD by Eaton SPD120, Schneider Electric, General Electric or equivalent.

PART 3 EXECUTION

3.1 DISCONNECT SWITCH INSTALLATION

Install HVAC equipment disconnect switches such that maintenance access to HVAC equipment is not impaired.

3.2 SPARES

Provide three spare fuses of each type and ampere rating installed.

3.3 TESTING

- A. Operate each disconnect switch three times, under load and verify that all phases of the load are disconnected each time.
- B. Operate pushbutton and selector switches and verify that the equipment controlled operates per the plans or other sections of these specifications.

3.4 TELEPHONE BACKBOARDS

Install vertically with type 4" x 96" A veneer grade facing outward and painted white. Mount panel bottom 3 inches above finished floor. Phone board shall be provided with double duplex receptacle and copper ground bar with min. of 8 ground lugs

3.5 PRESSURE SWITCHES

- A. Set pressure switches as directed in the field.
- B. Pressure Switches: Simulate pressure and verify that the equipment controlled operates per the plans or other sections of these specifications.

END OF SECTION

SECTION 16090

SPARE PARTS

PART 1 GENERAL

1.1 SUMMARY

Section includes spare parts and expendables.

1.2 RELATED SECTIONS

- A. Section 16010 – General Electrical Requirements
- B. Division 17 - Instrumentation and Controls

1.3 SCOPE OF WORK

- A. Provide all spare parts and expendables prior to start-up and final payment.
- B. Supply to Owner, a list of manufacturer's recommended spare parts that should be purchased and stocked by Owner.
- C. Recommend, for spare, any replacement parts that may be special order items and would not be readily available in the event of a failure.
- D. Identify all spare parts with manufacturer's description and part number.

PART 2 MATERIALS

2.1 SPARE PARTS

Provide the following spare parts to the Owner:

- A. Process Controller and Communication Components (Specification 17125/17300):
 - 1. One (1) spare DI, DO, AI and AO card of each type.
 - 2. One (1) spare Process Controller.
 - 3. One (1) spare PLC Power Supply of each type provided.

4. One (1) spare Ethernet switch of each type.

B. Instrumentation (Specification 17700):

1. Expendables: 2-year supply of expendables required for calibration and operation of instruments.
2. Four (4) surge protection terminals of each type.
3. One (1) smoke detector and base. Include a gas (smoke) canister and other tools required to test smoke detectors.
4. One (1) spare desiccant pack for each submersible level transmitter provided.

C. Control Panels:

1. 10% spare terminal blocks with DIN rail matching those used in control panel.
2. Two (2) power fail relays (PFR) of each type.
3. Two (2) relays with bases for each type of relay.
4. Two (2) timers with bases for each type of timer.
5. Ten (10) lamps for each type of light. (2) if LED type)
6. Two (2) lenses of each color for indicating lights.
7. Ten (10) fuses for each type and size of control fuses.
8. One (1) fuse holder of each type and size.
9. Three (3) fuses for each type and size of power fuses.
10. 10% spare terminal blocks for switchboard.
11. Two (2) selector switches for each type of selector switch.
12. Two (2) pushbuttons for each pushbutton type.
13. Five (5) sets of N.O. and N.C. of switch add-on blocks for switches and pushbuttons.
14. Two (2) coils and two (2) sets of auxiliary contacts for each size of motor starter.
15. One (1) control power transformer for each size.
16. Touch-up paint, 1 can for each color of Switchgear, Switchboard and Control Panel.
17. One (1) 24VDC power supply of each type.

PART 3 EXECUTION

3.1 DELIVERY

- A. Prepare an itemized shipping list and transmit with all spare parts. Delivery and acceptance of spare parts shall be indicated by Owner and Contractor's initials and date on each item on the shipping list.
- B. Spare parts shall be sealed in plastic bags and packaged in heavy duty plastic storage boxes.. Provide clear labels on exterior of package(s), to include manufacturer's description, part number and tag name of corresponding equipment.

END OF SECTION

SECTION 16110
RACEWAYS, BOXES AND FITTINGS

PART 1 GENERAL

1.1 DESCRIPTION

Work included:

- A. Raceways.
- B. Boxes.
- C. Fittings.
- D. Supporting Devices.

1.2 RELATED WORK

- A. Section 16010: General Electrical Requirements
- B. Section 16012: Seismic Restraint for Electrical Equipment
- C. Section 16450: Grounding

1.3 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01300 and Section 16010.
- B. Submit material list and catalog cuts for devices and materials.
- C. Submit catalog information for seismic support system.
- D. Submit manufacturer's installation manual for PVC-coated rigid metal conduit.

PART 2 MATERIALS

2.1 GENERAL

Raceways, boxes and fittings shall comply with Section 16010.

2.2 RIGID METAL CONDUIT AND FITTINGS

A. Material:

1. Rigid Metal Conduit and Fittings: ANSI C80.1 and UL-6, hot dipped galvanized after threading.

B. Fittings:

1. Locknuts: Steel or malleable iron.
2. Bushings: Threaded type, malleable iron, with 105°C rated plastic insulated throat. Plastic bushings with a temperature rating of 105°C may be used for conduits 1-inch and smaller. Provide grounding type bushings where required per Section 16450.
3. Box connectors for dry locations: Threaded pipe with locknuts.
4. Box Connectors for Damp and Wet Locations: Provide watertight threaded hubs consisting of sealing fitting with tapered conduit thread, neoprene O-ring, and 105°C rated insulating throat with grounding and bonding lug.
5. Couplings: Threaded, hot dipped galvanized after fabrication.

2.3 ELECTRICAL METALLIC TUBING (EMT) CONDUIT AND FITTINGS

A. Material: Steel, hot-dipped galvanized inside and out conforming to ANSI C80.3 and UL-797.

B. Couplings: Zinc plated steel, gland compression type.

C. Box Connectors: Zinc plated steel, gland compression type with 105° rated insulated throat.

2.4 RIGID NONMETALLIC CONDUIT (PVC) AND FITTINGS

A. Material: Polyvinyl chloride (PVC), 90°C rise rating, conforming to NEMA TC-2 Type EC-40 and UL-651.

B. Couplings, adapters, bell ends, expansion couplings, elbows and turns of 30°: Factory made to NEMA standards TC-2 and TC-3.

C. Joint Cement: As recommended by manufacturer as suitable for the climate, furnished with instructions to achieve watertight joints.

2.5 PVC-COATED RIGID METAL CONDUIT, FITTINGS, CONDUIT BODIES, OUTLET DEVICES, AND COVER PLATES

Provide rigid metal conduit and fittings with an exterior factory coated .040-inch minimum thickness PVC coating complying with NEMA RN 1. Factory coat conduit interior and threads with .002-inch urethane. Provide Thomas&Betts Ocal, Robroy Plasti-Bond Red or equivalent.

2.6 FLEXIBLE CONDUIT AND FITTINGS

- A. Material: Aluminum conforming to Federal Specification WW-C-566C.
- B. Fittings: Conform to ANSI C33.92, UL-listed for grounding, steel or malleable iron, zinc plated, squeeze or double grip saddle connector, 105°C insulated throat, grounding and bonding lugs.

2.7 LIQUIDTIGHT FLEXIBLE CONDUIT AND FITTINGS

- A. Conduit: Single strip steel, hot dipped galvanized prior to conduit fabrication with overall PVC jacket. Conform to UL-360.
- B. Fittings: Hot-dip or mechanically galvanized with insulated throat, locknut and sealing ring.

2.8 CONDUIT ELBOWS - GENERAL

Provide elbows with the following minimum radius:

Conduit Size	Minimum Radius (Inches)
3/4"	12
1"	12
1-1/4"	18
2"	24
2-1/2"	24
3"	30
3-1/2"	30
4"	30
5"	36
6"	42

2.9 CONDUIT BODIES

Provide threaded-hub cast ferrous or aluminum boxes. Provide with open type neoprene gaskets and matching cast ferrous covers, secured with at least two captive Type 304 stainless steel screws.

2.10 CONDUIT SEALING MATERIALS

A. Conduit Sealing Compound

1. Provide non-toxic conduit-sealing compounds consisting of 100% non-volatile solids including synthetic polymers with inert mineral fibers. Compounds shall have a putty-like consistency and shall be easily shaped and worked by hand and when pressed in place, shall cling to metal, plastic, rubber, painted surfaces, masonry, and concrete. In-place tolerance range shall be between -30 degrees and 175 degrees F and the product shall not sag at 275 degrees F (for brief periods of exposure). Hand workable range shall be between the temperatures of 25 degrees F and 120 degrees F. Dielectric strength of the compound shall be 110 Volts/mil in accordance with ASTM D149-64. Provide Anderson Type DSC, L.H. Dottie Co. Type LHD, or equivalent conduit sealing compounds.

B. Conduit Plugs

1. Provide polyethylene conduit plugs with pull tags properly sized for the conduit. Provide CalAm Manufacturing (800-992-0499) Poly Pull Plugs or equivalent.

2.11 SPECIALTY CONDUIT FITTINGS

- A. Expansion/Deflection Fittings: Use with rigid metal conduit only and weatherproof with an internal bonding arrangement. Provide for 3/4-inch movement in all directions. Where used for angular movement, allow for a 30° deflection from normal in any direction.
- B. Expansion Fittings for Rigid Non-Metallic Conduit: O-ring type with at least two rings, allowing for at least 6-inch movement of conduit.
- C. Thruwall and Floor Conduit Seals: Hot-dip galvanized malleable iron body and pressure clamps complete with pressure rings, neoprene sealing grommets and hot-dip galvanized tightening bolts. Provide O-Z/Gedney types FSK or WSK or equivalent.
- D. Conduit Sleeves: Schedule 40 steel pipe with seepage ring and hot-dip galvanize after fabrication per ASTM A123. Provide Link Seal products or equivalent.

2.12 WIREWAYS

- A. General: Provide electrical wireways of types, sizes, and number of channels as indicated. Fittings and accessories, including but not limited to couplings, offsets, elbows, expansion joints, adapters, hold-down straps, hangers, and end caps shall match and mate with

wireway for complete system. Where features are not indicated, select to fulfill wiring requirements, plus 25% spares, and comply with provisions of NEC. Construct wireways in accordance with UL 870 and without knockouts.

- B. Indoor Locations: Provide wireways with hinged covers. Provide Square D Class 5100 or equivalent.
- C. Outdoor Locations: Provide raintight trough wireway complete with cover. Provide Square D Class 5130 or equivalent.

2.13 OUTLET BOXES

- A. Concealed and Flush-Mounted Boxes:
 - 1. Galvanized steel, of gang sizes and as required by code. Do not use sectional boxes for multi-gang applications.
 - 2. Device Boxes: Minimum 4 X 4 X 2-1/8 inches with:
 - a. Plaster ring for plaster and drywall construction.
 - b. Square cornered tile type rings for exposed masonry wall construction and where tile is used. For masonry walls provide deep boxes or extensions such that conduits enter boxes without cutting inside surface of concrete blocks or bricks.
 - c. Square corner tile type covers with ribs or extensions for casting in concrete.
- B. Exposed Boxes:
 - 1. Cast iron or aluminum, with threaded hubs and mounting lugs.
 - 2. Conduit bodies may be used instead of boxes except where boxes contain devices.

2.14 JUNCTION AND PULL BOXES

- A. General: Construct of 12 gage steel for boxes larger than 30 by 30 inches and 14 gage for smaller boxes. Provide factory made standard sizes and shop fabricate when non-standard size boxes are shown. Comply with UL and NEMA standards. Use where conduit bodies are not practical.
- B. Interior, Exposed Dry Location:
 - 1. Provide NEMA 1 pull boxes hot-dipped galvanized after fabrication in accordance with ASTM 123.
 - 2. For boxes 64 in³ or larger, provide NEMA 1 pull boxes of steel fabrication, prime coated and finished with two coats of rust-resistant paint.

- C. Outdoor and wet locations or where indicated as weatherproof. Where located outdoors, in wet locations, or indicated as weatherproof, provide pull boxes constructed of code-gauge steel. Install cover with Type 303 stainless-steel bolts.
- D. Outdoor, wet and corrosive locations or where indicated as weatherproof: Where located outdoors, in wet locations, in corrosive areas, or where indicated as weatherproof, provide NEMA 4X pull boxes constructed of Type 304 stainless steel. Install cover with neoprene gaskets and Type 303 stainless-steel bolts.

2.15 SUPPORTING DEVICES

A. Channel and Channel Conduit Clamps

- 1. Steel Channel: Steel channel 1-5/8 inches wide by 1-5/8 inches or 3-1/4 inches high by 12-gage metal thickness conforming to ASTM A570, Grade 33. Hot-dip galvanize channels after fabrication per ASTM A123. Provide fittings and two piece U shaped conduit clamps formed from ASTM A570 Grade 33 Steel and hot-dipped galvanized after fabrication in accordance with ASTM 123. Provide Unistrut P1000HG for 1-5/8 inch channel, Unistrut P1001HG for 3-1/4 inch channels or equivalent.

B. Anchor Bolts and Screws

- 1. Materials
 - a. Indoor, Dry Locations: Anchor bolts and screws shall be ASTM A307 galvanized steel. Nuts shall be hex, ASTM A563 galvanized steel.
 - b. Outdoor, Wet or Corrosive Areas: Anchor bolts and screws shall be Type 316 ASTM A276 stainless steel. Nuts shall be hex Type 316 stainless steel, ASTM A194, Grade 8M, or ASTM F594, Type 316 stainless steel.
- 2. Types
 - a. Concrete: Wedge, sleeve, or self-drilling expansion anchor bolts.
 - b. Solid Masonry: Sleeve expansion anchor bolts.
 - c. Hollow Masonry: Toggle bolts.
 - d. Wood: HD Galvanized Lag bolts.

C. Threaded Rods

- 1. Non-Corrosive Areas: ASTM A36, A575 or A576 carbon steel with zinc-electroplating conforming to ASTM 164-71. Provide 3/8 inch minimum size.
- 2. Corrosive Areas: ASTM A276, Type 304 stainless steel. Provide 3/8 inch minimum size.

D. Conduit Clamps

1. Conduit runs on concrete, masonry or wood in non-corrosive areas: One hole galvanized malleable iron clamps with galvanized malleable iron pipe spaces (clamp backs).
 2. Supports at structural steel members: Malleable iron electrogalvanized steel beam clamps.
 3. Conduit Runs in Metal Stud Walls: Steel fasteners, Caddy MF clips, Minerallac stud clips or equivalent.
- E. Seismic Supports
1. Provide seismic supports complying with Section 16012.

2.16 UNDERGROUND PULL BOXES

- A. General: Provide precast concrete units complying with ASTM C858 with a load designation of A-16. Dimensions indicated on drawings are inside box dimensions. Provide units manufactured by Associated Concrete Products, Brooks Products, Christy or equivalent.
- B. Handholes: Refer to drawings for size. Provide handholes with concrete boltdown covers in unpaved areas and with flush mounted cast iron traffic covers with boltdowns and lifting hook in paved areas.
- C. Concrete pull boxes and vaults: Provide with pull-in iron, hot-dipped galvanized cover with hot-dipped galvanized frame, and two galvanized cable racks with porcelain blocks on each of the two longest sides. Provide parkway rated covers in non-traffic areas and AASHTO H-20 traffic rated covers in traffic areas. Refer to drawings for size. Secure covers with two stainless steel penthead bolts to stainless steel insert nuts. Cover frames shall be factory pre-cast into concrete. After cables have been pulled and inspected, seal box between cover and frame with a mastic compound similar to Parmagum, Dukaseal, or equivalent.
1. For pullboxes 2 by 3 feet and larger provide end hinged, torsion spring opening assist type cover assemblies. Provide single leaf assemblies for 2 by 3 feet pullboxes. Provide double leaf assemblies for pullboxes larger than 2 by 3 feet.
- D. Cover Identification: engrave or bead weld handhole and pullbox covers to indicated services within pullbox as follows:

Service	Identification
Power	Electric
Street Lighting	Street Lighting
General Area Lighting	Lighting
Telephone	Telephone

- E. Joint Sealing Compound: At joints, provide joint sealing compound conforming to Federal Specification SS-S-00210. Provide Associated Concrete Products Quickseal or equivalent.

2.17 CONDUIT FLASHING

Conduits passing through roof which cannot be routed within equipment curbs shall be flashed with seamless flashing assemblies. Provide flashings with conical steel reinforced boots, eight inch skirts, interchangeable bushing, and open top cast iron counterflashings. Seal flashing neck and the conduit with Permaseal waterproofing compound and secure protecting counterflashing to the conduit with vandal proof set screws. Seal the upper annular space between the conduit and the counterflashing with a waterproof epoxy compound. Provide Stoneman VERA-FLASH for single conduits, and Stoneman MULTI-FLASH for multiple conduits.

2.18 CONCRETE - ENCASED DUCT BANKS

Concrete shall conform to ASTM C94, with 28-day 3000 PSI compressive strength and minimum cement content of 376 pounds per cubic yard. Use a color additive for identification purposes: Brick red "Colorfull," as manufactured by Owl Manufacturing Company, Arcadia, California; coral red "Chrimix C-22," as manufactured by L.M Scofield Company, Los Angeles, California; or equivalent. Add the color additive while the concrete is being mixed using the quantity per cubic yard of concrete recommended by the manufacturer for the class of concrete indicated.

2.19 HAZARDOUS LOCATIONS

- A. Conform with NEC Articles 501 and 502 for areas identified as "Classified or Hazardous Areas".
- B. Provide threaded cast boxes and fittings for junction boxes and pull boxes in Class I and Class II areas. Unless otherwise indicated, boxes and fittings shall be UL listed for installation in Class I, Groups A, B, C, and D and Class II, Groups E, F, and G.
- C. Fixture hangers for pendant-mounted lighting fixtures shall conform to Class I, Division 1 and Class II Division 1 requirements.
- D. Provide conduit seals with sealing compound and fiber in Class I, Division I location within 18 inches of each conduit entering an enclosure containing electrical devices except for hermetically sealed switches and receptacles. Provide a conduit seal for each conduit leaving the hazardous location.
- E. Flexible connections to motors and other vibrating equipment in Class I, Division I locations shall be made with PVC-coated flexible fittings approved for Class I locations.

2.20 CONDUIT TAGS

- A. 2" round, 20 gauge Type 304 stainless steel, with 1/4" high lettering stamped into tag. Designation shall match that shown on conduit and cable schedule.
- B. Attach conduit tag with #6 stainless steel bead chain.
- C. Install conduit tags on all conduits inside of switchgear, switchboard, motor control center, panels, enclosures, pullboxes and manholes.

PART 3 EXECUTION

3.1 CONDUIT USAGE SCHEDULE

- A. General: Install the following types of conduits and fittings in locations listed, unless otherwise noted in the drawings.
- B. Exterior, Exposed:
 - 1. Material: Rigid metal conduit.
- C. Interior, Exposed, Dry, Wet and Damp Locations:
 - 1. Material: Rigid metal conduit.
- D. Interior, concealed, dry locations; typical for spaces above suspended ceilings, concealed in interior stud and masonry partitions:
 - 1. Material: Rigid metal conduit or electrical metallic tubing.
- E. Interior, concealed, damp locations; typical for embedded in masonry walls:
 - 1. Material: Rigid metal conduit.
- F. Embedded in Concrete excluding stub-ups:
 - 1. Material: Rigid metal conduit or rigid non-metallic conduit.
- G. Underground Direct Burial, or Below Concrete Slabs or Stub-ups:
 - 1. Material, excluding elbows and stub-ups: Rigid PVC conduit or PVC-coated rigid metal conduit.
 - 2. Elbows, excluding stub-ups (horizontal underground runs):
 - a. Conduit smaller than 3 inches: Rigid PVC conduit, Schedule 80.

- b. Conduit 3 inches and larger: PVC-coated rigid metal conduit.
 - 3. Stub-ups from below grade to above grade (includes elbows from horizontal underground to stub-up): PVC-coated rigid metal conduit.
 - 4. Stub-ups from below grade to above grade when entering bottom of electrical equipment installed on slabs-on-grade (includes elbows from horizontal underground to stub-up): Rigid PVC conduit, Schedule 40, with end bells.
- H. Underground Concrete Encased:
 - 1. Material: Rigid PVC conduit, Schedule 40.
 - 2. Elbows:
 - a. Conduit smaller than 3 inches: Rigid PVC conduit, Schedule 40.
 - b. Conduit 3 inches and larger: PVC-coated rigid metal conduit.
- I. Final connections to motors, transformers, vibrating equipment or instruments (pressure switches, valve limit switches etc.)
 - 1. Material: Liquid-tight flexible conduit.
 - 2. Length: Minimum three feet conduit lengths for conduits 3 inches or larger. Minimum two feet for remaining conduit sizes. Maximum six foot length.
- J. Connections to Recessed Lighting Fixtures:
 - 1. Material: Flexible conduit.
- K. Corrosive Locations:
 - 1. Material: PVC-coated rigid metal conduit with stainless steel channel and fittings. Provide PVC-coated conduit bodies, outlet devices and cover plates.
- L. Hazardous (NEC classified) Locations:
 - 1. Material: PVC-coated rigid metal conduit.

3.2 RACEWAY FILL

For runs that are not sized in drawings, compute the maximum conduit fill using NEC requirements for type XHHW/XHHW-2 conductors (larger if applicable), although the actual wiring may be with types of conductors having smaller cross-sections.

3.3 CONDUIT INSTALLATION, GENERAL

- A. Conduit runs are shown schematically. Install concealed unless specifically noted otherwise. Supports, pull boxes, junction boxes, and other ancillary equipment are not usually shown. Provide pull boxes and junction boxes where shown.
- B. Run exposed conduits parallel and perpendicular to surface or exposed structural members and follow surface contours as much as practical to provide a neat appearance.
- C. Make bends and offsets so that the inside diameter of conduit is not effectively reduced. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offsets parallel.
- D. Cap all conduits immediately after installation to prevent entrance of foreign matter.
- E. Do not use diagonal runs except for concealed areas or when specifically shown in the drawings.
- F. Route exposed conduit to preserve headroom, access space, and work space. Install with a minimum 10 feet mounting height. Install a maximum of 3 feet away from the ceiling.
- G. Treat threaded joints of rigid metal conduit with T&B "Kopr-Shield" before installing fittings where conduit is in slabs, damp or corrosive areas.
- H. Rigid Metal Conduit Terminations:
 - 1. Install conduits squarely to the box when terminating with locknuts and provide one locknut outside the box and one locknut and bushing inside the box. Install locknuts with dished side against the box. When terminating in threaded hubs, screw the conduit or fitting tight into the hub so that the end bears against the fire protection shoulder.
 - 2. When chase nipples are used, install the raceway and coupling square to the box and tighten the chase nipple leaving no exposed threads.
- I. Do not route conduits below or within concrete footing except to cross footing at 90 degree angles.
- J. Install exposed, parallel, or banked raceways together. Make bends in parallel or banked runs from the same center line so that the bends are parallel. Factory elbows may be used in banked runs only where they can be installed parallel.
- K. Provide expansion fittings for raceways crossing expansion joints in structures and in straight runs exceeding 100 feet.
- L. The distance between pull boxes shall not exceed 150 feet.
- M. Cut conduit square, ream and remove burrs before installation.

- N. Install PVC coated conduit in accordance with the manufacturer's instructions.
- O. Conduit Cleaning: Clean conduits with an assembly that consists of a flexible mandrel (manufacturer's standard product in lengths recommended for the specified size and type of duct) that is 1/4 inch less than inside diameter of duct, 2 wire brushes, and a rag. The cleaning assembly shall be pulled through conduit a minimum of two times or until all debris is expelled from the duct.
 - 1. Where cable is being installed in existing conduits, clean conduits a minimum of four weeks prior to cable installation. After cleaning, plug conduit ends with conduit plugs. Within 24 hours of installing cable, re-clean conduits.
- P. Conduit in Concrete Slabs: Run conduits 2 inches clear from face of slab and 3 inches clear between other conduits.
- Q. Conduit in Concrete Walls: Run conduits in center of wall and 4-inches vertical clear between other conduits.

3.4 GROUNDING

- A. Provide grounding in accordance with Section 16450.
- B. Use grounding bushings for conduits carrying a bonding jumper conductor.
- C. Provide a grounding conductor in flexible and liquidtight flexible conduit, size conforming to NEC Article 250 -Equipment Grounding Conductors.

3.5 CONDUITS EMBEDDED IN CONCRETE AND BELOW SLABS

Install conduits and sleeves passing through slabs, walls, columns or beams so as not to impair the strength of construction. Secure conduit to prevent sagging or shifting during concrete pour.

- A. Conduits larger than 1-1/2 inches in diameter may be embedded in structural concrete only after submittal and review of location and reinforcement details.
- B. Conduits shown under slab-on-grade construction shall be installed below the floor slab and under curing or dampproofing membranes. An exception may be made for conduit with an outside diameter not larger than 25% of the slab thickness, in which case, standards applying to slabs other than slab-on-grade may be used.
- C. Do not run conduit within concrete slabs and walls unless otherwise noted.

3.6 SUPPORTS

- A. Above Suspended Ceiling and at Structural Steel Members: Support conduit on or from the structure. Install conduits as close to the structure as possible.
- B. Conduit on Concrete, Masonry or Wood: Conduit clamps with pipe spacers (clamps backs). Grouped conduits may be supported with channel. Anchor with anchor bolts.
- C. Suspended Conduit: Split-hinged pipe rings with threaded rods sized for the weight to be carried. For grouped conduits, construct trapeze type racks with threaded rods and channel. Construct channel to limit deflection to 1/200 of span. Clamp each conduit individually to a channel members. Where rods are more than 12 inches long, provide seismic support as specified in Section 16012.
1. Construct trapeze type supports so two conduits may be added in the future. Future conduit size will be equivalent to the largest conduit on the support being constructed.
- D. Maximum Spacing of Raceway Supports:

Raceway Size (inches)	No. of Conductors in Run	Location	Support Spacing (feet)	
			RSC	EMT
Horizontal Runs				
1/2, 3/4	1 or 2	Flat ceiling or wall	5	5
1/2, 3/4	1 or 2	Where it is difficult to provide supports except at intervals fixed by the building construction	7	7
1/2, 3/4	3 or more	Any location	7	7
1 & Larger	1 or 2	Flat ceiling or wall	6	6
1 & Larger	1 or 2	Where it is difficult to provide supports except at intervals fixed by the building construction	10	10
1 & Larger	3 or more	Any locations	10	10
Any	---	Concealed	10	10
Vertical Runs				
1/2, 3/4	---	Exposed	7	7
1, 1-1/4	---	Exposed	8	8
1-1/2 & Larger	---	Exposed	10	10

- E. Seismically support raceways in accordance with Section 16012.
- F. Steel Channel: Cut steel channel straight and perpendicular. Remove all burrs and sharp edges prior to installation.

3.7 CONDUIT PENETRATIONS

- A. Unless otherwise indicated, dry-pack with nonshrink grout around raceways which penetrate concrete block, masonry and concrete walls, floors, or ceilings. Provide grout in accordance with Section 16051.
- B. Maintain the integrity of all damp-proofing and water proofing membranes that are penetrated by raceways and boxes.
- C. Gypsum Board Wall Penetrations: Provide circular penetrations maximum 1/8-inch larger in diameter than outer diameter of conduit being used. On both sides of the wall fill space between conduit and wall with joint compound, depth to match gypsum board thickness.
- D. Conduits passing vertically through concrete slabs above grade and through structural beams shall be sleeved, except where sealing and expansion/deflection fittings are required. Non-rated penetrations may be packed with nonshrink grout.

3.8 DAMAGED CONDUITS

- A. Repair or replace conduit damaged during or after installation.
- B. Replace crushed or clogged conduit or any conduit whose inner surface is damaged or not smooth.
- C. Repair cuts, nicks or abrasions in the zinc coating of galvanized conduit with galvanizing repair stick, Enterprise Galvanizing "Galvabra" or equivalent.
- D. Repair cuts, nicks or abrasions in the PVC coating of the conduit with the manufacturers recommended PVC material and build up surface thickness to match the factory coating thickness and color.

3.9 EMPTY CONDUITS

- A. Provide 200-pound strength, 1/8 inch diameter braided yellow polypropylene pull cord in empty conduits. Plug empty conduit ends with conduit plugs.
- B. Provide a 2-inch diameter, 20 gage Type 304 stainless steel tag on each conduit plug to indicate the destination of the other end.

3.10 OUTLETS FOR GENERAL WIRING

- A. Use multi-gang boxes and device plates where several devices are located in the same general area.

- B. Mount outlets for different conduit systems shown in the same wall areas not more than 5 inches on center.
- C. Locate switch boxes 4 inches from door jamb. Verify rough-in dimensions for outlets occurring above counters, cabinets, mirrors, etc. to ensure that finished outlet clears all trim.
- D. Rigidly support boxes for wall and ceiling outlets and finish flush and straight. Front edge shall be within 1/8-inch of finished surface and plumb. In stud walls use rigid bar hangers, attached to hanger with stud and nut. In ceilings attach to building structure. Anchor boxes into masonry construction with one or more integral flanges.
- E. Install outlets flush in exposed masonry and tile walls, with square corner boxes or standard boxes with square corner extensions, that are sufficiently deep so that conduit offsets are not required. Saw cut openings in exposed masonry and tile walls with an opening tolerance of 1/8-inch on all sides, placing bottom of box at nearest masonry joint to specified mounting height. For other wall finishes, install with plaster or other rings. Do not activate any outlet unless these installation requirements are met.
- F. No outlets shall be back-to-back. In non-fire rated walls, place outlets so that adjacent boxes facing opposite sides are isolated by a stud.
- G. Outlets in Fire Rated Walls: Separate outlets on opposite sides of fire rated walls a minimum distance of 24 inches. Cover back of outlet with firestopping pads.

3.11 UNDERGROUND PULL BOXES

- A. Set handholes and pullboxes level on a crushed rock base 6 inches thick with horizontal dimensions same as bottom of handhole plus 6 inches all around. Crushed rock shall be 3/4 inch maximum size, 1/4" minimum size. Set units parallel or perpendicular with adjacent structures.
- B. Seal pullbox joints located between box cover, extension and bottom with joint sealing compound.
- C. Install covers flush within finished paved or concrete surfaces. In unfinished areas, install covers one inch (1") above finished grade.
- D. Prior to project completion, clean out debris and dirt in pullboxes with concrete bottoms.

3.12 UNDERGROUND CONDUITS

- A. Provide 24-inch-minimum cover at finished grade for direct burial underground conduit. Provide 3-inch-minimum sand above and below conduit. Underground conduits shall be direct buried unless identified as concrete encased on the drawings.
- B. Provide 24-inch-minimum cover at finished grade above top of concrete for concrete-encased duct banks. Provide separation between conduits and encasement around conduits as detailed on the drawings. Extend the concrete encasement under any floor slabs or equipment mounting pads to the point of raceway termination. After the concrete envelope has set, pull a mandrel of a diameter approximately 1/4 inch less than the raceway inside diameter, through each raceway then pull a bristle brush through each raceway to remove debris.
- C. Where other utility piping systems are encountered or being installed along a raceway route, maintain a 12-inch-minimum vertical separation between raceways and other systems at crossings. Maintain a 12-inch-minimum separation between raceways and other systems in parallel runs. Do not place raceways over valves or couplings in other piping systems. Refer conflicts with these requirements to the Owner's Representative for instructions before further work is done.
- D. Maintain a grade of at least 4 inches per 100 feet, either from one pulling location to the next or from a high point between them, depending on the surface contour. Slope ducts from building to pull boxes or manholes.
- E. Changes in direction of over 10 degrees shall be with long sweep bends with minimum radii of 10 feet. Manufactured bends may be used at manholes or pull boxes for runs under 100 feet.
- F. Thoroughly clean conduits before laying. During construction and after completion, the conduit ends shall be kept plugged to prevent water from washing mud into the manholes or pull boxes.
- G. Terminate conduit in end bells in manholes and pull boxes and enter at right angles to the wall.
- H. Place conduit separators every 4 feet on centers and securely anchor to prevent movement.
- I. Backfill, Non-paved Areas: Use native backfill, compacted in 6 inch layers to 90 percent relative compaction. Final backfill elevation shall match existing.
- J. Backfill, Paved Areas:
 - 1. Use clean imported sand having the following gradation:

Sieve Size	Percent Passing by Weight
3/8 inch	100
No. 4	75 – 100

No. 30	12 – 50
No. 100	5 – 20
No. 200	0 – 15

2. Imported sand shall be free from organic material, trash, debris and rubbish.
3. Compact trench backfill by water flooding.

3.13 WARNING TAPES

- A. Bury warning tapes approximately 12 inches below grade, above all underground conduits and duct banks. Align parallel to and within 3 inches of the centerline of the conduit or duct bank.
- B. Plastic tape shall be yellow, 6 inch minimum width. Utilize tape made of material resistant to corrosive soil. Use tape with printed warning that an electric circuit is located below the tape. Manufacturers and types: ITT Blackburn Type YT, Griffolyn Co., Terra-Tape, or equivalent.

3.14 HAZARDOUS LOCATIONS

- A. Provide conduit seals in Class I, Division I locations within 18 inches of each conduit entering an enclosure containing electrical devices, except for hermetically sealed switches and receptacles which are UL labeled for the purpose.
- B. Provide a conduit seal for each conduit leaving the hazardous location.
- C. Flexible connections to motors and other vibrating equipment in Class I, Division I locations shall be made with flexible fittings approved for Class 1 locations.

3.15 CONDUIT SEALING

- A. Equipment and Enclosures
 1. Where underground conduits with cable enter equipment and enclosures, tightly seal cable within conduit with conduit sealing compound [conduit/cable sealing plugs]. Where underground empty conduits enter equipment, seal conduits with conduit plugs [watertight conduit plugs].
- B. Underground Pullboxes and Manholes
 1. At conduit entry locations, tightly seal cable within conduit with conduit sealing compound. For empty conduits, seal with conduit plugs.

3.16 ADJUSTING AND CLEANING

Upon completion of installation of raceways and boxes, inspect interiors of raceways and boxes; clear all blockages and remove burrs, dirt, and construction debris.

END OF SECTION

SECTION 16120
WIRES AND CABLES

PART 1 GENERAL

1.1 DESCRIPTION

Work included:

- A. Wires and cables, 600 volts and less.

1.2 RELATED WORK

Section 16010 - General Electrical Requirements.

1.3 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01300 and Section 16010.
- B. Submit catalog cuts and material list for each conductor type. Indicate insulation material, conductor material, voltage rating, manufacturer and other data pertinent to the specific cable, such as type shielding, number of pairs and applicable standards.
- C. Submit catalog cuts for devices.

PART 2 MATERIALS

2.1 GENERAL

Wires and cables shall comply with Section 16010.

2.2 POWER CONDUCTORS

- A. Conductor material: Class B stranded, soft annealed copper per ASTM B-3.
- B. Insulation: 600-volt insulated; color coded per Part 3: Identification.
 - 1. THHN/THWN-2: Lighting and receptacles.
 - 2. XHHW-2: All equipment and devices, other than lighting and receptacles.

- C. Minimum conductor size: No. 12 AWG

2.3 CONTROL CONDUCTORS

- A. Conductor: Class C stranded soft annealed copper per ASTM B-3.
- B. Insulation: THHN/THWN-2, 600-volt insulated, color coded per Part 3: Identification.
- C. Minimum Conductor Size: No 14 AWG.
- D. Multi-Conductor Cable: Where multi-conductor cable is indicated on the drawings, provide type TC, multi-conductor cable assemblies with an overall heat, moisture, and sunlight resistant PVC jacket. Conductor insulation shall be color coded per ICEA-S-58-679, method 1, colored compounds with tracers.

2.4 INSTRUMENT CABLE

- A. Twisted Shielded Pair - Single Pair Cable: Provide two #18 AWG stranded tinned-copper conductors individually insulated with color-coded polyethylene rated at 600 volts; insulated conductors shall be twisted together and shielded with a spiral-wound metal foil tape overlapped for 100% shielding. Provide 18 AWG, stranded, tinned copper drain wire. Outer overall jacket shall be PVC. Provide Belden 8760 or equivalent.

2.5 VARIABLE FREQUENCY DRIVE CABLE

- A. Provide all variable frequency drive (VFD) load side power wiring connection to motor with shielded multi-conductor copper cable designed for VFD application. No splicing allowed.
- B. Cable shall be UL Listed, 1000 volts rated, XLPE insulation, two spiral copper tape or foil/braid shield (100% coverage), with sunlight and oil resistant overall PVC jacket.
- C. Provide cable termination kit designed for terminating VFD cables. Terminating kit shall be approved for use by the VFD cable manufacturer.
- D. Provide VFD cable by Belden, OLFLEX, Southwire or equivalent.

2.6 CONDUCTOR CONNECTOR/SPLICES

- A. Aboveground Dry and Damp Locations, #10 AWG and Smaller: Wire nuts, 3M "Scotchlock", Ideal "Super Nut", Buchanan "B-Cap", or equivalent.

- B. Aboveground Dry and Damp Locations, #8 AWG and Larger:
 - 1. Use one piece, standard length barrel, copper compression splice. Provide Thomas and Betts two way connectors, Burndy "Hylink", Teledyne "Penn-Union Penn Crimps" or equivalent.
- C. In-ground Handholes and Pull Boxes, #10 AWG and smaller: As specified above plus sealing with individual sealing packs of Scotchcast 400 Resin or equivalent.
- D. In-ground pull boxes, #8 and larger:
 - 1. Use one piece, standard length barrel, copper compression splice. Provide Thomas and Betts two way connectors, Burndy "Hylink", Teledyne "Penn-Union Penn Crimps" or equivalent.
 - 2. Insulate splices with either tape or with shrinkable insulators.
- E. See Sections 16450: Grounding for connectors used with specialized grounding applications.

2.7 MOTOR TERMINATIONS

Splice conductors to motor leads with copper compression terminal lugs bolted together and insulated with an EPDM rubber slip-on lug cover. Provide 3M Electrical Products 1000V or less Non-Shielded Cable Motorlead Splicing Kits or equivalent.

2.8 PULLING COMPOUND

Use only cable pulling compound which is approved by the manufacturer of the cable as being compatible with cable insulation and jacket materials.

2.9 CONDUCTOR TAGS

- A. For termination of individual conductors, provide plastic sleeve markers, Thomas and Betts, SM markers; Panduit Clip-On markers, Brady SCD clip sleeve markers or equivalent. For conductors terminated within control panels, refer to Section 16950 for conductor tag requirements.
- B. For cables routed through handholes, pull boxes, manholes, motor control centers, switchboards, and switchgear, provide 2-inch round, 20 gauge Type 304 stainless steel tags. Stamp with ¼-inch high lettering identifying the cable identifier.

2.10 ELECTRICAL TAPE/SHRINKABLE INSULATORS

- A. Vinyl Tape: 7 mil, 600 volt rated, flame retardant, hot and cold weather resistant vinyl tape conforming to UL 510. Provide 3M Super 33+ Scotch vinyl tape or equivalent.
- B. Vinyl Tape for Color Coding: 7 mil, 3/4" wide, hot and cold weather resistant vinyl tape conforming to UL 510. Provide 3M 35 Scotch vinyl tape or equivalent.
- C. Vinyl Mastic: 90 or 125 mil self fusing, rubber based insulating vinyl mastic laminated to PVC. Provide 3M 2200 or 2210 or equivalent.
- D. Rubber Tape: EPR rubber, 90 degrees C continuous rated. Provide 3M 130C Scotch Tape or equivalent.
- E. Varnished Cambric Tape: Adhesive backed, 9-mil bias cut cotton tape, coated with yellow insulating varnish. Provide 3M 2520 or equivalent.
- F. Shrinkable Insulators: Provide heat or cold shrinkable insulator tubing. Provide Thomas and Betts "Shrink-Kon" heat shrink insulators, 3M thick wall heat shrinkable cable sleeves, 3M 8420 series cold shrink cable sleeves or equivalent.

PART 3 EXECUTION

3.1 WIRE INSTALLATION

- A. Install wiring and cable in conduit unless otherwise noted.
- B. To reduce pulling tension in long runs, coat cables with pulling compound.
- C. Remove debris and moisture from the conduits, boxes and cabinets prior to cable installation.
- D. Group conductors in panelboards, motor control centers, cabinets, pull boxes and switchboard wireways; tie with plastic ties; and fan out to terminals.
- E. Terminate phase conductors A, B and C reading left to right, front to back or top to bottom looking into the front of the equipment.
- F. Install control wire and instrument cable between devices without splices.

3.2 IDENTIFICATION

- A. Color Coding of Power Wire: Provide color coding throughout the entire network of feeders and circuits (600 volts and below) as follows:

Phase	240/120 Volts	208/120 Volts	240 Volts	480/277 Volts
Phase A	Black	Black	Black	Brown
Phase B	Red	Red	Red	Orange
Phase C	---	Blue	Blue	Yellow
Neutral	White	White	White	Gray
Ground	Green	Green	Green	Green

- B. Conductors #10 AWG and smaller shall have factory color coding with solid color insulation.
- C. Conductors #8 AWG and larger shall have factory color coding with solid color insulation or with three wide color stripes co-extruded with the cross-linked polyethylene insulation or shall have black insulation with on-site application of colored tape at conductor terminations and at splices. If color tape is used, install 2 layers minimum.
- D. Control wires shall have colored insulation. Field control wires shall be violet, with the exception of neutral.
- E. Tagging of Conductors: Tag control wires and instrument cable in panels, junction boxes, pullboxes, handholes, manholes, wireways and at control devices. Tag control wires and instrument cables with same wire numbers as on the shop drawings submittals or drawings. Tag power wires in pullboxes, manholes, handholes and wireways or tag with the feeder identifier if shown on the drawings or panelboard number and circuit numbers. In panelboards, tag conductors with circuit numbers one inch from termination at circuit breaker.

3.3 WIRE SPLICING AND CONNECTING

- A. Tighten electrical connections and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A and UL 486B.
- B. Retighten bolt-type connectors 24 to 48 hours after initial installation and before taping.
- C. Insulate splices with either tape or with shrinkable insulators.
- D. Tape connections as follows: Step 1 - apply one layer of varnished cambric tape; Step 2 - apply vinyl mastic for air/moisture seal; Step 3 - apply one layer of rubber tape half lapped; Step 4 - apply two layers of half lapped vinyl tape.
- E. At switchboards, terminate conductors with copper conductor compression lugs.

END OF SECTION

SECTION 16140
SWITCHES, RECEPTACLES, AND OUTLETS

PART 1 GENERAL

1.1 DESCRIPTION

Work included:

- A. Switches
- B. Receptacles
- C. Outlets

1.2 RELATED WORK

Section 16010 - General Electrical Requirements

1.3 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01300 and Section 16010.
- B. Submit material list and catalog cuts for each type of switch, receptacle and cover plate. Indicate type, ratings, material, color, and manufacturer.

PART 2 MATERIALS

2.1 GENERAL

Switches and receptacles shall comply with Section 16010.

2.2 RECEPTACLES

- A. Duplex Receptacles: Provide molded composition, ivory specification grade receptacles complying with Federal Specification WC-596-F. Duplex receptacles for 120-volt, single-phase, 3-wire service to be rated 20 amperes, 125 volts, NEMA Type 5-2OR.

- B. Double Duplex Receptacles: Double duplex receptacles for 120-volt, single-phase service to be same as duplex receptacle with the two duplex receptacles installed in one 4" X 4" outlet box with one two-gang faceplate.
- C. Ground Fault Circuit Interrupter Duplex Receptacles: Receptacles shall be rated 20 amperes and comply with UL-943, Class A. Provide Leviton 6899-I, or equivalent.
- D. Clock: Single outlet having a smooth ivory cover plate with both a hanger hook and stud for supporting the clock and a recessed area for coiling excess wire.
- E. Corrosion-Resistant Duplex Receptacles: Provide corrosion-resistant receptacles for areas identified as "Corrosive Area" on the drawings. Provide yellow melamine, specification grade receptacles complying with Federal specification WC-596-F. Duplex receptacles for 120-volt, single phase, 3 wire service to be rated 20 amperes, 125 volts, NEMA type 5-20R. Provide Hubbell 53CM62G, General Electric 0526-C or equivalent.

2.3 SWITCHES

- A. Provide molded composition, ivory, specification grade complying with federal specification WS-896E, single pole, three or four way as shown on the drawings.
- B. 120- or 277-Volt Lighting: Provide switches rated 20 amperes, 120/277-volt a-c. Provide quiet operation, toggle type switches.

2.4 COVER PLATES

- A. Provide engraved or etched cover plates to indicate equipment or area serviced for equipment, pilot switches, control circuit switches, three-gang or larger gang switches, and switches from which the equipment controlled cannot be readily seen. Receptacles other than standard duplex receptacles shall have their cover plates engraved or etched to indicate panelboard and circuit number. Lettering shall be 1/8 inch high with filler of black color. Provide a separate nameplate mounted above receptacles for receptacles without cover plates or where engraving or etching is impractical. Nameplate shall be as described in Section 16010 except with 1/8-inch-high lettering.
- B. Provide smooth, no line, rounded edge type 430 stainless steel plates in electrical and mechanical equipment rooms, utility rooms and in unfinished areas on recessed boxes. For surface mounted boxes use galvanized steel plates.
- C. In wet areas, areas subject to hosing down, areas identified as "Corrosive Area," or where indicated, use individually gasketed weatherproof cover plates.
 - 1. For receptacles provide gray polycarbonate lift-cover type suitable for use in wet location with cover closed or with cover open with receptacles in use. Provide Tay Mac standard cover Safety Outlet Enclosures or equivalent.] [Outdoor receptacles

shall have flush locked cover in stainless-steel finish. Provide Pass and Seymour Sierra WPH-8L equivalent.

2. For light switches provide die cast aluminum cover plate with neoprene gasket, exterior toggle switch and locking capability.
- D. Provide ivory smooth style, noncombustible, mar-resistant thermoplastic (nylon) plates in all remaining locations.
- E. For telephone and data outlets provide blank cover plates.

PART 3 EXECUTION

3.1 GROUNDING

Provide a bonding jumper between the grounded outlet box and the receptacle ground terminal.

3.2 TESTING

- A. Operate each switch and verify that the load is turned on and off.
- B. Test each receptacle with a circuit tester that checks voltage polarity, and grounded conditions. Repair or replace defective receptacles and repeat the test.

END OF SECTION

SECTION 16150
ELECTRIC MOTORS

PART 1 GENERAL

1.1 DESCRIPTION

Work included:

- A. Electric Motors, 500 hp and less.

1.2 RELATED WORK

- A. Section 16010 - General Electrical Requirements.
- B. Section 16155 - Low-Voltage Motor Control.
- C. Section 16157 - Variable Frequency Drives.

1.3 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01300 and Section 16010.
- B. Show complete nameplate data, ratings, characteristics, mounting arrangements, size and location of conduit entry, location and size of grounding lug, and coatings.
- C. Submit catalog cuts for accessories.
- D. Submit efficiency and power factor at full, 3/4 and 1/2 load and locked rotor current.
- E. Submit bearing information including catalog cuts and calculations for thrust loads and life ratings. Calculations shall be in accordance with the bearing manufacturer's recommendations. Submit with the calculations a signed letter from the bearing manufacturer's engineer stating that the calculations have been done correctly.
- F. Nameplate designations, sizes and mounting methods.
- G. Submit factory test results.
- H. Submit calculated performance curves for the following:

1. Speed versus torque/current.
2. Efficiency, power factor, speed, KW and current versus load at full voltage.
3. Safe stall time versus percent of full load (from full load to locked rotor amperes).
4. Speed versus torque for the driven equipment.

1.4 OPERATION AND MAINTENANCE MANUALS

Submit operation and maintenance manuals in accordance with Section 01680 and Section 16010.

PART 2 MATERIALS

2.1 GENERAL

- A. Motors and accessories shall comply with Section 16010. Motors shall conform to NEMA MG-1.
- B. Provide single speed, hollow shaft squirrel cage induction motors, NEMA design B (normal starting torque, low starting current) NEMA starting code F or G. Provide copper stator windings.
- C. The connected load (maximum HP required) of each motor shall not exceed its nameplate HP rating (exclusive of service factor) under any operating condition. Motor speed shall be as required for driven equipment.
- D. Size motors to start and accelerate the design load of the driven equipment without exceeding any of the specified design requirements. Replace or repair any motor failing these requirements with a motor that will meet the specifications and requirements at no additional cost to the Owner.
- E. Open dripproof and weather-protected motors shall have a service factor of 1.15, and totally enclosed motors shall have a service factor of 1.0, unless a higher service factor is standard for the operating duty.
- F. Rate motors for continuous duty at an ambient temperature of 50°C and at an altitude of 3,300 feet.
- G. Unless otherwise noted, provide AC motors 1/3 HP and smaller at 115 volts, single phase, 60 Hz, and motors 1/2 HP and larger at 460 volts, 3 phase, 60 Hz.

- H. Equip motors with stainless steel hardware including grease fittings, pipe plugs and machine screws. Equip motors with two lifting lugs.
- I. Motors shall be suitable for the following starting methods:
 - 1. Full voltage start.
- J. For motors controlled by variable frequency drives, use a motor whose critical frequency is not within the operating range of the VFD.
- K. Provide energy efficient motors with minimum full load efficiencies in accordance with NEMA MG 1-12.55. Determine efficiency by IEEE 112 method B for motors up to 300 HP.

2.2 ENCLOSURES

- A. Provide motors with the following enclosure types:
 - 1. As indicted in equipment specifications
- B. Provide open drip proof and weather-protected motors with stainless steel screens over openings. Screen mesh size shall not be larger than 0.125 inch.
- C. Provide motors installed in wet locations with drain openings and plugs.
- D. Provide rotation arrows on enclosures to indicate the required rotation of loads.

2.3 INSULATION AND TEMPERATURE RISE

- A. Insulation: Provide Class F capable of operating at a maximum hot-spot temperature of 155°C.
- B. Temperature Rise: Provide Class B temperature rise (80 degrees C) at unity service factor, rated horsepower, voltage and frequency with an ambient temperature of 40 degrees C.

2.4 BEARINGS

- A. Vertical Motors
 - 1. Provide bearings of the type and size required to meet the thrust loading requirements with a rated B-10 life of 100,000 hours as defined by the Anti-Friction Bearing Manufacturers Association (AFBMA).

2. Bearings for motors 75 HP and larger shall be oil lubricated and contained in an oil reservoir with oil sight level gage and oil fill and drain openings with plugs.
3. Equip grease lubricated bearings with fittings in each bearing housing. Fittings shall be accessible without removals of any covers or guards. Provide drains to prevent over lubrication.

B. Horizontal Motors:

1. General: Equip motors larger than one (1) HP with end single shielded bearings of either the anti-friction or sleeve type with a rated B-10 life of 100,000 hours as defined by the AFBMA.
2. Anti-Friction Type: Grease lubricated type with sealed end caps to prevent grease from migrating to the bearing exterior. Provide with an excess-grease reservoir located outboard of the bearing and provisions for purging old grease.
3. Sleeve Type: Oil lubricated type contained in an oil reservoir with oil sight level gage and oil fill and drain openings with plugs. Provide bearings with shaft seals and pressure-equalizing vents to prevent oil from migrating to the motor windings.

2.5 CONNECTION BOXES

- A. Provide motors with NEMA MG-1 type I connection boxes made of fabricated steel or cast iron construction compatible with the motor specified. Provide boxes with gaskets between the box and motor and between the box and cover. Boxes shall be capable of rotation in 90° increments.

2.6 PROTECTIVE DEVICES

- A. Provide stator winding protection by the following devices:
- a. Enclose control module within a NEMA 4 enclosure mounted on the motor.

Thermistor Selection Chart												
Service Factor	1.0						1.15					
	Alarm			Shut Down			Alarm			Shut Down		
Purpose	A	B	F	A	B	F	A	B	F	A	B	F
Temperature Rise Class												
Open Motors without Ducts*	105	115	145	115	125	155	105	125	155	115	135	165
Open Motors with Ducts & TEFC Motors	105	125	155	115	135	165	115	135	155	125	145	165

*Ducts – Refers to spacers built into rotor and stator laminations for additional cooling.

- B. Provide bearing protection by the following devices:

1. Two bearing temperature relays with indicating scale, one per bearing.
- C. Prewire protective device lead wires to the auxiliary terminal box.

2.7 NAMEPLATES

A. Equip motors with stainless steel nameplates fastened with stainless steel pins.

B. The main nameplate shall contain the following information:

1. Rated Horsepower
2. Full load speed
3. Frequency
4. NEMA KVA Code and Design letter
5. Rated Voltage
6. Rated Current
7. Serial Number
8. Service Factor
9. Insulation Class
10. Temperature Rise
11. Maximum Ambient Operating Temperature
12. Frame Size and Designation

C. Provide the following additional nameplates as follows:

1. Space heater nameplate to indicated the rating of the space heater provided on motor when required.

THIS MACHINE IS EQUIPPED WITH
ELECTRIC SPACE HEATERS TO
PREVENT CONDENSATION OF MOISTURE
VOLTAGE _____ WATTS _____

2. Caution plate for space heaters.

WARNING
DO NOT SERVICE UNIT WITHOUT
FIRST DE-ENERGIZING HEATER

3. Oil lubrication instruction plate.

BEARING LUBRICATION INSTRUCTIONS

OIL CAPACITY _____ OZ.

APPROX. VISCOSITY _____ SUS AT 100°F
FILL TO LEVEL INDICATED. DO NOT FILL
WHILE RUNNING.

4. Caution plate for starting duty of motor.

CAUTION
FOLLOWING STARTING DUTY MUST NOT BE EXCEEDED

_____ START(S) IN SUCCESSION WITH MOTOR INITIALLY
AT AMBIENT TEMPERATURE

_____ START(S) IN SUCCESSION WITH MOTOR INITIALLY
AT RATED OPERATING TEMPERATURE

SUBSEQUENT STARTS AFTER
LIMITED TO _____ HOUR(S) APART.

SUBSEQUENT STARTS AFTER
LIMITED TO _____ HOUR(S) APART.

RATED VOLTAGE & FREQUENCY MUST BE WITHIN NEMA LIMITS AND LOAD
INERTIA AT MOTOR SHAFT IS NOT TO EXCEED _____ LBS. FT2

5. Bearing information nameplate.

BEARING INFORMATION

THRUST BEARING

TYPE: _____
MANUFACTURER: _____
CAT#: _____

GUIDE BEARING

TYPE: _____
MANUFACTURER: _____
CAT#: _____

2.8 VIBRATION

Maximum motor vibration shall be as follows (measured in peak-to-peak inches):

Speed	Vibration
3000 and above	.0010

1500 - 2999	.0150
1000 - 1999	.0020
999 and below	.0025

2.9 ACCESSORIES

- A. Space Heaters: Equip motors with 120 volts, 60 Hz heaters to maintain an internal motor temperature of 10 degrees C above ambient. Terminate leads in an auxiliary terminal box.

PART 3 EXECUTION

3.1 STORAGE

- A. Protect motors from exposure of elements for which they are not designed. Install and energize temporary electrical service to motors with electrical heaters.
- B. Unless protected by manufacturer's packing, upon delivery, carefully wrap each motor in three layers of 8 mil minimum polyethylene. Secure the wrap with adhesive tape to minimize the entrance of moisture. For base mounted motors, wrap the entire assembly.

3.2 FACTORY TEST

- A. For each motor perform a routine short commercial test in accordance with NEMA MG1-12.51. Test consists of:
 1. Locked Rotor Current.
 2. No Load Current.
 3. Winding Resistance.
 4. High Potential.
 5. Bearing Inspection.

3.3 SITE TESTS

- A. Run each motor with its control as nearly as possible under operating conditions to demonstrate correct rotation direction, alignment, wiring size, proper overload relay sizing, speed and satisfactory operation. Test interlocks and control features to verify correct wiring and operation.

- B. Record current in each phase of each motor 1/2 hp and larger and include in the maintenance manual. Repair or replace motor or driven equipment if current exceeds motor nameplate value.

- C. Where indicated, conduct a vibration test in the field after the installation has been completed. The tests shall be conducted for each motor when specifically noted or when ordered by the Owner in cases of discernible abnormal vibration. Vibration shall not exceed values specified.
 - 1. Measure N-S and E-W vibration at top and bottom of front and rear bearing housing.

END OF SECTION

SECTION 16155
LOW VOLTAGE MOTOR CONTROL

PART 1 GENERAL

1.1 DESCRIPTION

Work included:

- A. Low-voltage motor control equipment.

1.2 Related Work

- A. Section 16010 - General Electrical Requirements
- B. Section 16015 - Equipment Drawings/Diagrams
- C. Section 16157 – Variable Frequency Drive Systems
- D. Section 17110 – Enclosures and Control Panels

1.3 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01300 and Section 16010.
- B. Submit manufacturer's descriptive data including ratings, circuit diagrams, dimensional data, conduit entry restrictions and overload heater ratings. For NEMA 3R enclosures, show additional equipment including layout and dimensions which will be located within the enclosure.
- C. Submit equipment fabrication Drawings/Diagrams in accordance with Section 16015.
- D. Submit a legend and abbreviation sheet defining symbols and abbreviations used on the drawings.
- E. Submit catalog cuts of all devices used.
- F. Submit nameplate designations, sizes and mounting methods.
- G. Submit control power transformer voltage regulation information.

- H. Submit seismic anchoring calculations and methods per Section 16012.
- I. For motor control center NEMA 3R enclosures, show additional equipment (including layout and dimensions) which will be located within the enclosure.

1.4 RATINGS

Motor horsepower ratings and enclosure shown are minimum expected. This does not limit the equipment size. When motors furnished differ from the minimum ratings indicated, make the necessary adjustments to wiring, conduit, disconnect devices, motor starters, branch circuit protection and other affected material or equipment to accommodate the motors actually installed, at no additional cost to the Owner.

1.5 OPERATION AND MAINTENANCE MANUALS

Submit operation and maintenance manuals in accordance with Section 01680 and Section 16010.

1.6 SYSTEM INTEGRATORS

The following companies are known system integrators. The companies are listed for information only and the Contractor is not required to use the services or products furnished by these companies:

TESCO 8440 Florin Road Sacramento, California 95828 (916) 395-8800 Fax: (916) 395-8362	Krug-Bixby-Long Associates 26269 Research Road Hayward, California 94545 (510) 887-1117 Fax: (510) 887-1153
Telstar Instruments 4017 Vista Park Court Sacramento, CA 95834 (916) 646-1999 Fax: (916) 646-1096	

PART 2 MATERIALS

2.1 GENERAL

Low-voltage motor control devices and equipment shall conform with Section 16010.

2.2 MOTOR CONTROL CENTERS

- A. Motor Control Centers (MCC) shall be dead front, dead rear, floor standing and front accessible NEMA 3R construction. The voltage, ampere, and interrupt ratings and physical dimensions shall be as indicated on the drawings. Wiring shall be NEMA Class IIS, Type

B, with wiring schematics showing field connections. Tag control wiring within 2 inches of termination at each device and terminal board. Schematics shall also show terminal numbers and interior and field wire numbers.

- B. Provide channel iron sills and removable lifting angles.
- C. Provide a separate 4-inch vertical wireway for each MCC section with cable supports and a hinged door separate from the unit starters. Provide 6" horizontal wireways, both top and bottom for each MCC section with removable covers held closed by captive screws. Isolate wireways from bussing.
- D. Provide removable, plug-in type individual compartments separated by steel barriers and with separate hinged doors for each starter, circuit breaker or other unit. Locate equipment to enable termination of field wiring from front without equipment removal.
- E. Mechanically interlock starter and circuit breaker doors so doors cannot be opened with unit energized. Provide defeater mechanism to allow intentional access while starter or circuit breaker is energized. Provide provisions for padlocking external disconnect handles in the OFF position.
- F. Bus bars shall be silver plated copper, braced to withstand the RMS symmetrical short circuit current ratings as shown on the drawings and sized for maximum current carrying capacity of 1,000 amps per square inch. Provide full horizontal bus rating for entire length of the MCC.
- G. Provide a continuous, front accessible 200-ampere-minimum ground bus extended the full length of the MCC.
- H. Feeder circuit breakers shall be molded-case type. Provide quick-make and quick-break toggle mechanism, inverse-time trip characteristics and trip-free operation on overload or short circuit. Indicate automatic tripping by a handle position between the manual OFF and ON position. Provide trip ratings and number of poles as indicated on the drawings. Provide breakers with fault current interruption ratings equal to or greater than the motor control center short-circuits current rating shown on the drawings.
- I. Combination starters shall be as described in "Combination Motor Starters" in this section.
- J. Provide a main nameplate as specified in Section 16010 with minimum 1/2 high lettering. Indicate the MCC identifier, voltage, amperes, number of phases and wires and feeding source of the MCC. Example:

MCC-A
480V 600A 3P 3W
Fed From: SWBD2A

- K. Motor control centers shall comply with applicable NEMA, UL and ANSI standards for industrial control. Provide UL label on each motor control center section.
- L. MCC and anchoring supports shall comply with Section 16012: Seismic Restraint for Electrical Equipment.
- M. Provide Eaton Freedom, Schneider Electric Model 6, Allen-Bradley Centerline 2100, General Electric Spectra 8000 line or approved equivalent.
- N. Provide a NEMA 3R non-walk-in enclosure for the MCC. Doors shall be three point, latched, with pad lock provisions. Provide filtered louvered door ventilation, lighting, switches and receptacles, thermostatically controlled space heaters for each section, thermostatically controlled exhaust fan ventilation.

2.3 COMBINATION STARTERS

- A. Provide interior starters with NEMA 1 enclosure and exterior starters with NEMA 3R unless otherwise noted on the plans.
- B. Mechanically interlock door so it cannot be opened with unit energized. Provide defeater mechanism to allow intentional access while starter is energized. Provide provisions for padlocking external disconnect handle in the OFF position.
- C. Starter and devices shall be as described in "Combination Motor Starters" in this section.
- D. Starters shall have nameplates as specified in Section 16010.

2.4 COMBINATION MOTOR STARTERS

- A. Comply with NEMA ICS, Class A and with NEC Article 430.
- B. Combination Motor Starters: Provide circuit-breaker type equipped with adjustable magnetic-trip circuit breakers (motor circuit protectors) as noted on the drawings. The short-circuit rating shall be at least 22,000 amperes symmetrical. Where a higher short-circuit rating is shown on the drawings, provide current-limiting type breakers or circuit breakers with current limiters to achieve the short-circuit rating.
- C. Control Power Transformer: Provide copper wound, vacuum impregnated dry type control transformer with screw-type terminals. Provide 120 volt with minimum 100-volt-ampere spare capacity that is in addition to contactor load plus other loads specified. Size transformer for a maximum voltage drop of 5% with 100% primary voltage during contactor inrush. Fuse one side of secondary winding and ground other side. Provide primary winding fuses for both sides of the primary winding.

- D. Motor Contactors: Provide electrically operated, electrically held, three pole assemblies with double break cadmium oxide silver contacts. The design shall meet or exceed the applicable requirements of UL and NEMA. IEC rated contactors are not acceptable and shall not be provided. Provide contactors with block type manual reset, eutectic three pole overload relay assembly with visual trip indicators, non-ambient temperature compensated eutectic type heaters for each phase, and one common, normally closed and one normally open contact. Contactors shall have provisions for a total of four auxiliary contacts. Provide number of auxiliary contacts required for control operation plus one spare NO and NC auxiliary contact. The manufacturer shall verify the motor ratings and coordinate the starter overloads with the actual horsepower ratings of the motors installed.
- E. Provide indicator lights, selector switches, push-buttons, ammeter, fuse holder etc., where shown in the wiring diagrams and single line diagrams. Mount on the front panel of the starter.
- F. Provide externally operable overload relay reset buttons and disconnect operators.
- G. Provide control relays, time-delay relays, etc., within the starter enclosure as shown in the schematic wiring diagrams.
- H. Control Relays: Provide magnetically held type with NEMA A300 convertible contacts for 120 or 208 volt circuits and NEMA A600 convertible contacts for 480 volt circuits, with coil voltage, number of poles and pole arrangement as indicated on the drawings. Relays shall be Allen-Bradley Bulletin 700, Schneider Electric Class 8501 Type X, General Electric CR120B or equivalent.
- I. Time-Delay Relays: Provide solid state, magnetically held type with NEMA A300 rated convertible contacts, with coil voltage, number of poles, pole arrangement and maximum timing adjustment as indicated on the drawings.
- J. Power Fail Relays: Provide with phase loss, low voltage and phase reversal functions. Provide adjustable trip delay, restart delay and voltage trip settings. Provide a green LED indicating NORMAL and a red LED indicating TRIP. Provide Time Mark model 2583 with TimeMark Smart Sockets, Type C or equivalent.
- K. Control Power Fuses: Provide 13/32, 1/4 inch by 1-1/2 inch with an AIC rating of 10,000 amperes. Provide a panel mounted fuse holder with clear bayonet knob and blown fuse indicating neon lamp. Provide Bussman HG series or equivalent.
- L. Pushbuttons and Selector Switches: Provide NEMA Type 4/13 for indoor and exterior areas with NEMA A300 rated contacts. Pushbuttons shall be standard size, (30.5 mm mounting hole) round, flush head with momentary contacts. Selector switches shall be standard size, (30.5 mm mounting hole) round with standard operator.
- M. Pilot Lights: Provide standard full size transformer type, (30.5 mm mounting hole) NEMA Type 4/13 for interior and exterior areas, complete with color of lens indicated on drawings

and legend plate. Lamps shall be high density light emitting diodes. Indicating lights shall be push-to-test type.

- N. Control Wiring: Provide Class C stranded copper MTW. Provide No. 14 AWG minimum conductor size.
 - 1. Conductor Tags: Provide plastic sleeve markers, Thomas and Betts SM markers; Panduit Clip-On markers; Brady SCD clip sleeve markers or equivalent.
- O. Nameplates:
 - 1. Provide exterior nameplates as specified in Section 16010 indicating the device controlled, the identification number, the device size, the starter type and location of the device. Provide additional information if indicated on the single line diagrams. Example: Chilled Water Pump CWP-1, 50 HP, FVNR Chiller. Provide nameplates within the enclosure to identify relays and all other components. Nameplates shall agree with identification on drawings.
 - 2. Provide nameplates for operator interface devices (pushbuttons, pilot lights, etc.) Provide anodized aluminum nameplates with 1/8 inch high black engraved lettering and contrasting painted lower half. Nameplate lettering shall be as shown on the schematic wiring diagrams.
- P. Elapsed Time Meters: Provide synchronous motor driven, 0 to 99,999.9-hour range, nonreset type, suitable for semiflush, panel mounting. Provide Yokogawa 2-1/2-inch Big Look unit or equal.
- Q. Terminal Blocks: Control wiring terminal blocks shall be the hinge split type assembly to provide foreign voltage isolation in compliance with NEC article 430. Provide terminal blocks for incoming and outgoing cable.
- R. Motor Protector Relay: Shall be as described in "Motor Protector Relays" in this Section.
- S. Control Power Circuit Breakers: Provide molded case, DIN rail mounted circuit breakers with number of poles and accessories as shown on the drawings. Provide Allen Bradley 1492-GH, General Electric V-Line or equivalent circuit breakers.

2.5 MANUAL MOTOR STARTERS

- A. Fractional: Provide for single phase motors rated 1 Hp, 277V or less. Provide with toggle operator, provisions for padlocking in the OFF position. Provide number of poles and size of thermal overload heaters for the motor being controlled. Provide NEMA 1 surface enclosures for starters located indoors and NEMA 4 for enclosure for starters located outdoors or as indicated. Provide with nameplates as specified for combination starters.

- B. Integral: Provide for single phase motors rated larger than 1 Hp and for three phase motors. Provide with push button operation, provisions for padlocking in the OFF position. Provide number of poles and size of thermal overload heaters for the motor being controlled. Provide NEMA 1 surface enclosures for starters located indoors and NEMA 4 for enclosure for starters located outdoors or as indicated. Provide with nameplates as specified for combination starters.

2.6 MOTOR PROTECTOR RELAYS (MPR)

- A. Provide solid state motor protector relays where indicated on the drawings. Provide SymCom, Inc. Model 777 (800-843-8848, www.symcominc.com).
- B. Provide MPR with the following programmable functions:

Programmable Settings	Range (Increment)/[settings]
Overcurrent Trip (overload)	Undercurrent Trip – 5.00(0.02)
Undercurrent Trip	0.00 – Overcurrent Trip (0.02)
Current Unbalance Trip	2.00 – 50.0%(0.2)
Trip Delay (except phasing and overcurrent faults)	2.00 – 50.0 seconds
Restart Delay on power up	0 – 500 seconds (2)
Restart Delay after all faults except undercurrent	0 – 500 minutes (2)
Restart Delay after undercurrent (dry well recovery time)	2 – 500 minutes (2)
Number of restarts after all faults	0,1,2,3,4 or 999
Motor Acceleration Time	0.0 – 50.0 seconds (0.2)

- C. Provide with remote CT for application larger than 90 amperes.

2.7 SEISMIC REQUIREMENTS

Motor Control Centers and anchoring supports shall comply with Section 16012: Seismic Restraints for Electrical Equipment.

PART 3 EXECUTION

3.1 INSTALLATION

Secure motor control centers rigidly to floors or mounting pads with anchor bolts as specified in Section 16110.

3.2 CONDUCTOR TAGGING

At a point 1/2 inch away from devices, tag control conductors with conductor tags. Tags shall identify the wire number corresponding to the drawings.

3.3 INSULATION TESTS

- A. Prior to energizing, perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground for one minute at a test voltage of 1,000 volts DC. Perform tests with branch disconnects and the main disconnect in the OFF position.
- B. Submit test results for review.

3.4 ADJUSTMENTS

- A. Set adjustable trip circuit breakers two settings above the setting that causes the breaker to trip during motor starting. Do not adjust the setting above 1,300% of the motor nameplate current rating.
- B. Field test combination magnetic motor starters with all field wiring connected. Set adjustable set points and time delays as required. Check operation of control logic and field devices to verify correct operation. Perform adjustments required for correct operation.
- C. Set Power Fail Relays as follows: Voltage Trip - 440 volt for 480 volt system; 190 volts for 208 volt systems; Trip Delay - 5 seconds; Restart Delay - 5 seconds.

3.5 SPARES

- A. Provide three spare fuses for control power transformer protection of each type and ampere rating installed.
- B. Provide five spare pilot light lamps.

END OF SECTION

SECTION 16157

VARIABLE FREQUENCY DRIVE SYSTEMS

PART 1 GENERAL

1.1 DESCRIPTION

Work included:

- A. Variable Frequency Drive
- B. Provide drive system consisting of variable frequency controller, certain auxiliary items, and components necessary to provide a complete, operating system as shown on the drawings.

1.2 RELATED WORK

- A. Section 16010: General Electrical Requirements
- B. Section 16150: Electric Motors
- C. Section 16155: Low Voltage Motor Control

1.3 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01300 and Section 16010.
- B. Submit overall drive system operating data, including efficiencies, input currents, and power factors, at driven equipment actual load and rated system input voltage, at 0, 40, 60, 80, 100, and 110 percent of rated speed.
- C. Submit individual and total harmonic content (voltage and current) reflected in system normal source supply at driven equipment actual load at 70 and 100 percent of rated speed. Harmonic content shall be a percent of the 60 Hz fundamental at driven equipment actual load at 70 and 100 percent of rated speed with a source system short-circuit available at the drive at approximately 65,000 amps rms symmetrical at 480 volts. Utilize distortion factor as defined in IEEE Standard 519 to designate total harmonic content.

- D. Submit complete variable frequency drive rating; including all nameplate data and continuous operation load capability throughout speed range of 0 to 120 percent of rated speed; list any controller special features being supplied.
- E. Submit controller, reactor, harmonic filter, and isolating transformer (if required) dimensional drawings; information on size and location of space for incoming and outgoing conduit.
- F. Provide maximum heat dissipation from enclosure.
- G. Submit layout of controller face showing pushbuttons, switches, instruments, indicating lights, keypad, etc.
- H. Submit complete system operating description.
- I. Submit complete system schematic (elementary) wiring diagrams.
- J. Submit complete system interconnection diagrams between controller, drive motor, and all related components or controls external to system, including wire numbers and terminal board point identification.
- K. Submit description of diagnostic, display, control, input/output, and other features specified and being provided.
- L. Submit descriptive literature for all control devices such as relays, timers, etc.
- M. Submit itemized bill-of-materials listing all system components.
- N. Submit specific description of provisions, such as filtering and harmonic suppression, being made to ensure proper system operation when power factor correction capacitors are included in system.
- O. Submit factory test results.

1.4 OPERATION AND MAINTENANCE MANUALS

Submit operation and maintenance manuals in accordance with Section 01680 and Section 16010.

PART 2 MATERIALS

2.1 GENERAL

- A. Provide variable frequency, controlled speed, drive systems capable of converting 480-volt, 3-phase, 60-Hz, input power into variable voltage, variable frequency, 3-phase output power of suitable capacity and waveform to serve as input power to the drive system, squirrel cage induction motors. Provide a variable frequency controller for each motor.
- B. The driven load shall not exceed 100 percent of the rated capacity of the complete drive system and any of its components at any point on the pump curves.
- C. The controller supplier shall supply any drive system information required by the drive motor supplier in order that the drive motor to be provided will be properly sized and designed to supply the driven load.
- D. The controller supplier shall furnish (and pay for installation, conduit, conductors, and connections for equipment required outside the VFD enclosure) any necessary isolating transformers, harmonic filters, or other devices necessary for proper system operation and compliance with IEEE Standard 519, 1992 (individual or simultaneous operation of VFDs shall not add more than 3 percent total harmonic voltage distortion and no more than 5 percent total harmonic current distortion to MCC when supplied from the specified power source. If more than one variable frequency drive is supplied from the same supply transformer secondary, provide necessary devices and circuits to prevent the operation of one drive from adversely affecting the operation of the other drives.
- E. Provide constant torque rated VFD by Eaton SVX9000, Schneider Electric Altivar, Rockwell Automation PowerFlex or approved equivalent.

2.2 VARIABLE FREQUENCY DRIVE REQUIREMENTS

- A. Provide a pulse width modulated (PWM), constant or variable torque controller rated for 480-volt, 3-phase, 60-Hz input, suitable for operating commercially available, high efficiency, squirrel-cage, induction motors.
- B. Provide equipment suitable for the following service conditions:
 - 1. Input Voltage: ± 10 percent of rated.
 - 2. Input Frequency: ± 2 Hz of rated.
 - 3. Ambient Temperature: 0 to 40 degrees C.
 - 4. Altitude: Sea level to 3,300 feet.
- C. Provide equipment meeting the following requirements:

In-service Deviation from Set Point Speed (due to variables other than load)	1 percent of full speed
Efficiency	95 percent minimum at 100 percent speed

Capacity	Suitable for operation continuously at its rated load
Short-Time Overload Capacity	125 percent of rated load in rms current for 1 minute following full load, full speed operation
Equipment Short Circuit Rating	Suitable for connection to a system with available short circuit capacity of 65,000 amps rms symmetrical at 480 volts
Harmonic Content Reflected Into Supply System Voltage and Current Waveforms	Individual or simultaneous operation of VFDs shall not add more than 3 percent total harmonic voltage distortion and no more than 5 percent total harmonic current distortion (per IEEE 519, 1992) to MCC

D. Provide equipment with the following features:

1. NEMA 3R enclosure, completely front accessible, with hinged front door(s) and lockable latch(es); enclosure cleaned and painted with at least one coat of rust inhibiting primer; interior finished in white enamel; exterior finished in supplier's standard gray enamel or ANSI 61.
2. Stranded copper wiring neatly bundled with nylon tie wraps or with continuous plastic spiral binding; each terminal labeled for permanent identification of all leads; each wire identified at each end with permanent sleeve-type wire markers with numbers applied; wire and terminal numbers shown incorporated in as-installed wiring diagrams; wiring across door hinges 19-strand, NEMA Class C stranding, or as approved, looped for proper twist rather than bending at hinge; wire connections internal to panels by crimp-on, or as approved, terminal types; multi-point plug receptacles for any control wiring crossing equipment shipping splits.
3. Selector switches, indicating lights, potentiometers, instruments, protective devices, major system components, etc., identified by means of mechanically attached, engraved, laminated plastic nameplates.
4. Line disconnect (circuit breaker), mechanically interlocked with the enclosure door, and current-limiting line fuses, as required.
5. Control circuit disconnect to de-energize all circuits in the unit which are not de-energized by the main power disconnect device.
6. Control power transformer to provide 115 volts, single-phase, 60-Hz for control power, operator controls, and pump seal water solenoid valve and motor space heater as applicable.
7. Component and circuit arrangement such that failure of any single component cannot cause cascading failure(s) of any other component(s).
8. Solid state logic for inverter circuitry; necessary logic for inverter operation on plug-in printed circuit boards.
9. For multiple unit systems, components necessary to prevent any unit in a drive system from interfering with operation of any other unit in the same drive system.
10. Linear timed acceleration and deceleration, variable up to at least 10 seconds.

11. Provision for adjustment of minimum and maximum pump speed.
12. Terminal block connection points at the VFD for remote control and speed input signals.
13. HAND/OFF/REMOTE selector switch with START pushbutton or an ON/OFF/AUTO selector switch as shown on the Drawings.
 - a. In the HAND mode, the motor is started by the normally open “momentary” START pushbutton and stops in the OFF mode. Speed is set by manual control included with VFD.
 - b. In the REMOTE mode, the motor is started by a remote normally open “momentary” start contact and stopped by a remote normally closed “momentary” stop contact. Speed is controlled by a remote 4 to 20 mA analog input signal.
 - c. “Start/stop” control relay interlock for local and remote operation shall be provided with the VFD.
 - d. In the ON mode, the motor starts, and in the OFF mode, the motors stop. Speed is set by manual speed control included with the VFD.
 - e. In the AUTO mode, the motor starts when a remote normally open “maintained” run contact closes. The motor stops when the run contact opens. Speed is controlled by a remote 4 to 20 mA analog input signal.
 - f. Provide a dry contact rated 5 amps, 120 volts, minimum, which closes when the selector switch is in the REMOTE or AUTO mode for remote indication.
14. Provisions for operating adjustable speed system without motor for checkout and adjustment purposes.
15. Power ON indicating light.
16. Indicating light test pushbutton arranged so that all indicating lights can be simultaneously tested, or each light can be the push-to-test type.
17. Motor speed indicator calibrated in percent of motor rated rpm (0-100 percent).
18. Voltmeter (panelboard class) measuring drive OUTPUT (motor) voltage with ON/OFF, single-phase selector switch.
19. Ammeter (panelboard class) measuring drive OUTPUT (motor) current with necessary current transformers and ON/OFF, single-phase selector switch.
20. Two independent dry contacts rated 5 amps, 120 volts, minimum, closing on motor operation for remote “ON” indication.
21. Independent dry contact rated 5 amps, 120 volts, minimum, closing on variable frequency drive “FAIL” or motor trouble for remote indication. Alarm contact shall not close when power to the panel is turned OFF.
22. Automatic reset and restart after fault trip, three attempts and then lockout stop.

23. Following loss of power, orderly shutdown of system; following power restoration, restart drive automatically in normal sequence.
 24. See Drawings for additional control requirements.
- E. VFD External Interfaces: Provide the following interfaces between the VFD and items outside of the VFD system:
1. Discrete Outputs: Supply the following maintained dry contact outputs which shall be rated no less than 5 amps at 120-volt, 60-Hz.
 - a. ON (contact closed when ON).
 - b. FAIL (contact opens on FAIL).
 - c. REMOTE or AUTO (contact closes in this mode).
 2. Discrete Input:
 - a. Accept momentary START and momentary STOP dry contact inputs. START contact closes to START and STOP contact opens to STOP.
 - b. In lieu of Item a, accept a maintained RUN dry contact input. Contact closes to RUN.
 - c. Accept motor thermostat contact input. Contact open on excessive motor temperature.
 - d. Contacts are rated 5 amps at 120 volts, 60 Hz.
 3. Analog Input: Accept 4 to 20 mA dc SPEED command. Load shall not exceed 250 ohms. A SPEED command of 4 mA corresponds to minimum speed and 20 mA corresponds to maximum speed.
- F. Provide equipment with manual reset protection against the following conditions:
1. Overvoltage and undervoltage of ac or dc power.
 2. Overvoltage or undervoltage of control power.
 3. Inverter fault.
 4. Motor fault.
 5. Incorrect phase sequence.
 6. Loss of input phase.
 7. Overfrequency (overspeed).
 8. Inverter overtemperature.
 9. Motor overtemperature (motor mounted thermostat).
 10. Inverse time/instantaneous overload and overcurrent protection.

11. Commutation overcurrent.
12. Surge protection against transient overvoltages in accordance with ANSI/IEEE C37.90 and ANSI/IEEE C62.41.

G. Provide operator's control devices mounted on the face of the controller:

1. Power ON indicating light, white.
2. Control power ON indicating light, white.
3. Motor ON indicating light, red.
4. Motor OFF indicating light, green.
5. Single light, amber, indicating any speed control system malfunction, VFD FAIL.
6. Fault reset pushbutton.
7. Motor speed indicator, 0-100 percent.
8. Running time indicator.
9. HAND/OFF/REMOTE switch with START pushbutton or ON/OFF/AUTO switch.
10. Speed set control.

2.3 EQUIPMENT GROUNDING

Provide means in all equipment for attaching grounding conductors.

2.4 FACTORY TESTS

Factory test the drive system for functional performance, proper operation, and proper wiring. Tests may be performed without the drive motor specified herein. Verify proper operation of all controls, instrumentation, and protective functions. Operate the controller with a motor throughout its specified speed range, and at rated power supply load for at least one hour. Provide certified copies of test reports. See Detail Equipment Specification(s) for motor tests and test reports.

PART 3 EXECUTION

3.1 INSTALLATION

Install in accordance with manufacturer's printed instructions.

3.2 TEST

A. Functional Test:

1. Conduct on each controller.
2. Inspect controller for electrical supply termination connections, interconnections, proper installation, and quiet operation.
3. Vibration Test: Complete assembly, consisting of motor, load, and flexible shafting, connected and in normal operation, shall not develop amplitudes of vibration exceeding limits recommended by current edition of Hydraulic Institute Standards. Where loads and drives are separated by intermediate flexible shafting, measure vibration both at top motor bearing and at two points on top pump bearing, 90 degrees apart.
4. Record test data for report.

B. Performance Test:

1. Conduct on each controller.
2. Perform under actual or approved simulated operating conditions.
3. Test for continuous 12 hour period without malfunction.
4. Demonstrate performance by operating the continuous period while varying the application load, as the input conditions allow, to verify system performance.
5. Record test data for report.
6. Measure the following to show parameters within specified limits:
 - a. Total and individual current harmonic distortion (up to and including 35th harmonic) at MCC, under following load conditions:
 - 1) VFDs running at full load and half load.
 - 2) Half of the specified VFDs running at full load and half load.
 - b. Power factor at input side of each drive. Documented verification that power factor is maintained at 95 percent as speed of drive goes down from 100 percent to 33 percent.
 - c. THD at MCC powering VFD under following conditions:
 - 1) VFDs running at full load and half load.
 - 2) Half of specified VFDs running at full load and half load.

C. Test Equipment

1. Use Dranetz HDPQ analyzer or equivalent instrument to document results.
2. Provide diagnostic plug-in test card complete with instructions, multiposition selector switch, and meters or built-in diagnostic control panel or ROM-based processor for monitoring ac, dc, and digital signals to assist in troubleshooting and startup of drive.

3.3 MANUFACTURER'S SERVICES

Manufacturer's Representative: Present at site or classroom for minimum person-days listed below, travel time excluded:

- A. 1 person-day for installation assistance and inspection.
- B. 1 person-days for functional and performance testing and completion of Manufacturer's Certificate of Proper Installation.
- C. 1 person-day for pre-startup classroom or site training.
- D. 1 person-day for facility startup.

END OF SECTION

SECTION 16160

PANELBOARDS

PART 1 GENERAL

1.1 DESCRIPTION

Work included:

- A. Panelboards.

1.2 RELATED WORK

Section 16010 - General Electrical Requirements

1.3 SUBMITTALS

- A. Submit shop drawings in accordance with Section 16010.
- B. Show ratings and characteristics including voltage ratings, bussing arrangements, continuous current ratings, fault current withstand ratings, neutral bus rating, ground bar termination points, enclosure type, ratings and arrangements of overcurrent protective devices and mounting provisions.
- C. Submit outline and dimensional drawings and conduit entry restrictions.
- D. Submit catalog cuts for circuit breakers and devices.
- E. Submit nameplate designations, sizes and mounting methods. Submit nameplate designations in table form, with all nameplates shown. Submit one sample nameplate.

1.4 OPERATION AND MAINTENANCE MANUALS

Submit operation and maintenance manuals in accordance with Section 16010.

PART 2 MATERIALS

2.1 GENERAL

- A. Panelboards shall comply with Section 16010.
- B. Provide dead front, circuit breaker, safety-type panelboards per NEMA PB-1 with voltage ratings as scheduled. Provide General Electric, Cutler-Hammer, Square D, or equivalent.
- C. Provide panelboards with permanent circuit numbers.
- D. Panelboards and circuit breakers shall be individually suitable for the available short circuit ratings indicated on the drawings. Provide 22,000 minimum RMS symmetrical ampere interrupting rating unless otherwise indicated on the drawings. Series rated circuit breaker combinations shall not be provided.

2.2 CABINETS

Enclose panelboards located indoors in a single sheet metal cabinet (NEMA 1 unless noted otherwise on the drawings). Secure hinged interior door with flush catch, lock and trim. Provide metal frame directory holder with glass cover on the inside of the door. Directory holder shall be factory welded to the interior of the interior hinged door. Panelboard locks shall be keyed alike.

2.3 BREAKERS

- A. Molded-case: Provide quick-make and quick-break toggle mechanisms, inverse-time trip characteristics, and trip-free operation on overload or short circuit. Automatic tripping shall be indicated by a handle position between the manual OFF and ON position. Provide trip ratings as indicated in the panelboard schedules. Provide lock-on or lock-off devices where indicated on the drawings.
- B. Single-pole breakers shall be full module size; two poles shall not be installed in a single module. Multiple circuit breakers shall be of the common-trip type having a single operating handle.
- C. Furnish ground fault interrupter (GFI), 5-ma trip, circuit breakers where indicated.
- D. For High Intensity Discharge (HID) lighting circuits supplying power to metal halide and high pressure sodium fixture, provide HID rated circuit breakers.
- E. For HVAC equipment or grouped motor installations provide HACR rated circuit breakers.

2.4 BREAKER CONNECTIONS

Circuit breaker current-carrying connections to the bus shall be bolted type.

2.5 BUS BARS

Bus bars shall be copper. Provide a copper ground bus bar installed on the panelboard frame, bonded to the box and containing at least 10 terminal screws.

2.6 GROUNDING BAR KITS

Provide copper grounding bars with main lug provisions. Bond grounding bars to the panel enclosure. Equip grounding bars with a dedicated grounding termination point for each branch circuit, including spaces.

2.7 SPACE ONLY

Where "space only" is noted on the drawings, provide connectors, mounting brackets, etc., for the future insertion of an overcurrent device of the size indicated.

2.8 DIRECTORIES

Provide typed circuit directories located in the directory holder. Type directory with capital letters, with odd numbered circuits on the left side or top and with even circuits on the right side or bottom. Define accurately and briefly the connected load and location (example: AC-1 MTD ON ROOF).

2.9 NAMEPLATES

Provide nameplates with 1/4 inch lettering as specified in Section 16010. Designate the panel name on the first line. Center each line on the nameplate. Remaining lines shall indicate voltage, amperes, phases, number of wires, short circuit rating, feeding source of the panel as shown on the drawings and conductor color coding associated with voltage used.

EXAMPLES: PANEL LA
 208/120V, 3Ø, 4W, 225A
 14,000 AIC
 FED FROM SWBD A
 PH. A-BLK, B-RED, C-BLUE

 PANEL HA
 480/277, 3Ø, 4W, 100A
 22,000 AIC
 FED FROM MSB-A
 PH, A-BRN, B-ORG, C-YEL

PART 3 EXECUTION

3.1 MOUNTING

Mount top of panelboards at 6 feet above finished floor.

3.2 CONDUCTOR TAGGING

At a point 1 inch away from the circuit breaker, tag power conductors with the panelboard circuit number. Conductor tags shall be in accordance with Section 16120.

3.3 TESTS

Operate each circuit breaker and verify that all phases of each load are disconnected.

END OF SECTION

SECTION 16400

LOW VOLTAGE SWITCHBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Low voltage switchboards.

B. Related Specification Sections include but are not necessarily limited to:

1. Section 16010 - Electrical - Basic Requirements.
2. Section 16011 - Power System Analysis
3. Section 16015 - Equipment Drawings and Diagrams
4. Section 16030 - Electrical Test

C. Provide electrical service sections, distribution switchboards, special control panels, control and terminal cabinets, control devices, circuit breakers, and all appurtenant work, complete and operable, in accordance with the Contract Documents.

1.2 QUALITY ASSURANCE

A. Referenced Standards:

1. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - b. PB 2, Deadfront Distribution Switchboards.
2. Underwriters Laboratories, Inc. (UL):
 - a. 891, Switchboards.

B. Verify the space required for the switchboard is equal to or less than the space allocated.

C. Factory Tests: Design test reports conducted on similar assemblies at the factory testing facilities shall be submitted.

1.3 WARRANTY

A. The system warranty shall be no less than one year after initial startup and shall include all costs for repair, parts, travel and living expenses, and labor.

1.4 SUBMITTALS

A. Shop Drawings:

1. Product technical data.
 - a. Provide submittal data for all products specified in PART 2 of this Specification Section.

2. See Specification Section 16015 for additional requirements.
 3. Fabrication and/or layout drawings:
 - a. Switchboard layout with alphanumeric designation, protective devices size and type, as indicated in the one-line diagram or switchboard schedule.
 - b. Front elevation and plan drawing of the assembly.
 - c. Three-line or single line and schematic diagrams.
 - d. Conduit space locations within the assembly.
- B. Contract Closeout Information:
1. Operation and Maintenance Data:
 - a. See Specification Section 01680 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
 2. Fabrication and/or layout drawings updated with as-build conditions
- C. Informational Submittals:
1. Equipment marking and documentation.
 2. Ground fault protection system test report signed by the projects supervising electrical foreman.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
1. Eaton.
 2. GE by ABB.
 3. Square D by Schneider Electric.
 4. Siemens Corporation.

2.2 SWITCHBOARDS

- A. Ratings:
1. Voltage, number of phases, number of wires, and main bus current rating as indicated on the Drawings.
 2. Assembly short circuit current and interrupting device rating as indicated on the Drawings.
 3. When low voltage power circuit breakers are utilized, the switchboard shall have a 30 cycle withstand rating corresponding to the breaker rating.
 4. Service Entrance Equipment rated when indicated on the Drawings.
- B. Construction:
1. Standards: NEMA PB 2, UL 891.
 2. Completely enclosed, dead-front, self-supporting metal structure.

3. Vertical panel sections bolted together.
4. Frames bolted together to support and house bus, cables and other equipment.
5. Frames and insulating blocks to support and brace main buses for short circuit stresses up to ratings indicated on the Drawings.
6. All sections rear aligned.
7. Devices front removable and load connections front accessible for mounting switchboard against a wall.
8. NEMA 3R rated weatherproof enclosure:
 - a. Nonwalk-in type with sloping roof downward toward rear.
 - b. Thermostatically controlled space heaters to minimize internal condensation.
 - c. Power for heater derived internal to the switchboard.
9. Interior and exterior steel surfaces cleaned and painted with rust inhibiting primer and manufacturer's standard paint.

C. Buses:

1. Material: Tin-plated copper.
2. Main horizontal bus:
 - a. Fully rated and continuous over length of switchboard with all three phases arranged in the same vertical plane.
 - b. Sufficient size to limit temperature rise to 65 DEGC over average air temperature outside the enclosure of 40 DEGC.
3. Neutral bus: Fully rated and continuous over length of switchboard.
4. Ground bus: 1/4 x 2 IN copper, continuous over length of switchboard and solidly grounded to each vertical section structure.
5. Bus joints connected using through bolts and conical spring-type washers for maximum conductivity.

D. Overcurrent and Short Circuit Protective Devices:

1. Main overcurrent protective device:
 - a. Individually mounted molded case circuit breaker.
2. Feeder overcurrent protective devices:
 - a. Molded case circuit breaker.
3. Factory installed.
4. Means to padlock all main and feeder devices in the open position.

E. Metering:

1. Utility:
 - a. Separate barriered-off compartment with hinged sealable door.
 - b. Bus work with provisions for required current and potential transformers and meter mounting.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install switchboards in accordance with manufacturer's instructions.
- B. Arrange switchboard as shown on the Drawings.
- C. Outdoor location:
 - 1. NEMA 3R enclosure.
 - 2. Install on concrete pad, align front of switchboard with top edge of pad chamfer and securely fasten to pad.
- D. Equipment Marking and Documentation:
 - 1. Provide labeling per NFPA 70 and other applicable codes.
 - 2. Service equipment:
 - a. Arc-flash hazard warning label. (Ref. NFPA 70 Article 110.16(A) and (B))
 - b. Available fault current label and documentation of the calculations made for compliance with marking requirements. (Ref. NFPA 70 Article 110.24)
 - 3. Other than service equipment:
 - a. Arc-flash hazard warning label. (Ref. NFPA 70 Article 110.16(A))
 - b. Available fault current label. (Ref. NFPA 70 Article 408.6)
 - 4. Identify (tag) all equipment and equipment components.
 - 5. Provide labels and tags in accordance with Section 16010.
 - 6. Available fault current and other required label data from Coordinated Power System Study as required by the contract documents.
- E. Miscellaneous:
 - 1. Provide circuit protective devices and other associated equipment as indicated on the Drawings.
 - 2. All control wiring shall be neatly laced and have flexibility at hinge locations.

3.2 FIELD QUALITY CONTROL

- A. Test the ground fault protection system as indicated in Specification Section 16030.

END OF SECTION

SECTION 16450

GROUNDING

PART 1 GENERAL

1.1 DESCRIPTION

Work included:

- A. Electrical Grounding.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 16010 - General Electrical Requirements
- B. Section 16120 - Wire and Cables

1.3 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01300 and Section 16010.
- B. Submit material list and catalog cuts for all grounding materials and equipment. Indicate size, material and manufacturer.
- C. Submit test results within ten days after testing.

1.4 OPERATION AND MAINTENANCE MANUALS

Submit test results as part of the operation and maintenance manuals in accordance with Section 01680 and Section 16010.

PART 2 MATERIALS

2.1 GENERAL

Materials shall comply with Section 16010.

2.2 GROUND RODS

Provide copper-clad steel, 3/4 inch diameter, minimum 10 feet long, with hardened steel points.

2.3 GROUND CLAMPS

Ground clamps for connection of ground wire to ground rod or to pipes shall be bronze or high strength corrosion resistant copper alloy. Provide ground clamps UL 467 listed for direct burial.

2.4 GROUND CONDUCTORS

- A. Underground ground conductors not in conduit shall be annealed bare standard copper conforming to ASTM B8.
- B. Ground conductors in raceway shall comply with Section 16120 for power wire.

2.5 EXOTHERMIC CONNECTIONS

Weld connections together using an exothermic fusion type process. Provide connections equal or larger in size than the conductors joined and with the same current carrying capacity as the largest conductor. Provide Erico Cadweld products or equivalent.

2.6 GROUND RESISTANCE TESTER

The ground resistance tester shall be an instrument specifically designed for ground resistance testing.

PART 3 EXECUTION

3.1 GROUND ELECTRODE

- A. Bond the interior metallic water system to the grounding system in accordance with NEC Article 250.
- B. Bond the building structural steel to the grounding system as shown on the drawings.
- C. Ground rods not enclosed in ground wells shall be driven not less than 18 inches below finished grade.

3.2 EQUIPMENT GROUNDING

- A. Connect the ground buses of panelboards, switchboards and motor control centers to the ground bus within the main service switchboard with a grounding conductor.
- B. Ground raceways and noncurrent carrying parts of electrical equipment in accordance with NEC Article 250. Use the metallic conduit system for equipment and enclosure grounding. Grounding through the conduit system shall be in excess of any ground conductors shown on the drawings. Install grounding bushings on conduits at panelboards and switchboards. Connect grounding bushing to ground bus with ground conductor sized in accordance with NEC Table 250.
- C. Install grounding bushing on conduits at both primary and secondary entrances to transformers. Ground transformer enclosures and wye transformer secondaries to bushings.
- D. Coordinate location of ground conductor stub-ups with equipment being furnished.

3.3 GROUND TEST WELL

Provide handhole and ground rod as detailed on the drawings to aid in performing ground testing and connecting additional ground rods, if required, by the test results. Connect ground wire from ground rod to main service switchboard ground bus as detailed on the drawings.

3.4 TESTING

- A. Before making connections to the ground electrodes, and before placement of sidewalks, landscape and paving, measure the resistance of each electrode to ground using a ground resistance tester. Perform the test not less than two days after the most recent rainfall and in the afternoon after any ground condensation (dew) has evaporated.
- B. After all individual ground electrode readings have been made, interconnect as required and measure the system's ground resistance.
- C. Record and submit all measured values to Owner.

END OF SECTION

SECTION 16460
TRANSFORMERS DRY TYPE

PART 1 GENERAL

1.1 DESCRIPTION

Work included:

- A. Dry type, power distribution transformers.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section 16010 - General Electrical Requirements

1.3 SUBMITTALS

- A. Submit shop drawings in accordance with Section 16010.
- B. Submit catalog data indicating ratings and characteristics including voltage, phases, connections, enclosure type and dimensions, and conduit entry restrictions.
- C. Submit nameplates, designations, sizes, and mounting methods.
- D. Submit catalog information on vibration isolators. Provide vibration isolator manufacturer's recommendation for pad type, size and placement for each transformer used in the project.

1.4 OPERATION AND MAINTENANCE MANUALS

Submit operation and maintenance manuals in accordance with Section 16010.

PART 2 MATERIALS

2.1 GENERAL

- A. Transformers shall comply with Section 16010.

- B. KVA size, voltage, and phase of the transformers are indicated on the drawings.
- C. Transformers shall be rated for continuous operation in a 40°C maximum ambient temperature. Construct transformers in accordance with ANSI C89.2, NEMA ST-20 and UL Standard 506.
- D. Transformers shall have energy efficiencies that meet or exceed the latest requirements of the California Code of Regulations Title 20 and Title 24 and NEMA TP-1. Transformers shall be Energy Star labeled.
- E. Provide nameplates in accordance with Section 16010. Indicate transformer identification, KVA, primary and secondary voltage, phases, number of wires, secondary feeding source and where it is fed from. Mount on the front of the transformer. For transformers mounted up to ten feet above ground level, provide ½ inch letter height. For transformers above ten feet, provide 1 inch high lettering height.

Example:

XFMR	T-3b45
KVA	45
PRI	480V, 3PH, 3W
SEC	208/120V, 3PH, 4W
FEEDS	PANEL 2RP-3A
FED FROM	PANEL PP-3

- F. Maximum transformer sound level shall be in accordance with ANSI C89 as follows:

Transformer Rating KVA	Maximum Sound Level Decibels
0-9	40
10-50	45
54-150	50
150-300	55
301-500	60

- G. Equip transformers located outdoors with weathershields.
- H. Provide Square D "Watchdog", General Electric "Type QL", Cutler-Hammer Energy Efficient or equivalent.

2.2 DRY-TYPE TRANSFORMERS (25 KVA AND BELOW)

- A. Construct transformers in accordance with ANSI C89.2, NEMA ST-20, and UL Standard 506.
- B. Transformers 5 KVA and larger shall have two 5% FCBN taps on the primary side.
- C. Transformers rated 0.5 KVA through 25 KVA shall have 115 degree C rise with 180 degree C insulation system.
- D. Encapsulate core and coil in an insulating resin of the class equal to the temperature rise and embed in a resin and filler system to attenuate the sound level.

2.3 DRY TYPE TRANSFORMERS (30 KVA AND ABOVE)

- A. Construct transformers in accordance with ANSI C89.2, NEMA TR-27, NEMA ST-20, and UL listed under the requirements of Standard 506.
- B. Transformers shall have two 2-2% FCAN and FCBN taps on the primary side.
- C. Transformers shall have 80 degree C rise, 220 degree C insulation system.
- D. Transformers shall be ventilated type.

2.4 VIBRATION ISOLATORS

- A. Provide one inch thick, sandwiched ribbed, oil and ozone resistant neoprene and cork pads. Provide California Dynamics Corporation (323-223-3882) Type FP Pads or equivalent.
- B. Pad type, quantity, and placement shall be determined by the vibration isolator manufacturer, based upon the characteristics of the transformer. Quantities shown on the drawings are estimated quantities only.

PART 3 EXECUTION

3.1 GENERAL

- A. Set taps under load conditions for correct voltage.
- B. Install transformers on vibration isolators selected for the weight of the transformer, to produce the maximum isolation. Anchor with four one-half inch diameter Hilti KWIK Bolt II, minimum 2-1/2" embedment.

- C. Install transformers such that no metal-to-metal, concrete, plaster, or wood contact exists between the transformer and structural members. For floor mounted transformers install with a 6 inch minimum clearance between transformer and walls.
- D. Conduit and cable penetrations shall be within six inches of the bottom of the transformer and in accordance with the manufacturer's instructions.

3.2 TESTS

Perform insulation resistance tests on the windings prior to being connected. The measurements shall be from primary and secondary windings to ground and between primary and secondary windings. The minimum value shall be 10 megohms.

END OF SECTION

SECTION 16620
STANDBY POWER GENERATION

PART 1 GENERAL

1.1 DISCRPTION

Work included:

- A. The CONTRACTOR shall provide an engine-driven standby electrical generating system, complete and operable, in accordance with the Contract Documents.
- B. The CONTRACTOR shall be responsible for coordination of interface with other equipment and for any special construction necessary to complete the WORK of this Section in an acceptable manner.
- C. The supplier of the generator set shall also be the manufacturer of the engine for the generator system; however, the CONTRACTOR shall be responsible to the OWNER for the WORK of this Section.
- D. Coordination and cost for submitting and procuring an authority to construct permit from the local Air Board.

1.2 REGULATORY AGENCIES AND STANDARDS

- A. Materials shall conform with applicable requirements of the National Electrical Code (NEC), and any other State or Municipal codes which apply. Generator system shall meet applicable standards and codes, including IEEE, NEMA, ANSI, OSHA, and UL.

1.3 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01300.
- B. Shop Drawings
 - 1. Detailed, dimensioned Shop Drawings and data demonstrating adherence to the requirements of these specifications shall be submitted and approved before fabrication, shipment, or other WORK under this Section begins. Include the manufacturer's certification that engine atmospheric emissions will comply with the limitations.
 - 2. Certified custom drawings and custom wiring diagrams of each component in the system and a master wiring diagram showing the entire system on one sheet. This diagram shall include all AC and DC power control connections between the generator, engine, fuel tank system, batteries, and circuit breakers and shall be a custom drawing for this specific installation. A master drawing of the engine/generator set shall also be provided, showing general dimensions, bill of materials, location and size of all connections for fuel, cooling, exhaust, direct current connections, conduit locations, and connections for control and

power wiring. Include wire and terminal numbers for all diagrams. Furnish KW output curves, fuel consumption curves, and certified air emission data sheets.

3. Outline drawings and connection diagrams shall be complete enough to enable the installation to be designed completely, and connection diagrams shall give both internal and external connections. Include foundation loading and clearances.
 4. Two (2) copies of complete and detailed instructions for the operation, lubrication, and maintenance of equipment in the system. The manuals shall be furnished after final approval of Shop and working drawings but prior to shipment of equipment. Manuals shall be complete with wiring diagrams, lubrication schedules and recommended lubricants, drawings, cuts, parts lists, and other necessary data. All parts shall be numbered or otherwise clearly identified to facilitate ordering of replacements. Descriptions of all operational control devices and their functions shall also be included.
- C. Submittal data shall include generator load step study showing all loads on the one-line diagram. The largest motor shall be included in the last step.

1.4 QUALITY ASSURANCE

- A. Permits from Local Air Quality District: Contractor shall submit engine emissions data and required fees and obtain a "Permit to Construct" from the North Central Coast Air Basin (NCCAB) in the Owner's name prior to delivery of engine-generator set to job-site.
- B. The engine/generator shall be the product of a manufacturer who has been regularly engaged in the design and production of similar engine/generator sets for a minimum of 10 years.
- C. The supplier shall maintain a local part and 24-hour service facility within the State of California. The supplier shall have factory trained and authorized service representatives to furnish necessary installation, test, and start-up supervision as well as operation and maintenance training necessary for final approval and acceptance.

PART 2 PRODUCTS

2.1 SYSTEM COMPONENTS

- A. Provide one new diesel engine-powered electric generator set, in an outdoor, waterproof, w/ level 2 sound attenuated enclosure. The engine generator shall have a nominal standby rating of 300KW, 375KVA, 0.8 power factor, 480 volts, three phase, four wire, grounded neutral, 60 Hertz. The equipment package shall include in general, and as applicable, engine and generator on a common vibration isolating base, with auxiliaries, accessories, and controls, including intake filters, discharge silencer, turbocharger, heat exchangers, foundation bolts, isolators, piping, flexible couplings, supports, complete exhaust piping, ring, and silencer, insulation, control panels, lubrication system, water jacket heaters, cooling system, fuel tank, batteries and battery rack, battery charger, spare parts, and all materials necessary to permit installation, testing and placing the system in successful operation.
- B. Provide one 800-amp frame circuit breaker located in the generator enclosure with amp trip as required for full load amps.

- C. Provide fuel storage tank with double wall steel construction, integral with the base of the generator-set and generator-set enclosure capable of operating the engine at 100% load for 24 hours.
- D. The generator-set, enclosure, base-mounted fuel tank, and accessories shall be assembled and shipped to the Site as a complete, coordinated package, ready for installation. The engine generator base, cooling system, etc, shall be factory painted before installation in the enclosure.

2.2 SYSTEM OPERATION

A. The system shall operate as follows:

1. Automatic Control

- a. A maintained remote contact closure from the automatic transfer switch shall cause the generator-set to start and run.
- b. When the remote startup contact opens, the engine shall continue to operate for an adjustable cool-down time (typically 5 to 30 minutes).

2. Local Control: The generator-set shall be capable of manual initiation or stopping from the locally mounted generator control panel. The local generator control panel shall be provided as part of this Contract.

3. Emergency Stop Control: An emergency stop pushbutton shall be provided at the generator control panel that shall cause the unit to stop without any delay.

2.3 ENGINE

- A. The CONTRACTOR shall provide a complete engine-powered standby electrical generating system of the type and capacity indicated.
- B. The diesel engine shall be mounted on a common base with the generator and the direct connected radiator and shall be rated for standby service, continuously for the duration of the electric power interruption, with engine jacket water cooled by means of a direct mounted water-to-air radiator under SAE conditions at 85 degrees F, 1500 feet above sea level. It should be noted that this is the rating of the engine.
- C. The minimum generator rating shall be 300 KW.
- D. The diesel engine shall be four-cycle, turbocharged, aftercooled, 1800 rpm, with individual fuel pumps and injection valve for each cylinder.
- E. The generator-set shall be Caterpillar, Onan-Cummins, or equal.
- F. The engine shall have a dry type air cleaner with service indicator, fuel oil filter, full pressure positive pump lubrication with full-flow oil filters, thermostatic regulated oil cooling system, and crankcase drain with valving to be able to drain the crankcase oil without reaching under the engine.
- G. The engine shall also be equipped with a 120 volt, thermostatically controlled jacket water heaters. Power shall be derived from a suitably-rated dry-type transformer and panelboard, also provided as part of the generating system, and including facilities to provide power to the battery charger, fuel oil transfer pumps if required, and other generator-related facilities.

- H. The diesel engine shall perform as indicated when operating on a commercial grade of non-premium distilled petroleum fuel oil such as No. 2 domestic burner oil and diesel fuel.
- I. The engine shall be equipped with an electric 24 volt dc starting system of sufficient capacity to crank at a speed which will start the engine under conditions indicated. Include a charging alternator. The starting pinion shall disengage automatically when the engine starts. The starting system shall include relays for fully automatic operation from a remote signal.
- J. The engine shall be provided with electronic governor system capable of automatic isochronous frequency regulation.
- K. The engine shall minimize discharge of gaseous pollutants and shall comply with the discharge limitations of the Air Quality Management District. The CONTRACTOR shall furnish a certification from the manufacturer that the proposed generator set will comply with the limitations.

2.4 BATTERIES AND BATTERY CHARGER

- A. Battery: Provide a lead-acid storage battery with sufficient capacity for three 30 second cranking cycles, allowing 10 seconds between cycles. Submit calculations verifying adequate capacity. The battery shall be on a plastic rack as close as practical to the starter motor. The CONTRACTOR shall provide vented, nonmetallic protective covers or red and black plastic or rubber boots covering all terminals to protect against an accidental short circuit as might be caused by laying a metallic object on the battery. Metallic racks and covers are not acceptable.
- B. Battery Charger: A unit-mounted battery charger for 120 V, single phase, 60 Hz input shall be provided. The battery charger shall be voltage regulated, with separate float and equalize charge voltage adjustment having a 10 amp rating. The battery charger shall include alarm relays to sense high and low dc voltage, zero current, and ac power failure, with individual output contacts wired to terminal strips for tie into remote alarms. Also, provide an ac "on" indicating pilot LED light and dc voltmeter and ammeter and annunciator. The battery charger shall be as recommended by generator-set provider.

2.5 EXHAUST SYSTEM

- A. The engine shall be provided with an exhaust system consisting of flexible connection, exhaust silencer, steel piping, fittings, stainless steel hardware and supports, brackets, and rain collar.
- B. The flexible connection shall be of the stainless-steel bellows type with flanged ends. Flexible elements shall be stainless steel suitable for exhaust temperatures recommended by the engine manufacturer. The flexible connection shall be suitable for vibration isolation and for relieving stress caused by thermal expansion.
- C. The exhaust silencer shall be a critical grade manufactured by Maxim, or equal.
- D. Exhaust piping shall be pitched upward from the engine and be provided with sufficient drains to eliminate condensation and rain water. Exhaust piping shall be welded steel pipe. Elbows shall be welding type, standard wall. Flanges shall be welding slip-on type, 125 pound, either forged or plate steel. Exhaust piping shall be supported independently of the silencer. The silencer and exhaust piping shall be insulated with a minimum of 2-1/2 inches of calcium silicate with a stainless steel jacket and shall be supported as required. The weight of the exhaust and silencer shall not be supported by the engine.

2.6 COOLING SYSTEM

- A. The engine shall be equipped with a cooling system having sufficient capacity to effectively cool the engine when delivering full rated horsepower at the conditions stated above. A radiator and engine-driven fan of a type and capacity recommended by the engine manufacturer shall be included.
- B. The radiator shall be sized in accordance with the engine manufacturer's recommendation for use with 50 percent aqueous ethylene glycol. Air flow shall be controlled by a power inlet damper and a gravity discharge damper, both provided as part of the walk-in outdoor enclosure. Design ambient air temperature shall be 100 degrees F at sea level.
- C. The engine shall have an engine-driven, gear driven centrifugal type water circulating pump for circulating water through the cooling system.

2.7 GENERATOR

- A. The generator shall be nominally rated 300 KW at .8 PF, 480 V 3 phase, 60 Hz, 4 wire wye and shall be a brushless design with solid state permanent magnet generator (PMG) exciter. Other excitation methods are not acceptable. The voltage regulator shall be solid state, generator mounted. Provide radio-interference suppression meeting commercial standards.
- B. If a line to neutral short circuit occurs, the generator shall be capable of supporting 300 percent rated current for 10 seconds without externally mounted devices.
- C. Voltage Regulation Tolerance: Plus or minus 1 percent of any present value over the 3 phase load range. Instantaneous voltage dip or rise, when measured with an oscilloscope, shall not exceed 25 percent upon full load application or rejection, and shall return to preset value within 0.5 seconds.
- D. Waveform: Deviation factor of output voltage shall not exceed 5 percent and the value of any individual harmonic shall not exceed 2 percent of the fundamental when operating with an unbalanced load.
- E. Temperature Rise: Temperature rise of any component shall not exceed the rise permitted by NEMA standards. The voltage regulator shall be adjustable minus 25 percent to plus 10 percent.
- F. Bearing: Double sealed ball bearing, lubricated for life.

2.8 VIBRATION ISOLATORS

- A. The engine and generator shall be mounted on a common system base and shall be provided with vibration isolators of number and size as recommended by the engine supplier to support the engine, generator, radiator, and base. The isolation mountings shall consist of steel or cast iron top and bottom housings incorporating steel springs or "donut" style isolators, located between the genset and the base, and shall be provided with built-in leveling bolts and built-in resilient chocks to control isolation and withstand lateral forces in all directions.
- B. The vibration isolators shall be Korfund Dynamics Corporation Series L, or equal.

2.9 LUBRICATION AND COOLING FLUIDS

- A. The supplier shall furnish the engine fully charged with lubricating oil and grease as specified by the manufacturer for continuous service. The cooling system shall be furnished with a full charge of 50 percent ethylene glycol.

2.10 GENERATOR SYSTEM CONTROL PANEL

A. The engine shall be provided with an integrally mounted instrument and control panel, vibration isolated, NEMA 12 compliant, dead front, constructed of 14-gauge steel and containing at least the following equipment:

Coolant temperature gauge
Oil pressure gauge
Four position selector switches marked for “auto,” “manual,” “stop,” and “stop/reset.”
Automatic starting controls (2 wire start/stop)
Coolant level pre-alarm
Coolant temperature pre-alarms (low and high)
Fuel pressure pre-alarm
Low dc voltage alarm to indicate loss of charge on battery
Electrical contacts and "push to test" pilot lights for shutting down the engine on low oil pressure, high oil temperature, over-crank, high coolant temperature, and overspeed condition
Individual electrical contacts for remote indication of any pre-alarm or alarm condition
Running Time Meter (Non Resettable)
Emergency stop switch
Voltmeter and switch, ammeter and switch, frequency meter

B. Wiring

1. Signal wiring shall be segregated from power wiring and be arranged neatly to facilitate tracing of circuits.
2. Plastic wiring wraps shall be used to bundle wires, except within wiring ducts. The bundles shall be securely fastened to the steel structure at suitable intervals not exceeding 12-inches in length. No open space hanging of wires will be permitted. Flexible stranded copper wiring shall be used throughout. No solid conductor wire shall be permitted.
3. Terminal blocks shall be provided for interconnections between remote devices and local control panel wiring. The terminal blocks shall be factory assembled on a mounting channel, and the channel shall be bolted to the inside of the panel. The terminals shall have

a continuous marking strip using the nomenclature on the schematic diagrams. No more than 2 wires shall be terminated at any one terminal. Wire terminals shall have sleeve wire markers properly marked to match the schematic diagrams.

2.11 GENERATOR ENCLOSURE AND FUEL TANK

A. Generator Enclosure

1. A weatherproof, sound attenuated, walk-in type enclosure shall be provided to house the engine/generator and accessories. The following standards and codes shall be met at a minimum:

- a. NEPA 70 (National Electric Code)
- b. NFPA 30
- c. NFPA 37
- d. NFPA 110
- e. UL 142
- f. API 620

2. The enclosure shall be constructed with an aluminum diamond plate finished floor for mounting on a concrete pad. The enclosure shall conform to the following design criteria.

Rigidity wind test equal to	[150] MPH
Roof load equal to	[50] lbs. per sq. ft.
Floor load equal to	[200] lbs. per sq. ft.
Rain test equal to	[4]-inches per hour
Enclosure certified to meet	[BOCA base building and mechanical codes]

3. Test data on similar construction by the manufacturer shall be available to the ENGINEER upon request.

4. Enclosure shall consist of a roof, steel floor, fuel tank base, 2 side walls and 2 end walls, of stressed skin, semi-monocoque construction, sized as required to meet dimensional, sound attenuation, and code requirements for the actual generator provided.

5. The system shall include a cooling and combustion air inlet silencer section, an equipment enclosure section, and a cooling air discharge silencer section. It shall be designed to reduce source noise by an estimated average 25 dB(A) as measured at a distance of 7-meters from the enclosure. The enclosure shall also be bird- and rodent-proof with all openings screened.

6. Roof and walls shall be of one-piece semi-monocoque construction. Framing members shall be aluminum or aluminized steel. Skin material shall be minimum thickness 0.040-inch,

pre-painted earth bronze color, aluminum (roof shall be mill finish) or minimum thickness 18-gauge aluminized steel. Other materials of construction may be acceptable; however, the CONTRACTOR shall furnish data verifying that the proposed system is equivalent or better than that indicated. Alternative skin colors may be submitted to the ENGINEER for selection. Skin panels shall be hard-riveted to framing members on 3-inch centers maximum. Pop rivets and bolts are not acceptable fasteners to attach exterior skin to framing. Roof assembly shall be cambered to aid in rain runoff.

7. Insulation in walls and roof shall be semi-rigid, thermo acoustic, thickness as required to meet the noise criteria. Lining shall be perforated mill finish aluminum. Self-adhesive foam and loose or batt-type insulating materials will not be accepted.
8. Lifting provisions shall be provided at the enclosure base, with capacity suitable for rigging the entire assembly. Quality assurance procedures of the manufacturer shall include regular testing of the lift devices.
9. A minimum of 4 single personnel access doors shall be provided. A hinged access door for the load bank controls shall also be provided. Doors shall consist of an extruded frame with skin material matching enclosure. Doors shall be fully gasketed to form a weathertight perimeter seal and be pad-lockable. Hinges shall be stainless steel, and lock mechanisms shall be 3 point, with panic hardware to allow opening from inside even when padlocked. The door threshold, if needed, shall be aluminum. Stairs and handrails shall be aluminum and shall be manufactured to meet field-installed conditions.
10. Air handling shall be as follows: Air shall enter the enclosure through a removable hood. Motor-operated dampers shall be provided, wired to be spring operated to open upon engine startup. Radiator discharge shall be through a gravity-operated damper and into a hood. The system shall not exceed 0.5-inch wg total external static pressure to ensure adequate airflow for cooling and combustion.
11. A bolt-in-place removable end wall panel shall be provided for maintenance and/or equipment installation. Bolts, nuts, and washers shall be stainless steel.
12. Enclosure manufacturer shall provide all necessary hardware to externally mount the exhaust silencer and maintain the weatherproof integrity of the system. A bird screen shall be installed on exhaust outlet.

B. Sub-base Fuel Storage System

1. Provide a double wall secondary containment sub-base fuel tank mounted within or beneath the structural skid below the generator set. The tank shall have fuel level gauge, fill, vent, bottom drain, top supply and return lines.
2. The tank shall have venting and emergency venting per UL 12 and NFPA 30; lockable fill, low-level, and high-level alarm contacts; and a dc electric analog fuel level gauge. The rupture basin shall include a float contact to indicate tank rupture. The crossmembers shall incorporate 3/8-inch thick steel tapping plates for gen-set mounting. The entire enclosure/fuel tank package shall be UL listed for use with a diesel engine generator system and shall meet the previously indicated codes and standards.

3. The fuel storage tank capacity shall be sufficient for operating the engine at 100% load for 24 hours, generator rating.

4. Pipe and Fittings

a. Pipe and fitting materials shall be new and the best of their respective classes. Pipe shall be clearly marked with the manufacturer's standard trade mark or identification mark. Pipe and fittings, unless otherwise indicated, shall meet the requirements of these specifications.

b. Piping carrying fuel oil shall be copper type "L" with wrought copper fittings silver soldered. Flexible connections shall be provided between fuel lines and the engine.

5. Hangers, Supports, and Miscellaneous Metalwork: The CONTRACTOR shall provide all necessary hangers, supports, concrete inserts, anchors, and guides for the standby generator equipment.

6. Valves: The CONTRACTOR shall provide ball valves for installation at all required points and on at least each fuel supply line. Ball valves shall be stainless steel, rated 125 pounds working pressure and in every respect be suitable for the purpose intended.

2.12 SPARE PARTS

A. Four sets of the following spare parts shall be furnished:

1. Air filters

2. Oil filters

3. Fuel filters

PART 3 EXECUTION

3.1 START-UP ASSISTANCE AND TRAINING

A. The manufacturer's representative shall furnish on-Site start-up assistance and shall inspect the installation prior to start-up to verify that equipment is installed in accordance with the manufacturer's requirements.

B. Upon completion of startup and after acceptance by the OWNER, the CONTRACTOR shall completely fill the fuel tank.

C. In addition, the manufacturer's representative shall provide on-Site training for operation and maintenance of all equipment included in this Section.

D. The following times shall be included, as a minimum, for the above tasks. A Day is defined as 8 hours on-Site, exclusive of meals and travel. Each task shall be considered a separate trip to the site. Dates and times for the trips shall be coordinated with the OWNER.

1. Inspection of the installation: 1 Days

2. Startup assistance: 1 Days

3. Operation and Maintenance Training: One Day

END OF SECTION

SECTION 16950
CONTROL PANELS

PART 1 GENERAL

1.1 DESCRIPTION

Work included:

- A. Control panels.

1.2 RELATED WORK

- A. Section 16010 - General Electrical Requirements
- B. Section 16155 - Low Voltage Motor Control

1.3 SUBMITTALS

- A. Submit shop drawings in accordance with Section 16010.
- B. Submit a complete list of equipment, materials, and any details required to demonstrate that the equipment will function properly as a unit. This material shall include:
 - 1. Equipment fabrication drawings, one-line diagrams, schematic diagrams and connection diagrams.
 - 2. Detailed descriptions of equipment including weights, dimensions, installation requirements, and heat dissipations.
 - 3. Catalog cuts of all devices used.
 - 4. Nameplates, designations, sizes and mounting methods. Indicate locations of nameplates.

1.4 MANUFACTURER'S SERVICES

Provide equipment manufacturer's services at the job site for the minimum man-days listed below, travel time excluded:

- A. One man-day to check the installation, calibrate the equipment, supervise start-up, and supervise testing of the system.

- B. One man-day to instruct the Owner's personnel in the operation and maintenance of the equipment.

1.5 OPERATION AND MAINTENANCE MANUALS

Submit operation and maintenance manuals in accordance with Section 01680 and Section 16010.

1.6 SYSTEM INTEGRATORS

The following companies are known system integrators. The companies are listed for information only and the contractor is not required to use the services or products furnished by these companies.

TESCO 8440 Florin Rd Sacramento, California 95828 (916) 395-8800 Fax: (916) 395-8362	Krug-Bixby-Long Associates 26269 Research Road Hayward, California 94545 (510) 887-1117 Fax: (510) 887-1153
George T. Hall 1315 Greg Pkwy #104 Sparks, Nevada 89431 (775) 356-7401 Fax: (775) 356-7475	
Telstar Instruments 4017 Vista Park Court Sacramento, CA 95834 (916) 646-1999 Fax: (916) 646-1096	

PART 2 MATERIALS

2.1 GENERAL

Custom control panels and devices shall comply with Section 16010.

2.2 EQUIPMENT DRAWINGS/DIAGRAMS

Design and provide equipment fabrication drawings, one-line diagrams, schematic diagrams and connection diagrams in accordance with Section 16015.

2.3 CONTROL ENCLOSURES

- A. Design and test control enclosures in conformance with UL 508. Enclosure types shall be as follows unless noted otherwise in the drawings:

1. Indoor use: NEMA Type 12
 2. Indoor or outdoor use wet locations: NEMA Type 3R
 3. Indoor or outdoor use corrosive area: NEMA Type 4X
- B. The depth of the control enclosure or compartment shall be a minimum consistent with the maximum depth of the control devices plus the required electrical clearance. In no case shall the depth of the enclosure be less than 8 inches.
- C. Provide mounting panel for mounting of all interior components. Panel finish shall be white enamel.
- D. Where heating from control devices results in a temperature rise which is detrimental to the contained equipment or its operation, provide louvers or forced air ventilation with air filters. When forced air ventilation is required, the cabinets shall be pressurized. Air filters shall be of commercially available types and sizes.
- E. Provide a permanent metal data pocket attached to the inside of the enclosure. If space permits, the pocket shall be at least 10-1/2 inches wide and of depth and thickness to accommodate all electrical diagrams.
- F. Enclosure construction shall be minimum 14-gauge steel. Finish shall be white enamel inside and ANSI 61 gray baked enamel outside over phosphatized surface. Provide continuous hinges for enclosure doors with stainless steel fast operating JIC clamps (Hoffman #A-L23SS or equivalent) and hasp and staples (or padlocking kit) for padlocking.

2.4 CONTROL WIRING

- A. Provide 600V rated Class C stranded Type MTW. Provide No. 14 AWG minimum conductor size. Ampacity shall be in accordance with the NEC.
- B. Instrumentation signal cables shall be of the type used for field wiring.

2.5 MARKING

- A. Identify wire terminations with a number to correspond with the schematic diagrams. Identification tags shall be preprinted white heat shrinkable tubing, Raychem Shrinkmark system or equivalent.
- B. Plainly and permanently identify control and other devices using the same identification as shown on the schematic diagrams. Show identification for devices inside the enclosure on the plate adjacent to, not on, the device.

1. Exception No. 1: Where the size or location of the devices make individual identification impractical, such as on electronic assemblies, use group identification.
 2. Exception No. 2: Where panel layouts do not permit mounting identification plates adjacent to components, such as relays, place the permanent relay identification on the relay where it is plainly visible, and provide a second identification on the top of the panel wireway cover directly below the relay. Identify the wireway covers to show their proper location.
- C. Identification plates for devices mounted inside and outside the control enclosure shall be one of the following:
1. Laminated phenolic for engraving stock; a minimum of 0.062 inch thick. Hold plates in place with metallic drive screws or the equivalent. Use permanent adhesives for attaching nameplates to wireway covers.
 2. Non-corrodible metal; a minimum of 0.031 inch thick for engraving stock of 0.012 inch thick for embossing stock. Hold plates in place with metallic drive screws.

2.6 SUPPLY CIRCUIT DISCONNECTING MEANS

Provide a supply circuit disconnect for each control panel. Disconnect shall be a circuit breaker mounted within the control enclosure operated by a variable depth flange-mounted circuit breaker operating mechanism. Provide operating mechanism with a defeater mechanism such that when the defeater mechanism is operated, the control panel front door can be opened without having to open the disconnecting means. Disconnect shall have the same enclosure environmental rating as the enclosure.

2.7 CIRCUIT BREAKERS

- A. Provide molded-case, bolt-on type with quick-make and quick-break toggle mechanism, inverse time trip characteristics and trip-free operation on overload or short circuit. Automatic tripping shall be indicated by a handle position between the manual OFF and ON position. Provide trip ratings and number of poles as indicated on the drawings. Provide provisions for padlocking external disconnect handles in the OFF position. Provide circuit breakers with copper conductor compression lugs. Provide terminal pads, if required, for lug mounting.
- B. Mount circuit breakers on offset at back of Control Pedestal enclosure. Offset shall have fastening mechanism to securely hold circuit breakers in place. Circuit breakers shall be fully operable through dead front panel. Opening dead front panel shall not interfere with the circuit breaker's position.

2.8 CONTROL DEVICES (OTHER THAN MOTOR CONTROL)

- A. Control Power Transformer: Provide 120-volt control circuit transformer if incoming power supply is not 120 volts. Provide copper wound, vacuum impregnated dry type control transformer with screw type terminals. Provide minimum 100-volt-ampere spare capacity that is in addition to the loads specified. Size transformers for a maximum voltage drop of 5% with 100% primary voltage during contactor inrush. Fuse one side to secondary winding and ground other side. Provide primary winding fuses on both lines.
- B. Provide control relays, time delay relays, etc. as shown on schematic diagrams or as required for correct operation.
- C. Provide indicator lights, selector switches, push buttons, meters, etc., as shown in the schematic diagrams, single line diagrams, and as required for correct operation. Mount on the front panel of the control enclosure.
- D. Push Buttons and Selector Switches: Provide NEMA Type 4/13 for indoor areas and exterior areas with NEMA A300 rated contacts. Provide NEMA Type 4X with hypalon protective boots for corrosive areas. Push buttons shall be standard size (30.5mm mounting hole) round, flush head with momentary contacts. Selector switches shall be round with standard operator.
- E. Pilot Lights: Provide standard full size (30.5mm mounting hole) round, transformer type, NEMA Type 4/13 for indoor and exterior areas or NEMA Type 4X for corrosive areas] complete with color of lens indicated on drawings. Lamps shall be high-density light emitting diodes. Indicating lights shall be push-to-test type.
- F. Control Relays: Provide magnetically held type with NEMA A300 convertible rated contacts and coil voltage, number of poles, and pole arrangement as indicated in the drawings. Relays shall be Allen-Bradley Bulletin 700, Square D Class 8501, type X, General Electric CR120B or equivalent.
- G. Time Delay Relays: Provide solid state magnetically held, with NEMA A300 convertible contacts, and coil voltage, number of poles, pole arrangement, and maximum timing adjustment as indicated on the drawings.
- H. Control Power Circuit Breakers: Provide molded case, DIN rail mounted circuit breakers with number of poles and accessories as shown on the drawings. Provide Allen Bradley 1492-GH circuit breakers, GE V-Line Miniature circuit breakers or equivalent.

2.9 LOW VOLTAGE MOTOR CONTROL

Provide devices in accordance with Section 16155.

2.10 TERMINAL BLOCKS

- A. Provide terminal blocks for incoming and outgoing control wires. Wire and mount terminal blocks so that internal and external wiring do not cross over the terminals. Terminate no more than one conductor at each terminal.
- B. Terminate field wiring on the "field side" of the terminal blocks. Do not connect internal panel wiring to the "field side" of the terminal blocks. Do not connect field wiring to the "panel side" of the terminal block.
- C. Terminal blocks shall be modular, rail mounted, rated at 20 amperes, 600 volts, capable of terminating wire sizes #8 through 22 AWG, constructed of thermoplastic and UL listed in accordance with UL 486A and 1059. Provide copper or brass current carrying parts electroplated with tin/lead. Terminal connection shall be a screw clamp pressure plate connection, designed such that the clamping screw does not clamp the screw directly to the wire.
- D. Provide symmetrical steel assembly rails, end brackets, jumper bars, and other accessories as required for a complete terminal block assembly.
- E. Consecutively number terminal blocks on both sides from top to bottom with preprinted white polyamide marking tags hot printed with permanent black symbols. Provide Allen-Bradley 1492-SM markers or equivalent.
- F. Terminal blocks shall be Allen-Bradley 1492-W10 or equivalent.

2.11 WIRING METHODS

- A. Contain wiring in panel wireways, including incoming and outgoing field control wiring. Provide white or light gray colored PVC or noryl panelways with restricted slot design, matching snap on covers, holes and nylon "push" rivets for mounting. Panelways shall be minimum 2-inch square and sized for maximum 10% fill. Provide Panduit products or equal.
- B. Provide minimum 2 inches of clearance between panel wireway and wire terminations to allow for clear viewing of wire identification marking.
- C. Wiring to control devices on the front door shall be tied together at short intervals and secured to the inside front door with Panduit adhesive mounts. Provide CLINCHER adjustable releasable clamp mounts for wire bundles .69 inch in diameter or smaller, or AM2-C mounts with UNI-TY releasable nylon cable ties for bundles larger than .69 inch in diameter. Attach mounts to front panel with Eastman 910 adhesive or equivalent. Enclose wiring between panel and front door in gaped polyethylene spiral wrapping.

PART 3 EXECUTION

3.1 FACTORY TESTS

Inspect and test control panel for correct operation. Test each circuit for continuity, short circuits, and fault grounds.

3.2 SITE TESTS

Test control panel with all field wiring connected. Set all adjustable set points and time delays as required. Check operation of control panel and field devices and perform required adjustments for correct operation.

END OF SECTION

SECTION 17010

INSTRUMENTATION GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. This section supplements the requirements of Division 1 and covers items common to sections of Division 17.
- B. The contractor shall take full responsibility for and shall coordinate the work of Division 16 and Division 17 to guarantee a complete and finished installation of the electrical, instrumentation and control systems. The Division 17 drawings and specifications are to be read together with drawings and specifications of all other Divisions and specifically Division 16. Additional information necessary to complete the work is included in other sections of the drawings and specifications.
- C. All tables shown of the Division 17 drawings and specifications are for information purposes only and may show partial lists of equipment and materials. A complete take-off from all drawings and specifications shall be done by the Contractor in order to determine accurate quantities of equipment and materials

1.2 QUALIFICATIONS

- A. The Contractor responsible for Instrumentation & Controls work shall meet the minimum requirements outlined in Section 00453.
- B. The Contractor shall provide fully qualified journeyman instrumentation and electrical personnel capable of performing the requirements of this work. The work identified in this Contract also includes, in addition to the installation: testing, system configuration, verification, troubleshooting and commissioning of Ethernet based components of the electrical, instrumentation and control systems. The qualifications of the instrumentation personnel shall include adequate and appropriate training in the Bus technology and fiber cable installation provided by recognized institutions.
- C. The Contractor shall provide evidence of suitability to complete the scope of work under this contract, e.g., similar completed projects, key project personnel resumes, certificate of recognition, etc.
- D. The Contractor must inform, in writing to the general contractor, and/or Engineer about the intention to use subcontractors on this project. The use of sub-contractors must be approved, in writing, by the Engineer, prior to start any work.

1.3 GLOSSARY OF TERMS

An explanation of definitions used throughout Division 17 are as follows:

- A. AI/AO Analog Input/Output.
- B. CMMS Computerized Maintenance Management System.
- C. DI/DO Digital Input/Output.
- D. FOC Fiber Optic Cable.
- E. HMI Human Machine Interface - an industrial panel computer or operator interface terminal usually installed outside of a control room, which allows the viewing of various graphics and alarms, and allows the operator to change process parameters, modes and other control actions within the process areas in real-time. The functionality of the HMI(s) is independent of the SCADA computers (servers/clients).
- F. HSE High Speed Ethernet.
- G. I/O Input/Output Signals.
- H. LAN Local Area Network.
- I. LIMS Laboratory Information Management System.
- J. MM Multimode (Fiber)
- K. OIT Operator Interface Terminal.
- L. OPC OLE for Process Control (communication interface driver).
- M. PID Proportional, Integral and Derivative Process Controller.
- N. PLC Programmable Logic Controller.
- O. PS Pump Station
- P. RAM Random Access Memory.
- Q. SCADA Supervisory Control and Data Acquisition
- R. SM Single Mode (Fiber Optic)

- S. UPS Uninterruptible Power Supply.
- T. WAN Wide Area Network.
- U. WTP Water Treatment Plant
- V. WWTP Wastewater Treatment Plant.

1.4 REFERENCE STANDARDS

This specification contains references to the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail:

- A. National Electrical Code (NEC), latest revision.
- B. API RP550-86, Manual on Installation of Refinery Instruments and Control Systems, Part I-Process Instrumentation and Control Sections 1 through 13.
- C. ASTM B68-86, Seamless Copper Tube.
- D. ASTM D883-89, Terms Relating to Plastics.
- E. IEC 61508, Functional Safety of Electrical Safety-Related Systems.
- F. ISA RP7.1-56, Pneumatic Control Circuit Pressure Test.
- G. ISA RP12.6-87, Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations.
- H. ISA S5.4-76, Instrument Loop Diagrams.
- I. ISA S51.1-79, Process Instrumentation Terminology.
- J. NEMA 25085, Enclosures for Industrial Controls and System.
- K. NEMA ICS 1-88, General Standards for Industrial Control and Systems.
- L. NEMA ICS 2-88, Industrial Control Devices, Controllers, and Assemblies.
- M. NFPA 820, Standard for Fire Protection in Wastewater Treatment and Collection Facilities, latest revision.

- N. SAMA PMC 17-10-63, Bushings and Wells for Temperature Sensing Elements.
- O. UL 1012-89, Power Supplies.

1.5 SUBMITTALS

- A. Shop Drawings: Submit with the related items of equipment in accordance with Section 01330 and Section 16010.
- B. Documentation provided by the Contractor shall be submitted in paper and electronic (PDF) format and shall include but not be limited to:
 - 1. Equipment descriptive data, including equipment tag as identified in the contract documents.
 - 2. Full manufacturer's part number indicating all selected options.
 - 3. Equipment installation, service manuals, operation/maintenance manuals and recommended spare parts lists.
 - 4. Schematics and interconnecting wiring diagrams.
 - 5. Records of conductor identification, field terminals, changes, etc.
 - 6. Instrumentation and control panel shop drawings, face layouts, schematics and point-to-point wiring diagrams.
 - 7. Ethernet network control system architecture drawings complete with wiring identification numbers.
 - 8. Records of as-built information for the control system components.
- C. Documentation provided to the Contractor for reference includes the following:
 - 1. P&IDs - depict the general intent of the control systems and are to be used as the governing document for the scope of work.
 - 2. Instrument Index - a sorted index of the detailed information for the devices shown on the P&IDs. The index lists the appropriate support information for the devices' supply and installation. The instrument index is the controlling document for the supply of materials.
 - 3. I/O Index - a sorted index of the PLC I/O points.
 - 4. Location Drawings – (E Series Electrical Drawings) indicates in plan and/or elevation views where the instrument elements and any other control system components are physically located. These drawings are provided to assist the Contractor in locating the devices.
 - 5. Instrument Standard Details (ISD) - provide a reference for installation, operation and other instructions pertinent to a particular type device.

6. Detailed Specification - lists qualifications, quality of materials and workmanship, and supplementary information.
 7. Plant control system SCADA Block Diagram representing the Fiber Optic network topology if required.
- D. On-Site Record Drawings:
1. Maintain on-site a complete set of as-built drawings as listed in Division 1 of this specification.
 2. In addition to the requirements as stated in Division 1, record on the drawings the following information:
 3. Mark all change orders, alterations or additions.
 4. Show all instrumentation cable and control tubing.
 5. Show all changes to the numbers and location of equipment, panels and end devices that may occur during the course of the work.
 6. Create record drawings for the complete instrumentation system. A complete set of contract drawings and associated files of schematic drawings will be made available to the successful bidder for the purpose of record drawing creation.
 7. Before requesting the final completion certificate, make any necessary final corrections to the drawings, sign each print as a certification of accuracy and deliver all sets to the Engineer for approval.

1.6 CLOSEOUT SUBMITTALS

- A. Operating and Maintenance Data: Provide with the related item of process equipment for incorporation in operation and maintenance manual as specified in Section 01680 and Section 16010.
- B. The contractor shall submit an updated instrument and IO indexes at the end of the project that reflect all changes made during construction.
- C. In addition to the requirements specified in Division 1, provide the following information:
 1. Table of Contents - Arrange contents sequentially by systems under section numbers. Label tabs of dividers between each to match section numbers in the Table of Contents.
 2. System Descriptions - A brief synopsis of each system typed and inserted at the beginning of each section. Include sketches and diagrams where appropriate.
 3. Maintenance and operating instructions for all equipment and controls - These operating instructions need not be manufacturer's data but may be typewritten

instructions in simple language to guide the in the proper operation and maintenance of his installation.

4. A copy of all wiring diagrams complete with wire coding, test sheets and programming information.
5. The Engineer and Owner will review a sample of shop drawing wiring diagrams and in case of any errors and omissions the contractor make all required corrections without any additional cost.

1.7 SERVICE CONDITIONS

- A. Unless specified otherwise, provide equipment and instrumentation suitable for continuous operation at an elevation of 3300 feet above sea level.
- B. Classification of Plant Areas.
 1. Refer to Division 16.

1.8 COORDINATION

- A. The Contractor shall examine the drawings and specifications of each division associated with this work. Before commencing work, obtain a ruling from the Engineer on any conflicts between divisions.
- B. The drawings and specifications shall be read and interpreted in conjunction with one another.
- C. The responsibility to determine which Division provides various products and work rests with the Contractor. Additional compensation will not be considered because of differences in interpretation of specifications.
- D. Provide work plan and identify methodologies for equipment installation with provision made for the most expeditious means to complete the work.
- E. Treat any item or subject omitted from this Division's specifications, but which is mentioned or reasonably specified in other Divisions' specifications or drawings and pertains to the instrumentation and control system, as being integral to the overall system. Provide such specified items or subjects.
- F. Structural members shall not be cut without prior approval of the Engineer.
- G. The Contractor is responsible to coordinate their work with other trades, and the Owner's Representative.

- H. The Contractor is responsible for determining cable lengths for manufacturer supplied equipment and devices with integrated cables.

1.9 QUALITY ASSURANCE

- A. The Contractor shall comply with all local, state and federal law and/or regulations applicable to the work to be performed, although said law; rule standard or regulation is not identified herein.
- B. The Contractor shall provide a minimum of two (2) year's warranty on installation and workmanship to the Owner, separate from the manufacturer's warranty, for all components specified under Division 17. Refer to Division 1 for additional warranty requirements.
- C. The Contractor shall clean and maintain the work environment free from trash, cardboard, dust, dirt, etc. which is accumulated during installation. Keep all liquids off finished floors and walls. The Contractor is responsible to clean or repair scratched/damaged/soiled finishes caused by them, at their own expenses.

1.10 QUALITY OF PRODUCTS

- A. All products provided to be UL Listed and meet the design and installation requirements of the NEC.
- B. Products provided, if not specified, to be of a quality best suited to the purpose required and their use is subject to approval by the Engineer.
- C. Provide new materials, equipment and articles incorporated in the Work, not damaged or defective and of the best quality (compatible with specifications) for the purpose intended. If requested furnish evidence as to type, source and quality of products provided.
- D. Defective materials, equipment and articles whenever found may be rejected regardless of previous inspection. Inspection by the Engineer does not relieve the Contractor of his responsibility but is merely a precaution against oversight or error. Remove and replace defective materials at own expense and be responsible for all delays and expenses caused by rejection.
- E. Unless otherwise indicated in the specifications, maintain uniformity of manufacturer for any particular or like item throughout the building.
- F. Permanent labels, trademarks and nameplates on materials, equipment and articles are not acceptable in prominent locations except where required for operating instructions and when located in mechanical or electrical rooms.

- G. Immediately upon signing the Contract, review Product requirements and anticipate foreseeable delivery delays in any items. If delays in deliveries of materials, equipment or articles are foreseeable, propose substitutions or other remedial action in ample time to prevent delay in performance of the Work.
- H. To receive approval, proposed substitutes must equal or exceed the quality, finish and performance of those specified and/or shown, and must not exceed the space requirements allotted on the Drawings.

1.11 SHIPMENT, PROTECTION AND STORAGE

- A. Examine each component upon delivery to site. Report all damage noted to the Engineer prior to accepting or rejecting delivery. All instrumentation primary elements, control components, panels, etc. shall be placed in a secure, dry, heated storage building. Maintain the space temperature above 50° F and the space relative humidity below fifty (50%) percent.
- B. Perform a preliminary examination upon delivery to ensure that all instrumentation and control components supplied for this project under this section of the specification comply with the requirements stated in the instrument specification sheets and drawings.
- C. Itemize all non-conformities noted above and forward them to the Engineer. Any delays in construction resulting from the delivery to site of non-conforming instrumentation and control components shall be the responsibility of the Contractor.
- D. Precautions:
 - 1. Do not install primary elements or other sensitive equipment until construction is sufficiently completed to provide an "operating condition" environment. Notify the Engineer prior to installing any equipment of this type.
 - 2. The physical dimensions of the components are such that they can be installed without interference with the building structure or other equipment, and that, after installation, there are sufficient clearances on all sides for maintenance, servicing and operation of the equipment.
 - 3. Ensure that covers where required are properly installed on all equipment. Provide all covers, padding, guards, etc. as required to guard any equipment against damage.
- E. Return all damaged equipment to the factory for total corrective repairs.

PART 2 MATERIALS

2.1 ACCEPTABLE MATERIALS

- A. Refer to Requirements of Division 1.
1. The Contractor shall certify that the products being provided under this contract are suitable for the hazardous area classification in which they will be installed.
- B. Selected Products and Equivalents:
1. Provide products and materials that are new and free from all defects.
 2. Products and materials called for on the drawings or in the specifications by trade names, manufacturer's name and catalogue reference are those which are to be used as the basis for the Bid and for installation as part of this contract.
 3. The design has been based on the use of the first named product, where applicable equivalent products are listed they must meet all functional requirements of the first named product.
 4. Provide the products specified unless a proposal for an alternative or substitute product has been accepted in accordance with the requirements following.
- C. Alternate Products:
1. Refer to Division 1 for consideration of alternate products.
 2. Alternate products and materials to those specified will only be considered by the Engineer if they are shown in the Bid as a material variation, and where applicable, with an appropriate price adjustment. The Engineer will reserve the right to accept or reject any alternative without explanation.
 3. The alternate submission shall provide sufficient information to enable the Engineer to determine whether the alternate is acceptable or unacceptable. Any additional information deemed necessary by the Engineer to verify the conformance of a proposed alternative shall be provided.
 4. Provide complete information on required revisions to other work and products to accommodate each alternate product. The Contractor shall provide adjustments to the contract documents as deemed necessary by the Engineer to accommodate a material or product variation.
 5. The Contractor assumes full responsibility when providing alternative products or materials that all space, weight, connections, performance, power and wiring requirements etc. are considered and compensated for. Any costs incurred for additional components, changes to other services, structural or space requirements, layouts and plans, etc. that may arise from the use of the alternate devices shall be borne by the Contractor.
 6. Materials or equipment rejected by the Engineer to be immediately removed from the project.
- D. Review of Products:

1. Immediately after notification of award of contract, review with the Engineer the list of products to be provided by this Division.
2. After agreement on product list has been reached, no subsequent changes will be permitted except as specified hereafter.

E. Substitution of Products after Contract Award

1. After acceptance of the list of products, no substitution of any item will be permitted unless the approved item cannot be delivered in time to comply with the work schedule.
2. To receive acceptance, proposed substitute products are to equal or exceed the quality, finish and performance of those specified and/or shown, and not to exceed the physical space requirements allotted, as shown on the drawings.
3. Provide to the Engineer documentary proof of equality, difference in price, where applicable, and delivery dates, in the form of certified quotations from suppliers of both specified items and proposed substitutions.
4. Refer to Division 1 for additional information on substitutions:
 - a. The Engineer will review the shop drawings for the equipment which deviates from the original specification only after the contractor provides written explanation that each substitution comply with at least one of the following criteria:
 - b. The specified equipment is no longer available.
 - c. The proposed alternative equipment has advanced technical characteristics than the specified equipment and it will be provided without contract price increase.
 - d. The proposed alternative equipment has same technical characteristics as the specified equipment but brings significant cost savings to the Owner.
 - e. The proposed alternative equipment carries significant construction cost savings for the Owner.

F. Uniformity of Manufacture:

1. Unless otherwise specifically called for in the specification, uniformity of manufacture to be maintained for similar products throughout the work.

G. Product Finishes:

1. Products shall be manufacturers' standard finish. Where special finishes are specified, refer to Division 9 for details on quality and workmanship of the finishes.

H. Use of Products during Construction:

1. Any equipment used for temporary or construction purposes to be approved by the Engineer and in accordance with Division 1 of this specification. Clean and restore to "as new" condition all equipment prior to the time of substantial completion.
2. The warranty period does not begin until the date of substantial completion of the work.

2.2 IDENTIFICATION AND LABELING

- A. Refer to Division 16 for general identification requirements. Provide UV resistant laminated nameplates with ¼" mm white lettering on a black background. Identify the loop tag number (where applicable) and the device name, function, and instrument range or set-point value on the nameplate.
- B. Where it is not possible to attach a UV resistant laminated nameplate to a field instrument component, provide the component with a stainless-steel metal tag firmly wired to the device and identified with the loop tag number.
- C. Clearly mark all panels, pull boxes, junction boxes, etc. to indicate the nature of service.
- D. Provide neatly typed circuit directories for panel power distribution systems to indicate loops or devices powered by the circuit and the fuse size.
- E. Identify all exposed conduits at all pull box locations and where the conduits enter or leave a location. This shall apply to conduits above removable ceilings.
- F. Cable and conductor identification/labeling shall be as per the requirements of Section 16120.

PART 3 EXECUTION

3.1 SITE EXAMINATION

Refer to the requirements of Division 1.

3.2 PRODUCT HANDLING

- A. Use all means necessary to protect the installation and to protect products and installed work of all other trades.
- B. Any damage to the products and/or installed work shall be repaired or replaced by the contractor, to the satisfaction of the Owner and Engineer, at no additional cost to the Owner.

3.3 WIRE AND CABLE

Refer to Section 16120.

3.4 EQUIPMENT CONNECTIONS

- A. Prior to the connection of signal wiring to process control and instrumentation devices, check the device voltage rating and polarity for compatibility with the corresponding loop and/or schematic diagram. Where device and circuit characteristics are found to be incompatible, the connections are not to be made. Report the condition immediately to the Engineer.
- B. All control wiring diagrams illustrate typical control circuits applicable to the type of equipment specified. Control circuits may vary with different manufacturer's equipment. Verify all control circuits with the suppliers of the equipment and make any corrections to the control wiring diagrams that may be required.
- C. Provide circuit breakers in the control panels for all devices or control system input/outputs sourced from the panel.
- D. Provide a disconnecting means in the cable connecting each ultrasonic transponder to the transmitter. This disconnect shall consist of a terminal strip in a local WP junction box with approximately 3 meters of cable from the transponder.
- E. Provide moisture barriers with enclosure rated for the area installed.

3.5 WIRING TO EQUIPMENT SUPPLIED BY OTHERS

Equipment supplied by the Owner or by other Divisions, that have external or field mount control devices, is to be installed, wired and commissioned by this Division.

3.6 ACCESS PANELS

- A. Provide access panels where instrumentation and control system junction boxes are concealed. Panels to be of adequate size for servicing of the concealed junction box and complete with necessary frames and hinged doors held closed with captive fasteners. The type and size of panels are to be coordinated with the Engineer.
- B. In removable ceiling areas provide markers on ceiling tile to locate equipment requiring access. Use a 1" dia. blue circle painted on the access panel to indicate that it is for instrumentation and control system access.

3.7 SEALING OF WALL AND FLOOR OPENINGS

- A. Seal all conduit and cable entries passing through outside walls of buildings, through partition walls separating electrical rooms from other areas, through fire separations, and through floors above grade.
- B. Seal openings after all wiring entries have been completed.
- C. Sealing material shall be fire resistant and not contain any compounds which will chemically affect the wiring jacket or insulating material. Cable penetrations through fire separations, if required, are to be sealed. Acceptable methods are Canstrut "Fire Stop", Electrovert "Multi-Cable Transit" or Dow Corning RTV Silicone Foam.
- D. Cable transit blocks (with knock out blocks) are also acceptable as long as they have capability to be sealed.

3.8 SLEEVES

- A. Provide sleeves of galvanized steel pipe with machine cut ends of ample size to accommodate conduits passing through walls, partitions, ceilings, floors, etc.
- B. For wall, partitions and ceilings the sleeve ends are to be flush with the finish on both sides. For floors the ends shall extend 4" above finished floor level.
- C. Fill the space between the sleeve and the conduit with fire stop material and caulked around the top and bottom with approved permanently resilient, non-flammable and weatherproof silicone base compound. Ensure that the seal is compatible with the floor and ceiling finishes.
- D. Locate the sleeves and position exactly prior to construction of the walls and floors.
- E. Failure to comply with the above requirements shall be remedied at the Contractor's expense.

3.9 INSTRUMENT MOUNTING STANDS

- A. Supply and install instrumentation mounting stands as required. Stands are to be floor, wall, or hand rail mounted. The mounting stands are to provide by the same manufacturer as the instrument it supports.
- B. Supply and install protective drip shield for any exterior stand-mounted instrumentation equipment. The drip shield is to extend 2" at the top and sides from the front face of the equipment. The drip shield is to be fabricated from aluminum or stainless steel.

3.10 CONNECTIONS TO MECHANICAL, ELECTRICAL AND EXISTING SYSTEMS

Refer to Divisions 11, 15 and 16 for the required tie-in procedures.

3.11 TAGGING STANDARDS FOR DEVICES AND WIRING

Tag all devices, wires and I/O using the assigned loop, equipment or device tag name. Where tag naming and numbering is not defined, the Engineer will provide naming and numbering that is consistent with the plant naming conventions.

3.12 CALIBRATION AND CONFIGURATION

- A. Instruments shall be factory pre-calibrated and the calibration verified in-place after installation. Provide a printed record of the factory calibration parameters for "smart" devices.
- B. Prior to calibration completely program and configure all "intelligent" instruments including entries of the appropriate range and tag number e.g., HART instruments. Tags are as shown on the P&IDs. Where specific loop configurations are required, loop diagrams shall be provided for input prior to commissioning. Provide a printed record of device serial numbers against their assigned tag number and record all block assignments and configurations.
- C. Verify that devices respond to the assigned address, label each device with the address and maintain a permanent record of the addressing scheme.
- D. Instrument set up and calibration is to be conducted by a qualified technician working under the approval of the instrument manufacturer and with qualifications as described in this section.
- E. Calibrate all instruments to an accuracy of 1/2 of one percent of reading, or to the manufacturer's stated accuracy for the instrument.
- F. Calibrate all instruments in accordance with the manufacture's recommendations. In addition, perform the following applicable calibration checks for each instrument and its associated signal conditioning equipment:
 - 1. Calibrate all inline flow meters by a draw-down test (If Practical)
 - 2. Calibrate all density meters by lab samples.
 - 3. Calibrate all vacuum and pressure instruments by manometer or accurate test instrument and hand test pump.
 - 4. Calibrate gas detectors using standard gas sample.
 - 5. Calibrate temperature instruments against a standard lab thermometer.

3.13 COMMISSIONING

- A. Refer to the requirements of Division 1 and Section 01670 for additional commissioning requirements.
- B. Inspections:
 - 1. Provide two (2) weeks written notice to the Engineer prior to energizing any system to allow for inspection by the Engineer.
- C. During commissioning demonstrate to the Engineer or the Engineer's representative proper calibration and correct operation of instruments and gauges.
- D. Commissioning of the instrumentation and control system to include but not be limited to the following:
 - 1. Verify instrument calibration and provide written report.
 - 2. Verify signal levels and wiring connections to control panels for all instrumentation and control equipment.
 - 3. Function check and adjust under operational conditions the instruments and control equipment.
 - 4. Coordinate instruments and control equipment supplier's service personnel as required for complete system testing.
 - 5. The Contractor shall make provision to be available and coordinate with the Plant Control System programming team, and the commissioning team to check the sensor signals from source to destination.
 - 6. Instruct plant personnel in correct method of operation of instruments and control equipment.
 - 7. Direct plant personnel at hand-over as to final adjustment of the system for correct operation of plant.

3.14 PROPER MOUNTING

- A. Follow the appropriate instrument installation standard details and manufacturers recommendations for installing local and field instrumentation and electrical devices.
- B. Do not install instrumentation on any support structures which could be removed.

3.15 TRAINING

Provide training and training literature, described in detail in Division 1 and Section 01675, in the proper operation and maintenance of all control devices, control valves, and ancillary

instrumentation described under this section of the specification.

END OF SECTION

SECTION 17015

INSTRUMENTATION SCOPE OF WORK

PART 1 GENERAL

1.1 WORK INCLUDED

This section covers items common to sections of Division 17. This section supplements the requirements of Division 1. Division 1 shall be used to clarify any anomalies associated with sections of Division 17.

1.2 PROJECT DESCRIPTION

A. Work under This Contract:

1. The Control System/Instrumentation work done under this Contract includes, but is not limited to: the supply of materials, labor, equipment, and permits necessary for the complete control system manufacturing, assembly, shop testing, installation, site testing and commissioning of the City of Auburn – WWTP Sludge Dewatering Upgrades project.
2. The work under this Instrumentation and Control (I&C) Section of the Contract includes supply of Instruments as specified in the Instrument Index and complete installation and integration of supplied instruments, for a complete and operational control system.
3. The Prime Contractor shall review the contract documents to determine the complete instrumentation, electrical, and data communications network requirements, and assemble a list of contract design information for clarification by the Engineer. The Contractor will be required to produce a work schedule in a compatible format with the Master Project Schedule, and submit it to the Engineer for approval. The submission task milestones will be compliant with the milestones of the Master Project Schedule.
4. This division requires the provision of a fully functional Control System to monitor and control the new facility. The work required to provide the system shall include; the design, fabrication, hardware, installation, testing, programming and configuration of devices and equipment, personnel training and documentation of the system.
5. This specification section does not show all required I&C work. The required I&C work is shown on the Contract Drawings, Specifications, and as specified herein. A guarantee of all workmanship and materials for a period specified herein is also required.

B. Related Work shall include but not be limited to:

1. Electrical work - specified in the Electrical Sections under Division 16, shall be considered to be a part of these Specifications for proper coordination between the Control system and the Electrical portions of the Work. The Electrical system work shall be supplied under the General Contract. The Division 17 Contractor shall work under the Division 16 responsibility for purpose of contract coordination. The wiring and installation of components will be coordinated by Division 16.
2. Process Equipment will be supplied under separate divisions. The process Equipment shall be incorporated by the Contractor into the overall process control system. The Various Process Equipment will be installed and tied into the control system by this division. Control System programming and SCADA Graphics for the control, monitoring and alarm notification will be provided by others. Coordination of signals tie-in, testing, functional programming and commissioning of various pieces of equipment resides with the Contractor.

1.3 PROJECT SUMMARY

- A. The following, lists primary components that will be provided as part of the Control system deliverables. This information is intended for use by the Prime Contractor to provide background knowledge of the Control system for integration with his scope of supply and installation for the local control panels, instrumentation and electrical field devices, data network communications equipment, and control room consoles.

1.4 WORK INCLUDED

The Work included is the provision and commissioning of a complete and fully functional control system, less PLC and SCADA programming and configuration. The work shall include any equipment, material and labor not specifically noted or detailed in the specifications and drawings but which is evidently required to furnish a complete system. The work shall include but not be limited to:

- A. Provide all instruments shown in the specifications and drawings, unless specifically noted as supplied by others, complete with required installation & mounting supports and hardware, sunshields, communication and power supply wiring to the associated control panels, calibration, setup, testing, adjusting and commissioning. The Contractor shall coordinate with the Prime Contractor and all other divisions.
- B. Installation of all instruments shown as supplied by others, complete with all field, communication and power wiring to the associated Local Control Panels, required installation & mounting supports and hardware, programming, setup, adjusting fine tuning, testing and commissioning.
- C. Provide engineered and complete Control Panels as indicated in Section 17110. All required mounting hardware is to be supplied by the Contractor.

- D. Install Local Control Panels (CP's) provided by packaged equipment suppliers, others as indicated in Section 17110. All required mounting hardware is to be supplied by the Contractor. Provide power supply and field wiring to all associated instruments.
- E. Provide all SCADA software licenses indicated in specifications and required by contract drawings. The software shall be provided with all the options necessary to meet the requirements in these specifications. The contractor shall furnish a complete software package including the functional requirements along with whatever additional software is required for proper and efficient operation.

1.5 WORK EXCLUDED

- A. General Requirements: Not applicable.
- B. Other Work Excluded: PLC programming and SCADA configuration.

PART 2 MATERIALS

2.1 SCADA SOFTWARE

- A. SCADA software shall be provided by the Contractor and SCADA development shall be performed by others.

PART 3 EXECUTION

3.1 SYSTEM INSTALLATION

NOT USED

END OF SECTION

SECTION 17110
ENCLOSURES AND CONTROL PANELS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. This section covers items common to sections of Division 17. Equipment, products and execution must meet all requirements detailed in Section 17010.
- B. The details specified herein pertain to all electrical, instrumentation and control enclosures provided under this contract.

1.2 COORDINATION

- A. It is not the intent of this specification to completely specify all details of the design and construction of each panel.
- B. The selection of all accessories, materials and methods of fabrication not specifically covered by these specifications, but which are necessary to complete the fabrication of the panels, shall be the responsibility of the Contractor and shall be carried out in accordance with good engineering and industry best practices.
- C. The enclosures must be suitable for carrying the weight of the equipment mounted inside the panel and on the doors without any distortion or warping.
- D. The enclosures shall be sized to accommodate the proper layout and mounting of equipment devices as per the drawings and specifications.
- E. The contractor shall supply all equipment and components mounted on or within panels unless otherwise noted.
- F. All free-standing enclosures must be installed on concrete house-keeping pads where indicated on the drawings.
- G. All panels, wall mounted and free-standing, shall be provided with mounting and anchoring calculations signed by a California Registered Structural Engineer.

1.3 REFERENCE STANDARDS

- A. This specification contains references to the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
- B. National Standards Institute (ANSI) / Institute of Electrical and Electronic Engineers (IEEE):
1. C62.90.2, IEEE trial use standard withstand capability of relay systems to radiated electromagnetic interference from transceivers.
 2. C62.41, IEEE recommended practice on surge voltages in low-voltage AC power circuits.
 3. C62.45, IEEE guide on surge testing for equipment connected to low-voltage AC power circuits.
- C. Underwriters Laboratories, Inc. (UL):
1. UL 508, Industrial control panels.
 2. UL 1283, Safety-electromagnetic interference filters.
 3. UL 1449, Surge protective devices.
- D. Electronic Industries Association (EIA):
1. TIA-232-E, interface between data terminal equipment and data circuit-terminating equipment employing serial binary data interchange.
 2. 422-A, electrical characteristics of balanced voltage digital interface circuits.
- E. International Organization for Standardization (ISO) 9001, quality systems-model for quality assurance in design, development, production, installation, and servicing.
- F. National Electrical Manufacturers Association (NEMA):
1. ICS 1 - General Standards for Industrial Control and Systems.
 2. ICS 3 - Industrial Systems.
 3. ICS 4 - Terminal Blocks for Industrial Use.
 4. ICS 6 - Enclosures for Industrial Controls and Systems.
 5. LS1 - Low Voltage Surge Protection Devices.
 6. Publication No. 250 - Enclosures for Electrical Equipment (1000 V Maximum).
- G. National Fire Protection Association (NFPA).
- H. National Electrical Code (NEC).

- I. Local and State Building Codes.
- J. All requirements of the Authority Having Jurisdiction (AHJ).

1.4 REFERENCES

National Electrical Manufacturers Association:

- A. NEMA IA 2.2 - Programmable Controllers - Equipment Requirements and Tests.
- B. NEMA IA 2.3 - Programmable Controllers - Programming Languages.
- C. NEMA ICS 3 - Industrial Control and Systems: Factory Built Assemblies.
- D. NEMA ICS 6 - Industrial Control and Systems: Enclosures.

1.5 SUBMITTALS

- A. Shop Drawings: Submit with the related items of equipment in accordance with Section 01330 and Section 17010.
- B. Documentation provided by the Contractor shall be submitted in paper and electronic (PDF) format and shall include but not be limited to:
 - 1. General arrangement drawings and bill of materials.
 - 2. Wiring design drawings and wiring diagrams.
 - 3. Equipment descriptive data.

PART 2 MATERIALS

2.1 CONTROL PANEL DRAWINGS

Refer to Control Panel drawings for approved layouts and products.

2.2 PANEL ENCLOSURES

- A. Approved Suppliers:
 - 1. Approved enclosure manufacturers: Hoffman, Tesco, or approved equivalent.
- B. Enclosure Ratings:

1. NEMA 12: Suitable for enclosures located in the, Electrical Room, and Control Room.
 2. NEMA 4X: Suitable for enclosures located outdoors and in damp and corrosive process areas.
 3. NEMA 7X (explosion proof and corrosion resistant): Suitable for enclosures located in classified areas.
 4. ALL modifications to the panel enclosure including device penetrations shall not compromise the enclosure rating.
- C. Enclosure Accessories:
1. All enclosures rated NEMA 12 shall be provided with ventilation louvers, exhaust fan and thermostat.
 2. All Control Panels installed outside or in non-air-conditioned environments shall have an integral heater c/w thermostat.
 3. All enclosures shall be provided with a corrosion inhibitor size per manufacture recommendations.
 4. Each panel enclosure shall be provided with a data pocket for storing wiring diagrams, operation manuals and other documentation inside the enclosure.
- D. General Enclosure Specification:
1. Unless otherwise specified, enclosures exterior finishes shall be ANSI 61 Grey in all process areas unless noted otherwise on the drawings.
 2. Enclosures materials shall provided as shown on the contract drawings. In general, all enclosures in non-classified and classified environments shall be stainless steel. All enclosures in non-process areas shall be 12 gauge steel.
 3. Enclosures for mounting field control indicator lamps and switches in unclassified areas to be approved model die cast enclosures. Allen-Bradley model 800H-xTZ or Engineer approved equal.
 4. Enclosures for mounting field control indicator lamps and switches in Class 1 areas to be approved model cast aluminum enclosures. Allen-Bradley model 800H-xHHX7 or Engineer approved equal.
 5. Supply, fabricate, checkout, layout, document and deliver to site fully equipped and functional panels.
 6. The Control Panel drawings indicate a suggested control panel layout based upon the components shown. It is the contractor's responsibility to build the control panels based on actual physical dimensions of the supplied equipment and panel components. Final layout and panel size will be determined at the shop drawing approval stage. Fuses required shall be determined based on actual instrumentation provide.

7. Provide panels with front access only. Doors shall be key/pad lockable (as required) and fitted with 3-point heavy duty latching assemblies. Provide a continuous piano hinge and a pneumatic hold open device on each door.
 8. Enclosure interiors shall be finished with white paint. Provide a switched LED light fixture and 120 V AC duplex convenience receptacles inside the enclosure were indicated.
 9. All components contained within an enclosure shall be supplied prewired and factory tested.
- E. For necessary information regarding the engineering and manufacturing of the Control Panels, refer to the applicable Instrumentation Standard Details, Instrument loop Diagrams, all applicable drawings and specifications and installation and user manuals for the selected equipment.
- F. Panel enclosures supplied as I&C control panels and housing PLC equipment, Remote I/O modules or field (FF) modules and other control equipment shall be supplied with devices to protect the equipment from damage due to supplied power failure, spikes and drops, noise/harmonics and temporary power failure. Power for all instruments shall be from the plant UPS system.

2.3 WIRING AND ACCESSORIES

- A. Provide wiring inside the panels according to the following specifications:
1. Control wiring to be a minimum of #14 AWG tinned stranded copper; insulation rated at 600 V.
 2. Wiring for power distribution shall be a minimum of #12 AWG tinned stranded copper; insulation rated at 600 V.
 3. Analog wiring to be a minimum of #16 single pair copper 300V CIC white/black cable with overall foil shield and the drain wire. The black wire shall be positive and white wire shall be negative. Drain wires shall be clipped in the field and terminated on individual green/yellow terminal blocks in the control panel. The shield shall be grounded at only one end in the control panel grounding terminals, and cut back and insulated at the instrument end.
 4. Refer to Division 16 for cable routing requirements.
- B. Wiring systems with different voltage levels or types shall be suitably segregated within the panel, according to relevant electrical codes. As a minimum separate control wiring from analog signal and communications wiring.
- C. Run all wiring in enclosed plastic wireways such as Panduit. Size all wireways so that the total cross sectional area of the insulated wire and cable does not exceed forty (40%) percent of the cross sectional area of the wireway.

- D. Provide a minimum clearance of 1.5” between wireways and any point of wire termination.
- E. Terminate all wiring, incoming and outgoing, at terminal strips mounted inside the panels. Identify each terminal strip with a terminal strip number, defined as follows:
 - 1. Wire identification to use the connected field device tag name with the wire's corresponding terminal number appended to it.
 - 2. Identify every joint and/or terminal of the above wire run with the same identifier until the wire meets another tagged device, at which point the wire identifier will change to use the new device name and terminal number.
 - 3. Identify spare wires by using the destination identifier, i.e., the location and terminal identifier of the opposite end of the wire are combined to form the wire tag. All spare wires must be terminated in the dedicated terminals at both ends.
 - 4. Arrange wiring on terminal blocks such that all internal panel wiring terminates on the inboard side of the terminal block and all external wire connections are made on the outboard side.
- F. Provide a 120 V AC panel power distribution system and a 24 V DC power distribution system in each panel. Provide a thermal magnetic circuit breaker on each main power circuit and a fused terminal block with blown fuse indicator for each branched circuit off the main.
- G. Provide disconnect type terminal blocks Weidmuller or Engineer approved type to isolate field wiring that is powered from the panel.
- H. Provide sufficient terminals so that not more than two (2) wires are connected under the same terminal. Provide twenty (20%) percent spare terminal capacity at each terminal block assembly.
- I. Provide nameplates for each device on or within the panels and enclosures. Nameplates shall be black laminated with white lettering, a minimum of 1” x 3” in size with up to three lines of ¼” lettering. Securely fasten nameplates in and situate them in a visible location.
- J. Every cable entering or leaving the enclosure shall be labeled with permanent marking identification subject to the review by the Engineer.

2.4 PANEL GROUNDING

- A. Provide noise free low resistance grounding connection using stranded ground wire to all equipment installed in the panel according to manufacturer's recommendations and all applicable standards and codes.

- B. Provide 1" x 8" copper grounding bus mounted in each Control Panel including grounding lugs, suitable for termination of up to #2 AWG copper grounding conductor. The grounded bus shall be bonded to the ground.
- C. Firmly bond all panel mounted devices on or within the panels to ground. Provide supplementary bonding conductors for back panels and doors. Attach a separate bonding conductor to all devices that are not firmly fastened to the panels with screws for such devices as case mounted instruments, meters, etc.
- D. Bond each enclosure door to the grounding lug.

2.5 LOCAL CONTROL PANEL EQUIPMENT AND INSTRUMENTS

Provide panel equipment and instruments, as applicable, unless otherwise indicated:

- A. Power Supply 24 V DC, 10 A:
 - 1. Input: 120 V AC.
 - 2. Output: 24 V DC, 10 A.
 - 3. Din Rail Mounted.
 - 4. Temperature Rating: -10 °C to +60 °C (without de-rating).
 - 5. Efficiency: $\geq 87\%$.
 - 6. Mount in Control Panels as per drawings, specifications and manufacturer's recommendations.
 - 7. Relay Output: 120 V AC, 2 A to indicated Power OK status.
 - 8. Approved Manufacturers: Siemens SITOP, Weidmuller PRO-M series, Allen Bradley 1606-XL series, Phoenix Contact Quint power series, Sola Heavy-Duty SDN series or engineer approved equal.
- B. Power Supply 24 V DC, 2.5 A:
 - 1. Input: 120 V AC.
 - 2. Output: 24 V DC, 2.5A.
 - 3. Din Rail Mounted.
 - 4. Temperature Rating: -10 °C to +60 °C (without de-rating).
 - 5. Efficiency: $\geq 85\%$.
 - 6. Mount in Control Panels as per drawings, specifications and manufacturer's recommendations.
 - 7. Relay Output: 120 V AC, 2 A to indicated Power OK status.

8. Approved Manufacturers: Siemens SITOP, Weidmuller PRO-M series, Allen Bradley 1606-XL series, Phoenix Contact Quint or Mini power series, Sola Heavy-Duty SDN series or engineer approved equal.

C. Pilot Lights:

1. Provide NEMA rated pilot lights of LED type for extended lamp life, oil tight, push to test, complete with appropriate color lenses. Normal colors used are run=green, stop=red unless otherwise depicted elsewhere. Refer to Division 16 for additional information.

D. Terminals:

1. Provide strap screw type terminal blocks rated for 600 volts.
2. Identify each terminal block within an enclosure with a unique machine printed terminal block number. Cabinet chassis grounding terminal blocks to be identified by the electrical ground symbol.
3. Connections to screw terminals to be locking fork tongue insulated crimp type wire connectors equal to Panduit PAN-TERM series or T&B STA-KON series.
4. Terminals to be Weidmuller terminal blocks or engineer approved equal.
5. DIN Rail NS 35/7.5 PERF 2000MM.
6. WDU4 Feed through Terminal Block.
7. WPE4 Ground Block.
8. WTR4 Disconnect terminal.
9. WDK4N Two Level Terminal Block.
10. WTR 4/SI LED Fused Terminal Block - for 24 V DC rated circuits c/w all required fuses.
11. WTR 6/2 SI LED Fused Terminal Block - for 120 V AC rated circuits c/w all required fuses.
12. WAP End Bracket.
13. Provide a group of terminals for each of 120 V AC hot and neutral and 24 V DC positive and negative power. Distribution wiring to have a thermal magnetic circuit breaker upstream of all major blocks of loads, adequately sized to protect the connected load while not causing nuisance tripping. Provide nickel-plated terminals for all high capacity applications in excess of 15 A.
14. Provide Weidmuller disconnect type terminal blocks c/w fuses for each load or loop powered instrument from the control panels.

E. Nameplates:

1. Refer to Section 17010 for nameplate specification.
- F. Signal Current Isolator:
1. Isolator to provide galvanic isolation of mA transmission signals from transmitters with inadequately isolated output circuits.
 2. Isolator to be housed in a NEMA 250, Type 4/7 conduit body and derive its operating power from the signal input circuit.
 3. Input and output signals shall be 4-20 mA DC, with an error not exceeding 0.1% of span. Input resistance will not exceed 550 ohms with an output load of 250 ohms.
 4. Isolator to be by Weidmuller or engineer approved equal.
- G. Isolation Relay:
1. Three isolated channels.
 2. Rated for Class 1 Zone 1.
 3. Power Supply: as required.
 4. Relay outputs: Minimum two (2) dry contacts 120 V AC rated N.O./N.C.
 5. Fail-safe earth fault protection.
 6. Manufacturer and Model: IDEC 2213 or Engineer approved equal.
- H. Consumables:
1. Supply all consumables such as fuses, lamps, bulbs, etc., until and during start-up and commissioning. At completion of commissioning, provide 10% spare inventory of each type of consumables.
 2. Provide a tabulated list of all consumables utilized, indicating where used, type, rating, and reorder details. Include the list with the operation and maintenance manual information.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Refer to Section 17010, Part 3.
- B. Locate as indicate on the drawings.
- C. Conduit and cable entrance shall be from bottom only, unless otherwise specified.

- D. All spare I/O shall be wired to a terminal strip and clearly marked.

3.2 MOUNTING HEIGHTS

Unless otherwise specified or a conflict exists, mount all control panels and field boxes 75" to top of cover.

3.3 IDENTIFICATION

- A. Each enclosure shall be clearly identified with a 1/8" thick laminated nameplate black face and white core, mechanically attached with self-tapping stainless steel screws to the panel door. The nameplate to indicate panel name as indicated on drawings.
- B. If more than one power source is present in a panel, a separate warning nameplate with red face and white core, mechanically attached with self-tapping screws to the panel door shall be provided. The nameplate to indicate the number of power sources and their origin.
- C. All instruments within the panel shall be identified as per Section 17010, part 2.2.
- D. Provide a list of all circuit breakers and fuses laminated in plastic. The list shall be located in each associated enclosure.
- E. All wires shall be identified.

3.4 RELATED WORK

- A. Interconnection to the associated panels terminal strips, communication and field devices.
- B. Installation of interconnecting cables to field devices, instruments and communication devices.

END OF SECTION

SECTION 17124
INSTRUMENTATION CABLES

PART 1 GENERAL

1.1 WORK INCLUDED

This section covers items common to sections of Division 17. This Section of the Specifications forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 INSPECTION

Provide adequate notice to the Engineer so that all cable installations can be inspected prior to connecting equipment.

PART 2 MATERIALS

2.1 TWISTED PAIR SHIELDED CABLES (TPSH)

TPSH shall be constructed as follows:

- A. Two (2) copper conductors, stranded, minimum #18 AWG, PVC insulated, twisted in nominal intervals of 50 mm.
- B. Insulated for 600 V, 90°C.
- C. One hundred (100%) percent coverage aluminum foil or tape shield.
- D. Separate bare stranded copper drain wire, minimum #18 AWG.
- E. Overall flame retardant PVC jacket to CSA-C22.2- 09.
- F. The entire cable assembly to be suitable for pulling in conduit or lying in cable tray.
- G. Where multi-conductor TPSH cables are called for, each pair shall be individually shielded, continuous number coded, and the cable assembly shall have an overall shield and overall flame retardant PVC jacket.

2.2 RTD AND MULTI CONDUCTOR SHIELDED CABLE

RTD cables shall be UL approved and shall be constructed as follows:

- A. Three (3) or more copper conductors, stranded, minimum #18 AWG.
- B. PVC insulated for 600 V.
- C. One hundred (100%) percent coverage aluminum foil or tape shield.
- D. Separate bare stranded copper drain wire.
- E. Overall flame retardant PVC jacket to CSA-C22.2-06.

2.3 FOUNDATION FIELDBUS (FF) NETWORK CABLE (TYPE A)

- A. Foundation Fieldbus H1 cables shall meet the requirements of ISA/SP50 and those set out by the Foundation fieldbus organization.
- B. Requirements:
 - 1. CSA certified.
 - 2. Temperature range: -40 to +105 °C.
 - 3. Flame spread category: FT4.
 - 4. Impedance @ 31.25 kHz = 100 Ohms +/- 20%.
 - 5. Maximum Attenuation @ 39 kHz (1.25 x 31.25) = 3.0 dB/km.
 - 6. Maximum Capacitive Unbalance to Shield = 2 nF/km.
 - 7. Maximum DC Resistance = 24 Ohms/km (per conductor).
 - 8. Maximum Propagation Delay Variance (7.8 to 39 kHz) = 1.7 us/km.
 - 9. Conductor Cross-Sectional area = 0.8 mm² (#18 AWG).
 - 10. Shield Coverage = 100%.
 - 11. Jacket Colour = Orange.
 - 12. Armour = Aluminum (Trunk Cables Only).
 - 13. Number of Data Pairs = 1.
 - 14. Sunlight resistant.
 - 15. Suitable for installation in conduit, cable tray, and outdoors.

16. Suitable for the hazardous area classification in which they shall be installed.
17. Jacket: flame-retardant poly-vinyl chloride (PVC).

2.4 PROFIBUS DP CABLES:

- A. Profibus DP Cables shall meet the requirements of EN50170-2-2:1996.
- B. Requirements:
 1. 2 (two) wire shielded with circular cross section.
 2. Loop resistance: < 150 Ohm/km.
 3. Operating Temperature: -40°C to 60°C.
 4. Flame-retardant to IEC-60322-3-24.
 5. Colour Code: red and green, 22 AWG stranded bare copper conductors.
 6. Isolation: 300 V.
 7. Jacket Colour: Purple.
 8. Provide: FastConnect stripping tool.
 9. Cables in Hazardous Areas: Aluminum Armored.
 10. Spur Cables: Not Armored.
 11. Sunlight Resistant.
 12. Siemens Profibus FC Standard Cable, Belden 3079E and/or 123079A Profibus DP cable, Turck 4515 and/or 4510A or Engineer approved equal.

2.5 WIRE

As per Section 16120.

PART 3 EXECUTION

3.1 ANALOG SIGNALS

- A. Use TPSH cable for all low level analog signals such as 4-20 mA, 1-5 V DC, 0-10 V DC, pulse type circuits 24 V DC and under, and other signals of a similar nature.
- B. Use RTD cable for connections between RTD's and transmitters.

3.2 DIGITAL COMMUNICATIONS SIGNALS

- A. Use TPSH cable for all low level input (24 V and below) and output signals to the plant control system.
- B. Use Stranded Copper wire for power to instruments, for 120 VAC signals other than those mentioned above and as otherwise indicated on the drawings. Use stranded wire and cable to supply power to instruments.
- C. For discrete signals and low power wiring use #14 THWN. Color code shall be presented in Division 16

3.3 CABLE INSTALLATION

- A. Install instrumentation cables in conduit systems or in cable trays. Use a maximum of 36" length of liquid tight flexible conduit to connect the field sensors to the rigid conduit. Refer to Division 16 for conduit or cable tray requirements.
- B. Where non-armoured instrumentation cables are installed in cable trays, provide barriers in the tray to separate instrumentation cables from power cables.
- C. At each end of the run leave sufficient cable length for termination.
- D. Do not make splices in any of the instrumentation cable runs. Where splices are required, obtain approval from the Engineer prior to installing the cable. Do not splice cables to gas detection heads.
- E. Where splices are necessary in instrumentation cables other than coaxial cables, perform such splices on terminal blocks in terminal boxes. Keep splices in instrumentation cable to a minimum and separated physically from power circuits. Cable shields shall be terminated on insulated terminals and carried through to the extent of the cable.
- F. Where splices are made to coaxial cables, use standard coaxial cable connectors.
- G. Ground cable shields at one end only. Unless otherwise specified, ground the shields at the marshaling / local control panels.
- H. Protect all conductors against moisture during and after installation.
- I. Terminate armoured cables with approved only connector.

3.4 CONDUCTOR TERMINATIONS

- A. All equipment supplied shall be equipped with terminal blocks to accept conductor connections.
- B. Instrumentation conductors, where terminated at equipment terminals other than clamping type terminal blocks, shall be equipped with Burndy-YAE-2 or STA-KON, self-insulated, locking type terminators, sized as required to fit conductors and screw terminals.

3.5 TESTING

- A. Test all conductors for opens, shorts, or grounds. Resistance values shall not be less than those recommended by the cable manufacturer.
- B. Perform tests as identified in section 17800, record results on forms as per section 17830.

3.6 IDENTIFICATION

Identify all instrumentation cables as per the requirements of section 17010.

END OF SECTION

SECTION 17125

INDUSTRIAL ETHERNET NETWORK/SCADA SERVERS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. This Section of the Specifications forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.
- B. This section specifies the Ethernet network equipment and topology required.
- C. The Work includes the provision of all industrial Ethernet equipment (hardware) and infrastructure.
- D. Provide labor, materials, tools, equipment and services for a complete installation as herein described.

1.2 COORDINATION

- A. The Contractor shall respect, maintain and protect the privacy and confidentiality of The City, including tender documents, drawings, products, etc. of this project.
- B. All products including cabling shall be from a single manufacturer, industrial grade, unless otherwise stated.
- C. The Contractor must provide an original manufacturer's Letter of Certification and all related assurance documents within two weeks following the completion of the project.
- D. The Contractor is required to review architectural plans to familiarize himself with the site and to verify routing of cables, and placement of all panels and cabinets.

1.3 QUALIFICATION

The Contractor, and all communication cabling installation personnel, must be trained and certified by the cabling manufacturer and shall have the authority to certify the installation and materials for twenty five (25) years respectively to cover system applications and performance prior to start of any work. The Contractor is subject to approval by the Engineer. The Contractor shall submit an up-to-date copy of the certification and proof of their CSV status from the manufacturer to the Engineer, prior to arriving on Site.

1.4 QUALITY ASSURANCE

- A. The Contractor to inspect all material, like: cable reel/boxes, patch panels, connectors, etc. for visible damage of goods incurred during shipping and transportation. It is the responsibility of the installer to return any damaged components to the supplier/manufacturer, and replace to The Owner at no cost prior to installation.
- B. Maintain manufacturer performance data/specifications supplied with components shipped and submit upon request to The City and/or Engineer.
- C. Drawing and specifications are to be read in conjunction with one another and along with the architectural, electrical, structural and mechanical specifications and floor plans.
- D. The Contractor shall provide an original manufacturer's Letter of Certification and all related assurance documents within two weeks following the completion of the project.

1.5 REFERENCE STANDARDS

Products, workmanship and installation: conform to the current guidelines contained in the following:

- A. ANSI/TIA/EIA-568-B.1, Commercial Building Telecommunications Cabling Standard. Part 1: General Requirements.
- B. ANSI/TIA/EIA-568-B.2, Commercial Building Telecommunications Cabling Standard. Part 2: Balanced Twisted-Pair Cabling Components.
- C. ANSI/TIA/EIA-568-B.3, Commercial Building Telecommunications Cabling Standard. Part 3: Optical Fiber Cabling Components Standard.
- D. ANSI/EIA/TIA-569, Commercial Building Standard for Telecommunications Pathways and Spaces.
- E. ANSI/EIA/TIA-606, Administration Standard for Telecommunications Infrastructure of Commercial Buildings.
- F. ANSI/EIA/TIA-607, Commercial Building Grounding and Bonding Requirements for Telecommunications.
- G. TIA/EIA 455-160-A Fiber Optic Test Procedures.
- H. ISO 11801 Class D specifications.
- I. IEEE 802.3 Ethernet Standards.

- J. Building Industry Consulting Service International (BICSI) TDMM Manual latest editions, at the time of tender.

1.6 SUBMITTALS

In addition to the requirements of section 17010, the Contractor shall submit network configuration information, including hardware settings for all devices.

PART 2 MATERIALS

2.1 GENERAL REQUIREMENTS

- A. This specification covers the contract requirements for supply of the SCADA data communications copper and fiber optic backbones. Supply of the fiber optic backbone shall encompass all fiber optic cabling required between the main server room and the facility electrical rooms including termination to and supply of patch panels. All Network management hardware, switches, shall be supplied by the Contractor and shall be installed under this contract.
- B. Manufacturers' part numbers are for reference purpose only. It is the responsibility of the Contractor to verify with the manufacture/distributors and The Owner exact component/devices, prior to purchase and installation.
- C. All materials are to be new and unused.
- D. Acceptable manufacturer for riser and horizontal cabling and passive hardware components: Belden or Panduit. For all other equipment/hardware refer to other sections and specific descriptions as noted.

2.2 ACCEPTABLE MANUFACTURERS

- A. The acceptable manufacturer(s) for horizontal Cu cabling and passive hardware components: Belden NORDX/CDT, or approved equal.
- B. The acceptable manufacturer(s) for backbone fiber optic cabling and passive hardware components: Corning Cable Systems, or approved equal.
- C. The acceptable manufacturer(s) for active hardware components:
 - 1. Din rail mounted network switches: MOXA EDS or approved equal.

2.3 FIBER OPTIC RISER DISTRIBUTION CABLE (BACKBONE)

- A. Fiber optic cable to be 24 strand, loose tube, OFC/FT4 rating, UV-Resistant, gel free fully water blocked for indoor/outdoor applications, that meet ANSI/EIA/TIA 568B.3 standards.
- B. The fiber cable shall be suitable for conduit, duct or direct burial without out the requirement for a transition piece upon entering the building.
- C. Route cables to each electrical room in underground duct banks and I&C cable trays. Install fiber optic cable in ducts in inner-duct to allow future cable additions; install at least three runs of inner-duct, sized to match the fiber optic cable provided.
- D. The fiber optic cable shall meet the following requirements:
 - 1. Compliance with the following standards IEC 60793, ISO/IEC 11801 and EIA/TIA 492 specifications.
 - 2. Color-coded PVC buffers, black color overall jacket.
 - 3. Fiber optic cabling shall be marked with manufacturer's name, sequential length, cable type and rating, strand count and UL/CSA listing.
 - 4. Optimized for operation in the 850/1300nm region.
 - 5. Max Attenuation (dB/km): 1.0/0.75.
 - 6. Maximum nominal cable length: 3000 m (3 km) or (9840 ft).
 - 7. Crush Resistance (EIA-455-41): 2000N/cm.
 - 8. Impact Resistance (EIA-455-25): 2000 Impacts @ 1.6 N-m.
 - 9. Operating Temperature: -40 to +70°C.
 - 10. Minimum Bend Radius Installation: 20 X OD.
 - 11. Minimum Bend Radius Long Term: 15 x OD.
- E. Acceptable manufacturer(s): Corning MIC armored, Belden CDT, or approved equal.

2.4 WALL MOUNTED FIBER OPTIC PATCH PANELS

- A. Fiber Ring Back Bone Patch Panels:
 - 1. Locate in Control panels or Communications Panels as shown on the drawings.
 - 2. The fiber patch panels shall be supplied with breakout kits, 1-meter pigtailed and heat shrink fusion splices.
 - 3. Each patch panel shall house minimum of Two 6 ST duplex single mode adapters.

4. Dimensions shall be W x H x D= 16" x 10" x 4".
 5. Manufacturer and Model: Panduit FWME or approved equal
- B. Fiber Patch Panels – Locate on the wall mounted industrial type box as shown on the drawings
1. The fiber patch panels shall be supplied with breakout kits, pigtails and heat shrink fusion splices.
 2. Each patch panel shall house minimum of 24 ST duplex single / multimode adapters; equal to Corning ICH-02P or Panduit CBXF12IW-AY. Typical dimensions shall be W x H x D= 10"x12"x4".
 3. Manufacturer and Model: Corning ICH-02P C/W CCH-CP1259 or approved equal.

2.5 RACK MOUNTED FIBER OPTIC PATCH PANELS

- A. Rack mounted Fiber optic Patch Panels to be 12 or 16 dual position, 19" rack mounted, loaded with 8 or 10 6-ST adapters, optical fiber field breakout kit, 1 meter pigtails and heat shrink fusion splices.
- B. Manufacturer and models: Corning CCH or Panduit FRME
1. Rack Mount Fiber Enclosure: CCH-04U (Corning) or FRME4.
 2. Optical Fiber Field Breakdown Kit: FO12CB.
 3. Connector adapters (6 x duplex ST fiber adapters).

2.6 FIBER OPTIC CONNECTORS

- A. "BFOC" Connectors shall supports 900µm or 300µm overall diameter buffered Fiber cordage.
- B. Meet EIA and IEC standards for repeatability, have a locking mechanism to assure not optical connector disconnect.
- C. Connector loss not to exceed 0.5dB per termination.
- D. Meet Fiber optic connector intermate ability and FOTP-171 standards.
- E. Insertion loss to be maintained to a minimum of 200 mating cycles as per EIA/TIA –455.21 and without violating the specifications.
- F. Multimode Transmission Characteristics:

1. Insertion Loss (one mated pair) @1300nm: 0.2dB.
2. Return Loss maximum: -40dB.
3. Mating durability: 500 reconnect without signal degradation.
4. Operating temperature: -40° to 85°C.
5. Material: Zirconia Ceramic connector, housing and body engineered resin.
6. Flame Retardancy: UL 94 V0.
7. Connector Mating Loss: 0.75dB loss, 26dB optical return loss.

2.7 FIBER PATCH CORDS

- A. Multimode 50/125µm ST male to ST male.
- B. Length: as required.

2.8 FIBER OPTIC LABELING

Label all fiber optic patch panels, jacks and fiber optic cabling at each end. Labeling shall be as follows: Control Panel - Plant Area – Fiber and Jack Number (i.e., LCP-B2A-901A-F001).

2.9 CAT 6 CABLES

- A. Provide industrial Ethernet Cat 6 24 AWG Bonded-Pair cables Al interlocked armor PVC outer jacket cable.
- B. Maximum distance 100 m.
- C. Color code: Blue.
- D. Un-armored cable shall be installed in a dedicated conduit and armored cable shall be installed in Division 17 (instrumentation) cable trays.
- E. No splices are allowed.
- F. Manufacturer and cable type: Belden Category 6 DataTuff Twisted Pair Cables or Engineer approved equal.

2.10 ETHERNET SWITCHES

Provide only Industrial grade Ethernet switches – MOXA EDS-508A Series (or approved equal)

2.11 MISCELLANEOUS

Grounding: Rack mounts and wall mounted copper and fiber optic patch panels to be connected with #6 AWG green stranded copper ground wire with appropriate termination hardware to the wall mounted ground bus bar in the DCS room.

2.12 SERVERS

- A. Manufacturer: Server shall be DELL PowerEdge T340 Server, or Approved Equal.
- B. Description: The contractor shall furnish one (1) DELL PowerEdge T340 Server. The server shall be turned over to the owner and installed by others.
- C. Processor: Intel Xeon (E-2224) Processor (Min.)
- D. Material/Components:
 - 1. 64GB RAM DDR4,
 - 2. Hardware Raid Controller RAID-5
 - 3. Four (4) 4TB SATA HDD (16TB TOTAL)
 - 4. Dual Hot-Plug Redundant Power Supplies
 - 5. Dual Port 1GBE Base-T Adapter
 - 6. ISDM and Combo Card Reader
 - 7. Two (2) 32GB Micro SDHC/SDXC Card
 - 8. Two (2) NEMA C13 Wall Plug
 - 9. Tower Security Bezel
 - 10. UEFI Bios Boot Mode with GPT Partition
- E. Warranty:
 - 1. Provide 7-Year Pro-Support Warranty
- F. Software:
 - 1. The Server shall be furnished with VMWARE ESXI 7.0 U1 Embedded Image with fully license VMWARE VSPHERE ESSENTIALS software platform Model BD706AAE.

- G. Additional Software:
1. Provide fully licensed copies of specified software as indicated in this section.
 2. The following the software shall be furnished by the contractor to the owner and installed by others:
 - a. Two (2) Microsoft Windows 10 Pro, Part No. FQC-089
 - b. One (1) Microsoft Office Home and Business 2019, Part No. T5D-03190
 - c. Ignition® Software from Inductive Automation (latest version)
 - 1) OPC UA Server Module
 - 2) Alarm Notification Module
 - 3) SMS Alarm Module
 - 4) Tag Historian Module
 - 5) Vision Module Limited (Minimum of 3 users)
 - 6) UDP and TCP Drivers Module
 - 7) All-Bradley Driver Suite

2.13 HISTORIAN SERVER

- A. Manufacturer: Historian server shall be QNAP Systems, Series TS-473A-8G or Approved Equal.
- B. Description: The contractor shall furnish one (1) QNAP TS-473A-8G Historian Server. The server shall be turned over to the owner and installed by others.
- C. Processor: AMD Ryzen Quad-Core 2.2 GHz (64-bit)
- D. Material/Components:
 1. 8 GB SO-DIMM DDR4 (1 x 8 GB), with addition 32GB DDR4 SO-DIMM Memory
 2. Real Time Snap Sync
 3. Hot-Swappable
 4. Drive Bay 4x3.5-inch SATA 6Gb/s, 3Gb/s
 5. M.2 SSD Slot
 6. Power Supply Unit – 250W, 100-240V AC, 60Hz, 3.5A
 7. Power supply, cables and adapters
 8. Storage
 - a. Provide four (4) Western Digital 6TB RED Plus NAS Internal HD - 7200RPM.

2.14 SMS ALARMING MODEM

- A. Manufacturer: Sierra Wireless RV55 no Equal.

Description:

- a. Permanently installed in CP-100
- b. RV55 for operation in North America on 24VDC with DIN rail mounting option.
- c. Provide with WIFI capabilities
- d. Sierra Wireless AirLink MIMO 5- in 1 Dome antenna Part number 6001275 or approved equal

PART 3 EXECUTION

3.1 ETHERNET INSTALLATION

- A. All non-armored Cat6 cables shall be installed in dedicated communication wireways or conduit.
- B. All Ethernet cables within Control Panels and MCCs shall be installed separately from power wires.
- C. Install cables, conduit and cable tray, etc. along, or at right angles, to building lines unless impractical to do so. Verify specific cases of deviation in advance with Engineer.
- D. Connect devices as indicated on the drawings. No more than two 90° bend in conduit run between pull points. Provide pull box for every 200' of conduit run.
- E. All installation shall be in accordance with manufacturer's instructions and good network practices.

3.2 GENERAL

- A. Install conduit system in accordance with Section 16110.
- B. Use cable lubricant specifically designed and approved for installing "Communications cables", to reduce pulling tension. Clean exposed cables and end conduits of lubricant residues after cables installation.
- C. Fiber Optic Cables:
 - 1. Maintain not less than minimum bend radius for fiber optic cable.

2. Terminate fiber optic cables on fiber optic patch panels, and at both ends with appropriate end connectors and fiber optic patch panels, unless otherwise specified.
3. Fiber optic cabling between communications rooms to be installed as individual links. No splices or intermediate connections points are allowed.
4. Follow manufacture guidelines and recommendations when installing fiber optical cables.
5. Provide a minimum of 5 m (15 ft) of slack (service loop) cable in each communications room, before termination for future additions, moves and changes.
6. Label all fiber optical cables with a high quality material and adhesive type label and as the following example: 02A-F001, where 02A indicates area number, F indicates fiber cable and sequential number of fiber strands.
7. Label fiber optical patch panel with the word: "CAUTION".
8. When installing fiber optic (backbone) cables in conduit, use Yellow 77 lubricant or equivalent. Confirm with Owner prior to use, if other alternative is proposed.

9. Maximum conduit fill:

Fiber	Fill
One Cable	53%
Two Cables	31%
Three cables or more	40%

10. Label fiber optical riser cables at 3 m (10 ft) intervals and with the word: "CAUTION".

D. Grounding:

1. Ground and testing of communications equipment to be done in accordance with Panduit design, industry standards testing guidelines, and as per local electrical safety code.
2. Grounding connections must be less than 1Ω above the electrical entrance ground resistance.
3. Adhere to the recommendations of the ANSI/TIA/EIA 607 standards.

3.3 FIRESTOPPING

- A. Firestopping will be required to re-establish the integrity of fire-rated architectural structures and assemblies, when these barriers are penetrated by:
 - 1. Pipes.
 - 2. Ducts.
 - 3. Cables.
 - 4. Conduits.
 - 5. Innerducts.
 - 6. Cable trays.
 - 7. Other items.
- B. Fire stopping material should be accomplished in a manner that will satisfy local fire and building codes. Any openings created for, or by the Contractor, to be sealed with the proper material.
- C. Coordinate fire stopping material and finishing with Prime Contractor on site.

3.4 TESTING

- A. Provide a Microsoft Excel file on disk, tabulated results for every cable, length, polarity information, pair attenuation (dB), induced noise (dB), worse pair NEXT, wire map, impedance, ACR and indicate whether the cable has passed/failed.
- B. Fiber Optical Cables:
 - 1. Testing of all fiber optic cables to be 100% for attenuation and length.
 - 2. Test cable for continuity to include cable, connectors, splices (if applicable) and adapters on each strand.
 - 3. Testing to be in accordance with ANSI/TIA/EIA-526-14A, ANSI/TIA/EIA-568-B, ANSI/TIA/EIA-455-50B method A for Multimode 62.5/125 μ m, 850nm/1300nm wavelengths, and Bi-directional.
 - 4. Field test for Multimode fiber cable 1310/1550nm wavelengths to meet ANSI/TIA/EIA-526-7.
 - 5. Clean all connections and adaptors at the optical test points prior to taking measurements.
 - 6. Cable links must be tested one hundred (100%) percent of the installed cable. Any failing links must be diagnosed and corrected, followed with a new test to verify that the corrected link meets the manufacturer and standards performance requirements. Links attenuation to be calculated using the following formulas and as per ANSI/TIA/EAI-568-B.

7. Formulas:
 - a. Link attenuation: Cable Attenuation + Connector Attenuation + Splice Attenuation.
 - b. Cable attenuation (dB): Attenuation coefficient (dB/km) X Cable length (km).
 - c. Connector attenuation (dB): number of connectors pairs X connector loss (dB).
 - d. Splice Attenuation (dB): number of splices X splices loss (dB).
 8. Testing of fiber optic cables to be Bi-directional.
 9. Test jumpers must be of the same fiber core size and connector type as the cable system and be 1 to 5 meters long.
 10. Before installing the cable, test the cable on the shipped reel for continuity.
 11. The maximum accepted loss for a mated connector pair should be no greater than 0.75dB.
 12. Maximum allowable splice loss should not be greater than 0.3Db.
 13. Testing to include: wavelength record, fiber type, bundle number, test equipment model, date of test and operator.
 14. Tester calibration to be within the manufacturer recommended period, so it can meet the industry standards requirements.
 15. If fiber optic strands, or cables are suspected of any problems, Contractor shall provide, upon request of the consultant or client representative, at no additional cost, OTDR testing to determine problems and repair. Submit test results to verify fiber test parameters.
 16. Refer to products section, fiber optic cabling multimode proposed performance transmission specifications.
- C. All costs associated with correction and re-testing of defective cabling will be the responsibility of the Contractor.

3.5 ADMINISTRATION

- A. Labeling:
1. Provide labels and administration system as per NORDX/CDT standards.
 2. A unique identifier to be placed on each connecting passive hardware component installed like: riser cables, horizontal cables, faceplates, etc.
 3. Label all components as per ANSI/TIA/EIA 606-A standards and as per manufacturer recommendations.
 4. Labels to be visible during and after the installation of the cabling infrastructure.

5. Labels to be resistant to the environment, such as moisture, heat, grease and ultraviolet light.
 6. Labels to be printed or generated by a mechanical device. No hand written labels will be accepted.
 7. Labels to support linkages to others individual/groups of records, like "as-built" drawings that will allow a person to easily located and/or relate outlets, pathways spaces within a given area or telecommunications room.
- B. Horizontal cabling:
1. All (individual) horizontal cables to be labeled, 8" from the cable ends.
- C. Riser cables:
1. All riser cables to be labeled at each end, indicating source and destination, and number of pair/strands.
- D. Test Results:
1. Test result to include all parameters listed on these specifications, and as per latest manufacturer's recommendations.
 2. Provide legible printed forms and on a USB flash drive using a recognized computer software application, like Microsoft Excel. This to include, but not limited to, cable reports, cross-connects and connecting hardware. Include any software tools to view, and print any or all cable test reports.
 3. Contractor to provide documents for all test result, and for all conductor pair strands of each cable.
 4. Reports to be generated from a computer-based recognized program.
- E. Test recorded in the memory of the field tester to be transferred into a windows TM based database software, unaltered and "as saved in the tester".
- F. Quality Assurance:
1. Contractor and sub-contractors to be fully certified to install the manufacturer products and have a minimum of three (3) years on the installation of systems of this type and size.
 2. Material to be new and conform to commercial grade, good quality, and meet industry standards.
 3. Subcontractor, if any, to assume all rights and obligations as the contractor toward the Owner and herein described.
- G. As-built Drawings:

1. Contractor to provide four (4) copies of "As built" drawings showing, communications room, outlets locations and labeling.
2. Submit soft and hard copies, along with other project deliverables, to the Owner/Engineer within 30 days of substantial completion.

3.6 WARRANTY AND CERTIFICATION

- A. A two-part certification program, provided by the manufacturers CSV, would cover all cable and connectivity components. The first part is an assurance that the certified system will support the applications for which it is designed (including 1000BaseT and Category 6 standards), during the lifetime of the certified system. The second part of the certification is a twenty (20) year warranty provided by the manufacturer and the CSV on all products within the system. Manufacturer to administer a follow-up program through the CSV to provide support, guarantee, warranty and service.
- B. The contractor, upon completion, is to provide a warranty for the entire installed communications system. Response time associated with this warranty is to be within twenty-four (24) hours of the initial request, during or outside regular working hours.
- C. The contractor is to provide the certification number within two (2) weeks of substantial completion, and will include:
 1. Verification of a complete cabling solution.
 2. Verification of correct performance levels for the Cat 6 solution.
 3. Manufacturer's Certification number.
 4. Identification of the installation by location and project number.
 5. A copy of the manufacturer's warranty request form.
- D. This guarantee to include all labor, material and time to travel to and from the site.
- E. Acceptance of the "structured cabling systems" work will be subject to completion of all related work, testing and receipt of full documentation as described herein.

END OF SECTION

SECTION 17216
SWITCHES AND RELAYS

PART 1 GENERAL

1.1 WORK INCLUDED

This Section of the Specifications forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.2 SUBMITTALS

Refer to Section 17010 for submittal requirements.

PART 2 PRODUCTS

2.1 GENERAL

- A. Use normally open contacts for alarm actuation which close to initiate the alarm.
- B. Use normally open contacts to control equipment. The contacts close to start the equipment.
- C. Contacts monitored by solid state equipment such as programmable controllers or annunciators to be hermetically sealed and designed for switching currents from 20 to 100 mA at 24 V DC.
- D. Contacts monitored by electro-magnetic devices such as mechanical relays to berated minimum 5 A at 120 V AC.
- E. Provide double barriers between switch elements and process fluids such that failure of one barrier will not permit process fluids into electrical enclosures.
- F. Switch electrical enclosures to be rated for the area classification and EEMAC 4X as a minimum.

2.2 INDICATORS, PUSHBUTTONS AND SELECTOR SWITCHES

- A. All control indicator lamps, pushbutton switches and selector switches in unclassified or non-corrosive areas to be Allen Bradley 800H-xTZ items.
- B. All control indicator lamps, pushbutton switches and selector switches in classified or corrosive (includes outdoors) areas to be Allen Bradley 800H-xHHX7 items.
- C. Enclosures to be as specified under Section 17110.

2.3 RELAYS

- A. 120 V AC relays to be 3PDT octal type, plug-in, complete with test button and operation indicator, and surge suppressor as manufactured by Idec, RH series or approved equal.
- B. 24 V DC relays to be 2PDT blade type plug-in, complete with test button and LED operation indicator, and surge suppressor as manufactured by Idec, RH series or approved equal.
- C. Time delay relays for behind panel mounting to be 2PDT, plug-in, and programmable for 16-time ranges and 4 operation modes.
- D. Time delay relays for flush panel mounting and operator accessible timing range modifications to be SPDT, screw terminals, programmable for 5 timing ranges and 8 operation modes, complete with digital display, module for time settings and flexible protective cover.
- E. Where the contact ratings of the relays listed are insufficient for the application, select an appropriate type from an approved manufacturer with the same quantity of contacts as was originally specified.
- F. Provide relay plug-in sockets for DIN mounting, complete with stacked screw lamp terminals.

PART 3 EXECUTION

3.1 INSTALLATION

Refer to Section 17010.

END OF SECTION

SECTION 17300
PROGRAMMABLE LOGIC CONTROLLER

PART 1 GENERAL

1.1 DESCRIPTION

Work Included

- A. Programmable logic controller (PLC).

1.2 RELATED WORK

- A. Section 16010 – General Electrical Requirements
- B. Section 16120 – Wires and Cables
- C. Section 17110 – Enclosures and Control Panels

1.3 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01300 and Section 16010.
- B. In addition to the above requirements, the following submittal items shall be provided:
 - 1. Bill of material listing all components, cables, connectors and modules included in the system.
 - 2. Catalog cut sheets for all hardware and standard software components.
 - 3. Detailed system block diagram showing each PLC module, rack, processor, power supply, etc.
 - 4. Shielding and grounding schematic drawing showing ground impedance and location relative to power source ground.
 - 5. Functional description of system hardware and software.
 - 6. Certification that the PLC equipment is compatible with all network and communications equipment provided.
 - 7. Load calculations and expected run times for each UPS system provided.

1.4 OPERATION AND MAINTENANCE MANUALS

Submit operation and maintenance manuals in accordance with Section 16010 and Section 01330.

PART 2 MATERIALS

2.1 PROGRAMMABLE CONTROLLER SYSTEM

A. General:

1. Manufacturers:
 - a. Allen-Bradley 1769 CompactLogix Controller.
2. Product Description:
 - a. Controller conforming to NEMA IA 2.2 and with required memory and functional capacity to perform specified sequence of operation with scheduled input and output points.
 - b. Each Controller system shall include but not be limited to:
 - 1) Controller.
 - 2) Power Supply.
 - 3) I/O modules as required.
 - 4) Communications modules as required.
 - 5) Connectors and cables as required.
3. Service Conditions: Conform to NEMA ICS 3.
4. Common Manufacturer: Controller system shall be furnished by a single vendor regularly and actively engaged in manufacturing and support of programmable controllers of the required specified capabilities.
5. Provide a field-expandable, modular controller system to allow for the customization and expansion of the system by the simple addition and configuration of hardware.
6. Each Controller system shall be designed using a Controller mounted on a local I/O module to perform all the functions as outlined in this Section.
7. The Controller system shall provide inputs and outputs (communications line, I/O, power, etc.) meeting the latest applicable NEMA, IEC, ANSI, IEEE, and all requirements of the Authority Having Jurisdiction (AHJ).
8. All Programmable Controller equipment shall be UL, CE, ETL listed.

9. The Controller system shall be capable of handling the required I/O as shown on the P&IDs plus capacity and pre-wiring to accommodate 20 percent future inputs and outputs by the addition of the I/O modules.
 10. Provide I/O modules with removable terminal connectors so that I/O modules may be replaced, expanded, or repaired without disturbing field wiring.
 11. Spare Input/Output Capacity: 20 percent fully wired.
- B. Programmable Controller:
1. Allen-Bradley 1769 CompactLogix L33ER.
 2. The Controller shall read the inputs, perform all system logic, conduct on-line diagnostics, and control the outputs. Diagnostics shall include memory checks, communications monitoring, I/O bus monitoring, watchdog timing, and user program validation. Diagnostic information shall be accessible from the program, from programming software, or remotely from the Operator Interface Terminal (OIT).
 3. The program shall be stored in either battery backed RAM or non-volatile flash memory.
- C. Analog Input (AI):
1. 8 channel analog input module 1769-IF8.
 2. Signal Range: 4 ... 20 mA.
- D. Analog Output (AO):
1. 8 channel analog output Module 1769-OF8.
 2. Signal Range: 4 ... 20 mA.
- E. Discrete Input (DI):
1. 16 channel digital AC input Module 1769-IA16.
 2. Voltage Range: 79 ... 132 V @ 47 ... 63 Hz.
- F. Discrete Output (DO):
1. 16 channel discrete output Module 1769-OA16.
 2. Voltage Range: 5 ... 265 VAC; 5 ... 125 VDC.

2.2 COMMUNICATIONS INTERFACES

- A. Provide one independent communication port, RS-232, for each Controller.

B. Connect Ethernet Card and Ethernet switch with Cat 5 patch cable.

1. Cable: 4 pair stranded PVC cable with Hi-Flex conductors.
2. Length: 5 feet minimum.
3. Color: gray.

2.3 POWER CONDITIONING

A. Manufacturers:

1. EDCO Model HSP121BT-1.
2. Approved equal.

B. Provide surge device equipment meeting the following specifications:

1. Clamping CAT: 330V L-N, 400V L-G ANSI/IEEE C62.41 1991-Cat. C1/B3.
2. Peak Clamp Voltage: 315V L-N, 350 V L-G.
3. Peak Surge Current (8 x 20 μ s): 10kA.
4. Response Time: < 5 nanoseconds.
5. Operational Temperature: -20° C to + 85° C.
6. Failure Indication: LED
7. Operational Voltage: 120VAC, 60Hz.
8. Operational Current: 15 Amps Service.

2.4 ETHERNET COMPONENTS

A. Ethernet Switches:

1. Manufacturers:
 - a. MOXA Managed Switch Model EDS-508A.
 - b. Approved equal.
2. Provide switches for Programmable Controller System as shown on Contract Drawing SCADA block diagram.
3. Ethernet switches be provided with ports as required as shown on the contract drawings.
4. Switches shall be DIN rail mounted.

B. Communication Jacks:

1. Manufacturers:

- a. Leviton Quickport.
- b. Approved equal.

2. Approvals and Listings:

- a. UL listed.
- b. FCC Part 68 compliant.
- c. NEC Article 800.

3. Descriptions

- a. CAT 5 wallplate and device boxes mounted at locations as shown on Contract Drawings.
- b. High-impact, self-extinguishing plastic rated UL 94V-0.
- c. Spring wire contacts - phosphor bronze plated with 50 micro-inches hard gold over 100 micro-inches nickel.
- d. Device Box: Minimum 2" by 4" as specified in Section 16140 - Wiring Devices.

4. Provide wall plates and jacks as follows:

a. Wallplates:

- 1) House any combination of up to four (4) 8-conductor keyed jacks.
- 2) Field configurable.

b. Jacks:

- 1) Interchangeable, depending on application.
- 2) Individually terminate each 8-conductor keyed jack using Insulation Displacement Connectors (IDCs) with punchdown caps.
- 3) Provide jacks in the following color codes:
 - a) Telephone network = Ivory
 - b) PC Data network = Gray
 - c) Programmable Controller Data network = Black
 - d) Spare = Brown

2.5 UNINTERRUPTABLE POWER SUPPLY

- A. Manufacturers:
1. Liebert.
 2. APC.
 3. Best.
 4. Approved equal.
- B. Product Description: Nonredundant uninterruptible power supply with reverse transfer.
- C. System Ratings and Operating Characteristics:
1. System Continuous Rating: 1500VA, 1000 W, minimum, over entire battery voltage range at specified power factor. Maintain output voltage within specified limits at load from full load to no-load.
 2. Battery Capacity: Capable of operating at full load for 30 minutes, minimum.
 3. Voltage Rating: 120/208 volts, single phase.
 4. Input Voltage Operating Range: +20 percent, -20 percent.
 5. Input Frequency Operating Range: 60 Hz.
 6. Input Current Limit: Adjustable to maximum of 125 percent required to operate at full load with battery bank on float charge.
 7. Current Walk-in: 25 to 100 percent in fifteen seconds.
 8. UPS Power Factor Over Full Range of Loads and Input Voltages: 80 percent, lagging.
 9. Harmonic Distortion of Input Current Wave Form: 15 percent maximum at full load.
 10. Output Harmonic Distortion: Maximum 5 percent rms total harmonic distortion (THD) and maximum 3 percent any single harmonic, at rated frequency and voltage, from 10 percent load to full load and over battery voltage range, measured into linear load.
 11. UPS shall annunciate via ethernet (CAT6) showing indication of:
 - a. UPS failure.
 - b. UPS battery trouble.
 - c. Trouble/Failure.
 12. Submit Load Calculations including expected UPS run time for load connected.

PART 3 EXECUTION

3.1 INSTALLATION

Install PLC control system in accordance with manufacturer's written instructions.

3.2 FIELD QUALITY CONTROL

- A. Demonstrate equipment and standard software are operating as specified.
- B. Conduct equipment startup and perform operational checks.

3.3 TESTING

Factory Testing

- A. Perform tests to demonstrate full compliance of the PLC with contract requirements.
- B. Tests shall be witnessed by Engineer or Owner's designated representative.

3.4 MANUFACTURER'S SERVICES

Provide equipment manufacturer's services at the job site for the minimum man-days listed below, travel time excluded:

- A. Two man-days to check the installation, termination, and adjustment of the PLC system.
- B. Two man-days to perform and complete onsite tests.
- C. One man-day to provide startup assistance.
- D. Three man-days to provide post-startup training

END OF SECTION

SECTION 17700
INSTRUMENTATION REQUIREMENTS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. This Section of the Specifications forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.
- B. Equipment and services provided under this Section shall be subject to the general instrumentation requirements specified in Section 17010 - Instrumentation General.
- C. Provide instruments complete with mounting hardware, floor stands, sunshades, wall brackets or instrument racks as required by the manufacturer and specified herein.
- D. Provide instrument enclosures NEMA/EEMAC rated for the environment. In hazardous areas, meet the area and zone rating as shown or specified. In areas subject to flooding, provide submergence rated enclosures. Enclosures in process areas a minimum of NEMA 4X.

1.2 STANDARDS OF CONFORMANCE

- A. Instrument Systems and Automation Society, ISA-S50.1, current edition, Compatibility of Analog Signals for Electronic Industrial Process Instruments.
- B. ISA Standard S20: Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves.
- C. Underwriter Laboratories, UL508, Standards for Industrial Control Equipment.
- D. National Electrical Manufacturers Association (NEMA), Pub. No. ICS-6, enclosures for industrial controls and systems.
- E. Approvals:
 - 1. Factory Mutual (FM) approval for explosion proof and intrinsic safety IS.

1.3 SUBMITTALS

- A. Comply with the provisions and requirements of Section 17010.

- B. Submit the following for each model instrument provided:
1. Manufacturer's design and performance specification data and descriptive literature.
 2. Equipment dimensioning and installation requirements and recommendations.
 3. Required and optional accessories lists.
 4. Electrical/pneumatic signal and power connection diagrams.
 5. Operation and maintenance documentation for each type instrument after product approval.
 6. Calibration certifications from the manufacturer for each calibrated instrument.
 7. List of recommended spare parts and spare parts to be provided. At a minimum, provide 2-year supply of expendables required for calibration and operation of instruments.
 8. List of optional accessories.
- C. Submit the following for each instrument provided:
1. Tag number and description.
 2. Complete model number.
 3. Instrument Data Sheets (ISA Standard -S20) with all fields completed.
 4. Catalog literature edited to indicate specific items provided.
 5. Mounting details for all typical installation requirements and special details for non-typical applications.
 6. Methods and materials required for installation. Include power and signal connection details.
 7. Other specific submittal information as specified in the particular instrument specification.

1.4 QUALITY ASSURANCE

- A. Provide instrumentation of rugged construction designed to operate at 1100 m above sea level and in WWTP site conditions. Provide only new, standard, first-grade materials throughout, conforming to standards established by Underwriter's Laboratories (UL), Inc., CSA approved and so marked or labeled, together with manufacturer's brand or trademark.
- B. Provide material and equipment in accordance with applicable codes and standards, except as modified by the specifications.
- C. Use single source manufacturer for each instrument type. Use the same manufacturer for different instrument types whenever possible.

- D. Coordinate instrumentation to assure proper interface and system integration. Provide signal processing equipment, to include, but not be limited to, process sensing and measurement, transducers, signal converters, conditioners, transmitters, receivers and power supplies.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Provide and securely attach the tag number and instructions for proper field handling and installation to each instrument prior to packaging.
- B. Package instrumentation to provide protection against shipping damage, dust, moisture and atmospheric contaminants.
- C. Include a shipping label which contains the following information:
 - D. Tag number and description.
 - E. Instructions for unloading, transporting, storing and handling at the site.

PART 2 MATERIALS

2.1 INSTRUMENTS

- A. Provide instrumentation as required and listed in the Instrument Index, located in Appendix A to this section, to provide a fully functioning Instrumentation and Control system.
- B. All instruments and associated devices located in hazardous or classified locations shall be rated for the location as indicated on the contract drawings. Provide intrinsically safe barriers for all non-rated instruments and devices.
- C. In general, alarm contacts close to alarm. Normally closed contacts that open on detection of the alarm condition or loss of power are only required for high priority critical or safety shutdown/interlock alarms.
- D. Provide all additional data communication hardware and software required to configure, test and commission all Communications network, such as DeviceNet, Modbus, Ethernet etc. between field devices and panel devices.

2.2 INSTRUMENT SPARE PARTS

Expendables: 2-year supply of expendables required for calibration and operation of instruments.

2.3 INSTRUMENT REQUIREMENTS

2.4 FLOAT TYPE LEVEL SWITCHES (LSHH/H/L/LL)

A. Manufacturers:

1. MJK 7030.
2. Approved equal.

B. Materials:

1. Float material: Polypropylene.
2. Cable clamp: 316 stainless steel.
3. Operating temperature: -4 to +140 °F (-20 to 60 °C).
4. Design and fabrication:
 - a. Provide switch complete with flexible electrical cables.
 - b. SPST dry contact rated at 120 VAC, 16 amps minimum.
 - c. External mount float switch: vertically mount to wall.
 - d. Terminate cables in junction box.
 - e. Install floats per Contract Drawing details.

2.5 MAGNETIC FLOW METER (FE/FIT)

A. Manufacturers:

1. Siemens SITRANS Magflo MAG 5100 W with MAG 5000 Signal Converter / indicator unit.
2. ABB Magmaster MFE meter with converter/indicator unit.
3. Toshiba "Mount Anywhere" magnetic flowmeter detector and converter.
4. Approved equal.

B. Each magnetic flow meter shall consist of a flow tube (FE) and a converter/indicator (FIT), complete with all necessary interconnecting cables and conduits.

C. Magnetic flow meters shall be of low frequency electromagnetic induction type and shall produce a DC pulse signal directly proportional and linear to velocity of the flow, with duration not less than 100 milliseconds. Meters shall be suitable for bi-directional flow with full scale flow rates from 3 to 31 feet per second.

- D. Metering system shall be inherently capable of complete zero stability. Meters requiring field zero adjustment will not be acceptable.
- E. Changes in fluid pressure, temperature, viscosity, or conductivity shall not affect meter accuracy.
- F. Provide ANSI Class 150 (minimum) flow element flange connections be or flangeless type as required by mechanical Drawings. Flanges shall be coordinated with Contractor installing piping.
- G. Provide stainless steel grounding rings at both ends of the flow element when required by the manufacturer. The sensor flow tube and liner material shall be neoprene or hard rubber, unless recommended otherwise by the manufacturer for the application and approved by the Engineer. Measurement and grounding electrodes shall be 316 stainless steel and shall be flush type. The meter shall incorporate a high impedance amplifier of 100,000 Megohms or greater, eliminating the need for electrode cleaning systems.
- H. Converter/Indicator:
 - 1. Integrally or remotely mount electronics as shown on Contract P&ID Drawings.
 - 2. Converter shall be microprocessor controlled, utilizing digital signal processing with automatic zero correction to provide a linear 4 to 20 mA signal proportional to the forward and reverse flow rates specified.
 - 3. Electronics shall provide and control output rated for 24 VDC switching for remote monitoring of forward or reverse flow indication.
 - 4. Rangeability shall be field adjustable over a 100 to 1 range.
 - 5. Provide field adjustable signal dampening.
 - 6. Provide low flow cutoff to eliminate flow transients when no flow is present in the pipe.
 - 7. Provide a rate indicator and totalizer scaled in engineering units and viewable on LCD display(s).
 - 8. Converter shall have self diagnostics which constantly check for proper operation. If a failure occurs, a fault indication shall be provided to notify the operator of the failure. The converter shall contain a self test mode to allow the operator to manually simulate the 4 to 20 mA output signal to any value between 0% and 100% to evaluate any driven devices in the loop.
 - 9. The converter shall be rated to operate in an ambient temperature range from 14 to 122 °F (-10 to 50 °C).
 - 10. When converter electronics is mounted remotely, manufacturer shall supply additional special cabling (cabling between flow element and remote mounted flow indicating transmitter), mounting hardware, and devices necessary to complete the installation at no additional cost to the Owner.

11. Provide NEMA rated enclosures, specified in Instrument Index, for converter electronics.
 - I. Flowmeter converter and components shall be designed for operation from a power source as listed in the Instrument Index with a power consumption of less than 20 Watts.
 - J. Flowmeter manufacturer shall supply the cable without splices from the flowtube to the remote electronics. Remote converter/indicator (FIT) shall be capable of being located up to 1000 feet from the flow element (FE).
 - K. Flowmeter element shall be submergence proof continuous to 30 feet of water per IP 68 and NEMA 6P when shown in Instrument Index. Cabling between flowmeter element and electronics shall be sealed to retain submergence rating per flowmeter manufacturer's requirements.
 - L. Accuracy of the complete metering system, including flow tube and converter electronics, shall be 0.5% of rate over the range settings of 3 to 31 feet per second. Variations in temperature, voltage, and frequency within the ranges listed herein shall not affect the accuracy in excess of 0.5% of flow rate.
 - M. Meter calibration:
 1. Meters shall be hydraulically calibrated at a facility located in the United States and calibration shall be traceable to the National Bureau of Standards.
 2. A certified copy of the calibration test results shall be submitted to the Owner prior to shipment of the meter.

2.6 ULTRASONIC LEVEL CONTROLLER/TRANSMITTER & ELEMENT (LE/LIT)

- A. Manufacturers:
 1. Endress+Hauser Prosonic FMU40.
 2. Approved equal.
- B. Ultrasonic Multi-Purpose Level Controller
 1. The multi-purpose level transmitter system shall be a microprocessor based echo-time measuring type providing an electronic output signal proportional to the level of material, space, volume, flow or differential as may be required. It shall consist of a transmitter and transducer integrated into a single loop powered device.
 2. Transducer:
 - a. Operating principle: Acoustic impulses emitted from an ultrasonic transducer are reflected back from the material surface and are received by the transducer. The transit time of pulse travel from generation to echo is measured. The

elapsed time is proportional to the distance between the transducer face and material surface.

- b. Primary Sensor: The acoustic transducer shall contain a polarized Zirconium crystal with acoustic impedance matching face and transformer.
 - 1) The range of the transducer shall be 1 to 16 feet.
 - 2) Process connection shall be 1-1/2" NPT.
 - 3) Operating temperature shall be -40o to 176° F.
- 3. Transmitter:
 - a. Enclosure shall be NEMA 4X powder coated aluminium.
 - b. Power supply shall be 2 wire loop power.
 - c. Power consumption shall be 15 VA.
 - d. Operating temperature shall be -5 to 122° F. Internally mounted heater and thermostat assemblies shall be enclosed at temperatures below -5 °F.
 - e. Outputs:
 - 1) 4-20ma.
 - f. Control and Programming:
 - 1) All parameter and commands shall be entered via a local keypad
 - g. Transmitter shall process all echoes from stored memory that is continually updated after echo enhancement.
 - h. The echoes shall be processed comparing returns for largest echo and first echo returned. The patented Sonic Intelligence shall compare the various returns and select the echo with the greatest confidence factor.
 - i. The transducer shall be permanently mounted at the measuring site and shall be installed in accordance with the manufacturer's recommendations.
 - j. There shall be no internal potentiometers or switches used in programming or adjusting the transmitter.
 - k. The following functions shall be provided:
 - 1) The controller shall provide an isolated 4-20ma or 0-20ma (or reversed) signal proportional to space, material, volume, flow or differential into a maximum of 750 ohms.
 - 2) The controller shall be capable of reading tank level.
 - 3) The transducer shall transmit and receive an acoustic signal to accurately measure material flow and level.

- 4) The output shall be proportional to level, flowrate or volume from 0 to 100 % with a resolution of 0.1%.
 - 5) The controller shall be capable of zero to full scale simulation to assure proper operation with regards to flow charts or pump control parameters.
 - 6) The controller shall have an EEPROM memory and shall not require a battery to ensure protection of stored data.
4. Transducer Performance:
 - a. Range shall be 0 to 16 feet
 - b. Accuracy shall be +/- 0.2% of range or 2 mm, whichever is greater.
 - c. Resolution shall be 0.1% of range.
 - d. Maximum separation between transmitter and transducer shall be 1200 feet.
 - e. Approved for Class 1 Division 1 Groups A, B, C and D Class 2 Division 2 Groups E, F, and G.
 - f. Shall accept submersible shield.
 5. Indication:
 - a. Display shall be a 4 digit LCD.
 - b. Individual alarm status light.
 6. Calibration:
 - a. Calibration of the multi-purpose level controller shall be accomplished by the entry of all operating data through the local keypad or hart communicator.
 - b. Internal self-diagnostics shall be available to assist in maintenance of the multi-purpose level controller.
 7. Follow manufacturer's recommendation for the minimum separation between the transducer face and the maximum expected material level.
 8. Mount the transducer to ensure a clear path to the material surface.

2.7 LEVEL INDICATOR (LI)

A. Manufacturers:

1. Precision Digital, Trident series.
2. Approved equal.

B. Multi-Purpose Process Indicator

The multi-purpose process indicator shall be 1/8 DIN with the following features:

1. NEMA 4X rated.
2. 4-20 mA input with built in Isolated 24VDC @ 200 mA transmitter power supply.
3. 4-digit display, 0.56" with sunlight readable display
4. 3-year warranty

2.8 INTRUSION SWITCH (ZS)

A. Manufacturers:

1. GE Guardswitch Model 193-4Z-06K,
2. Amseco BMC-33B,
3. Approved Equal.

B. Each security door switch shall have a wide gap magnetic sensor with SPDT contacts mounted in a rugged steel housing with a two-foot stainless steel armored cable for wiring to a junction box. Switch shall be provided with both open and close type loops. The intrusion switch shall meet the following specifications:

1. Response time: 1 msec; 10 msec (24vdc)
2. Operating temperature range: -40° C to 80° C
3. Nominal sense range: 0.5" (1.3 cm)
4. Nominal break range: 1.8" (4.6 cm)
5. Nominal lead length: 6' (1.8 m)

2.9 SUBMERSIBLE LEVEL TRANSMITTER

A. Manufacturers:

1. Keller America Level Rat.
2. Birdcage.
3. Approved equal.

B. Furnish materials in accordance with process requirements.

C. Level instruments shall be provided as shown on the instrument schedule. Length of cable shall be as shown on site plans and field verified by the Contractor.

D. Transmitter shall be configured by the system supplier.

- E. Transmitter shall have an accuracy of +/- 0.25% of span.
- F. Output: Transmitter shall be 4-20 mA output.
- G. Transmitter shall be 24VDC Loop powered.
- H. Intrinsically safe approved.
- I. Provide terminal enclosure and Vented Hytrel cable with moisture barrier from the same manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION

- A. All transmitters installed outside shall have sun-shade protection.
- B. All 120 V AC powered instruments shall be powered from the plant UPS system.

3.2 SETUP, STARTUP AND COMMISSIONING

- A. Setup, test, startup and commission all instruments as required by Section 17800.
- B. The contractor shall allow for services of a qualified equipment representative to carry out setup and testing of all instruments.

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APPENDIX A

INSTRUMENT INDEX

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INSTRUMENT INDEX

I Drawing	Tag No.	Description	Type	Specification Section	Range	Size	Power	NEMA/IP Rating
I100	LE 1051	Level Element	Ultrasonic	11337		-	Loop	4X
I100	FE 1071	Flow Element	Magnetic	17700		8"	-	6P
I100	FIT 1071	Flow transmitter	Remote	17700	0-2 MGD	-	120VAC	1
I100	FE 1072	Flow Element	Magnetic	17700		4"	-	6P
I100	FIT 1072	Flow transmitter	Remote	17700	0-2 MGD	-	120VAC	1
I110	LSHH 1151	Float Switch	N.O.	17700		-	ISR	Submersible
I110	LSLL 1151	Float Switch	N.O.	17700		-	ISR	Submersible
I110	LT 1151	Level Transmitter	Submersible	17700	0-23.1 FT	-	Loop	Submersible
I120	FE 1271	Flow Element	Magnetic	17700		8"	-	6P
I120	FIT 1271	Flow transmitter	Remote	17700	0-2 MGD	-	120VAC	1
I130	LE1351	Level Element	Ultrasonic	17700	0-15 FT	-	Loop	4X
I130	LI1351	Level Indicator	Display	17700	0-15 FT	-	120VAC	4X
I140	LE1451	Level Element	Ultrasonic	13322	-	-	-	-
I140	LI1451	Level Indicator	Display	13322	-	-	-	-
I190	LSL 1989	Low Level Switch	Float	16620		-	-	-
I190	ZS 1991A~I	Instrusion Switch	Wide Gap Magnetic	17700		-	24VDC	4X
I190	ZS 1992	Instrusion Switch	Wide Gap Magnetic	17700		-	24VDC	4X

END OF SECTION

SECTION 17800

TESTING, CALIBRATION AND INSTALLATION VERIFICATION

PART 1 GENERAL

1.1 WORK INCLUDED

- A. The Work includes the provision of all necessary testing, instrument calibration, and installation verification, for each system and piece of equipment complete with written reports prior to system completion.
- B. Conform to the general requirements of Section 16030 regarding testing of the instrumentation and control equipment and coordinate instrumentation and control work to facilitate testing of other equipment. Use test forms and requirements as detailed in Section 17830.
- C. Refer to Section 17010 for general instrumentation and control requirements related to testing, calibration, and installation verification.

1.2 COORDINATION

- A. Coordinate Testing and commissioning activities with Prime Contractor, supplier of process equipment representatives and other divisions.
- B. Refer to Section 01670 – Equipment And System Testing And Startup for additional information and requirements.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

3.1 TESTING

- A. Prior to the completion of the Work, perform comprehensive testing of the installation. Include the following activities:
 - 1. Wire insulation tests.

2. Wire continuity tests including associated terminations.
 3. Grounding system continuity and isolation tests.
 4. Any other testing necessary to verify the operation of equipment and installation work.
- B. Provide the services of a manufacturer's representative for equipment to assist with any of the equipment tests to be performed. Any components, incorrect wiring, or systems found to be defective or deficient during the tests shall be repaired or replaced.
- C. Provide a detailed test schedules to Engineer for review and approval as part of the Quality Control plan.
- D. The participation in testing activities and use of the equipment during testing periods by The City is to be allowed provided it does not adversely affect specified testing requirements. Such participation shall not relieve the Contractor of any of the obligations stipulated herein.
- E. Prior to the commencement of any testing, the Contractor shall ensure that all spare parts, expendables, and test equipment pertinent to the system being tested are on site. Test equipment shall include all necessary multi-meters, process instrument calibrators for 4-20 mA loops, 24 VDC devices and signal generators or simulators. Test equipment shall be provided by the Contractor and shall remain the property of the Contractor at the end of all testing.

3.2 CALIBRATION

- A. In situ, calibrate and adjust all instrumentation to verify correct operation, range adjustment, compensation, scaling, etc. Provide instrument calibration services for all individual components such as signal transmitters, analyzers, transducers, power supplies, and like equipment where appropriate.
- B. Provide certified calibration reports for each instrument. In the reports, include, but do not limit to, such information as:
1. Device tag number.
 2. Equipment description.
 3. Service application.
 4. Process variable measurement range.
 5. Description of calibration equipment used.
 6. "As found" calibration data.
 7. "As left" calibration data.

8. Date, name, and signature of technician.
- C. Include calibration reports in the operating and maintenance manuals described in Section 17010 and section 17830.

3.3 INSTALLATION VERIFICATION

- A. When the system installation has been completed (or part thereof), perform detailed verification checks for all systems supplied and installed as part of the Work. In the checks and reviews, include the following:
 1. Certify that the equipment has been installed as per the Contract drawings and recommended installation procedures, reporting any discrepancies to the Engineer.
 2. Certify that the equipment power and grounding requirements have been satisfied, reporting any discrepancies to the Engineer. For the grounding system, include an itemized check of each instrument circuit to verify the correct isolation of all shields and instrument grounds.
 3. Certify that all terminations to the equipment are properly installed. Report any discrepancies to the Engineer.
 4. Certify that all wiring continuity (whether new or existing) has been verified.
 5. Certify that all process taps and instrument connections have been performed according to the requirements detailed herein and shown on the drawings.
 6. Certify that the installation (or part thereof as completed) is ready for commissioning and start-up.
 7. Witnessed Functional Acceptance Test shall be done on the complete control system. During this test, the contractor has to execute component by component and loop by loop tests. The correct results have to be verified in the field and on the associated control components. The test shall be performed using approved procedures and shall be signed off upon satisfactory completion.
- B. Undertake any corrective action found to be necessary during the course of the verification checkout and review.
- C. Report any discoveries of defects or deficiencies in writing to the Engineer for any equipment supplied by the City.
- D. Allow for the participation of the Owner's personnel in the verification checks. Such participation shall not relieve the Contractor of any of the obligations.
- E. Prepare the various reports and certificates described herein. Forward three (3) copies of each report or certificate to the Engineer. Clearly identify any discrepancies which require action on the part of the Engineer

3.4 FIELD INSTRUMENTATION CHECKLIST

The following is a minimum checklist for all field-mounted devices:

- A. Instrument cables and the individual conductors are tagged and identified.
- B. Instrument cables are terminated on approved termination blocks.
- C. Conductors are terminated in an approved manner on termination blocks and at connection points on the instrument.
- D. Where required plug and receptacles have been used to connect field devices.
- E. Termination boxes and junction boxes are identified and tagged.
- F. Instrument cables are supported and strapped.
- G. Field Instruments (flow meter, level transmitter, etc.) are tagged and identified.
- H. Instruments are bonded to ground, and signal shield is not bonded to ground except at the host controller. (Signal shield is continuous and not bonded to any other signal shields in the field or field JB).
- I. Instruments are adequately supported.
- J. Instruments are located free of mechanical damage.
- K. Instruments are new.
- L. Instruments are free of dents, scratches, cracks, breaks, defects and damage.
- M. Instruments are rated for the environment in which they are placed (indoor, corrosive, classified, outdoor, etc.).
- N. Flexible connections or fittings are used to connect to the instruments.
- O. Fittings for connections are water tight and secure.
- P. Instrument control wiring is separated from power wiring.
- Q. Instrument control cable is shielded, twisted or configured in an approved manner to minimize electromagnetic and electrostatic interference.

- R. Instruments are tested, calibrated and adjusted to operate within prescribed parameters.
- S. 'Loop check sheets' and 'instrument calibration sheets' have been completed for each device.
- T. Exact Instrument location has been signed off with City Plant Operations department and the Engineer.
- U. All equipment will bear the UL label.
- V. Wiring at different voltage levels within the same panel or termination box are segregated by an effective barrier.
- W. A minimum clearance of 2" is provided between the wire-way and any point of wire termination.

END OF SECTION

SECTION 17830

INSTRUMENTATION AND CONTROL TEST FORMS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. In cooperation with the Engineer, Contractor and System Integrator. The contractor shall perform extensive commissioning and start-up functions to verify the operation of all of the systems described herein after the installation is completed.
- B. The Contractor System Integrator Team, under the direction of the General Contractor and designated Commissioning Agent, will coordinate and schedule all activities associated with testing and commissioning. Perform systems testing as required by Section 17800.
- C. Refer to Sections 17010 and 17015 for general instrumentation and control requirements related to testing, commissioning and start-up of the Instrumentation and control System.
- D. Contractor supplied instruments to be factory pre-calibrated. Provide a printed record of the factory calibration parameters for all devices.
- E. Prior to on-site calibration completely program all "smart" transmitters including entries of the appropriate range and tag number.
- F. Instruments to be set up and calibrated by an accredited instrument technician working under the approval of the instrument manufacturer.
- G. Calibrate all instruments to an accuracy of ½ of 1% of full range, or to the manufacturer's stated accuracy of the instrument whenever an accuracy of ½ of 1% is not achievable.
- H. Provide a printed calibration record for each instrument.
- I. Test equipment for calibration must have been certified and valid at time of calibration.
- J. After all devices within a loop have been connected, check the loop for correct functioning and interaction with other loops, where applicable. Provide two weeks written notice to the Corporation when the loops are going to be tested for continuity and correct operation so that both tests may be witnessed at the Corporation's discretion.
- K. Check the operation of all final control elements such as solenoid valves, actuators, and the like by manual control before checking with automatic control.

- L. Check the electrical and pneumatic failsafe operations of all final control elements such as solenoid valves, actuators, and the like.
- M. Test all tubing for leaks in compliance with ISA RP 7.1. Isolate all instruments when tubing is being tested to protect against over-pressure.
- N. Carry out all tests, sign and date all test reports as necessary and as provided in this Section. Submit the test reports to the Engineer within five working days of testing.

1.2 QUALITY ASSURANCE

- A. It is the responsibility of General Contractor and Plant Control System (System Integrator to provide a coordinated commissioning and start-up program. The overall program will be presented to the owner and Engineer for approval prior to testing and commissioning activities as part of the shop drawings approval process. Test forms and testing plan will be part of the submittal.
- B. Use only approved forms by the engineer to perform loop tests.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

Not used.

TEST FORM NUMBER AND DESCRIPTION

17830-A	LOOP WIRING AND INSULATION RESISTANCE TEST DATA FORM
17830-B	FIELD SWITCH CALIBRATION TEST DATA FORM
17830-C	TRANSMITTER CALIBRATION TEST DATA FORM
17830-D	MISCELLANEOUS INSTRUMENT CALIBRATION TEST DATA FORM
17830-E	INDIVIDUAL LOOP TEST DATA FORM
17830-F	VISUAL AND MECHANICAL INSPECTION FORM
17830-G	I/O POINT CHECKOUT TEST FORM
17830-H	FACTORY TEST FORM

17830-A: LOOP WIRING AND INSULATION RESISTANCE TEST DATA FORM

LOOP TAG: _____

List each conductor of all cables associated with a loop in table below. Ensure end devices are disconnected prior to making measurements. Perform continuity measurements with a 4,000 count DVM. Perform insulation resistance measurements with an insulation tester with energization voltage of 250V DC or less. Do not use a high voltage or hand-crank megohmmeter for this test.

Submit up to 5% of conductor recorded retest results when requested by the Engineer.

CABLE NO.	CONDUCTOR NO. (OR COLOUR)	CONTINUITY RESISTANCE ^A	SHIELD CONTINUITY INSULATION RESISTANCE ^B

A Continuity Test: Connect ohm meter leads between conductors 1 and 2 and jumper opposite ends together. Record resistance in table. Repeat procedure between conductors 1 and 3, and 4, etc. and finally between conductor 1 and cable shield. Any deviation of ± 2 ohms between any reading and the average of a particular run indicates a poor conductor. Take corrective action before continuing with the loop test.

B Insulation Test: With all conductors open, measure the insulation resistance between conductor 1 and shield. Repeat procedure for each conductor and record reading.

CERTIFIED _____
Contractor's Representative

DATE _____

WITNESSED _____
Owner's Representative

DATE _____

17830-B: FIELD SWITCH CALIBRATION TEST DATA FORM

TAG NO. AND DESCRIPTION: _____
 MAKE AND MODEL NO.: _____
 SERIAL NO.: _____
 INPUT: _____
 RANGE: _____
 SETPOINT(S): _____

Simulate process variable (flow, pressure, temperature, etc.) and set desired setpoint(s). Run through entire range of switch and calculate deadband.

Perform two tests per device or switch and record results.

SETPOINT	TRIP POINT (EU)		DEADBAND	
	INCREASE INPUT	DECREASE INPUT	CALCULATED	REQUIRED

CERTIFIED _____
Contractor's Representative

DATE _____

WITNESSED _____
Owner's Representative

DATE _____

17830-C: TRANSMITTER CALIBRATION TEST DATA FORM

TAG NO. AND DESCRIPTION: _____
 MAKE AND MODEL NO.: _____
 SERIAL NO.: _____
 INPUT: _____
 SUPPRESSION: _____
 RANGE: _____
 SCALE: _____

Simulate process variable (flow, pressure, temperature, etc.) and measure output with appropriate meter.

% OF RANGE	INPUT	OUTPUT		% DEVIATION
		EXPECTED	ACTUAL	
0				
25				
50				
75				
100				
75				
50				
25				
0				

NOTE: If transmitter includes integral switches include Form 16900-G for each switch.

CERTIFIED _____
Contractor's Representative

DATE _____

WITNESSED _____
Owner's Representative

DATE _____

17830-D: MISCELLANEOUS INSTRUMENT CALIBRATION TEST DATA FORM

TAG NO. AND DESCRIPTION: _____
 MAKE AND MODEL NO.: _____
 SERIAL NO.: _____
 SERVICE: _____
 INPUT: _____
 DATA SHEET: _____
 SUPPRESSION: _____
 RANGE: _____
 SCALE: _____

	TEST 1				TEST 2			
TEST METHOD								
	INPUT		OUTPUT		INPUT		OUTPUT	
PROCESS	INC.	DEC.	INC.	DEC.	INC.	DEC.	INC.	DEC.
TEST POINT 1								
TEST POINT 2								
TEST POINT 3								
TEST POINT 4								
TEST POINT 5								
COMMENTS								
GRAPHS								

CERTIFIED _____
Contractor's Representative

DATE _____

WITNESSED _____
Owner's Representative

DATE _____

17830-E: INDIVIDUAL LOOP TEST DATA FORM

LOOP NO.: _____

DESCRIPTION: _____
Give complete description of loop's function using tag numbers where appropriate

P & ID NO.: *Attach copy of P & ID*

1. Wiring tested (*attach test Form 17830 -A or equivalent*).
2. Instruments calibrated (*attach test Forms 17830-I through K*).
3. List step-by-step procedures for testing loop parameters. Test loop with instruments, including transmitters and control valves, connected and functioning. If it is not possible to produce a real process variable, then a simulated signal may be used with the Engineer's approval.
4. List step-by-step procedures for testing loop failure action. This testing to include loop operation upon loss of motive air supply, modulating control air signal, modulating control electrical signal and solenoid energizing power.
5. Sort all test forms associated with the P & ID in ascending order by loop number (*attach all associated instrument loop diagrams and interconnecting wiring diagrams*).

CERTIFIED _____
Contractor's Representative

DATE _____

WITNESSED _____
Corporation's Representative

DATE _____

17830-F: VISUAL AND MECHANICAL INSPECTION FORM

Equipment Name: _____	Location: _____
Manufacturer: _____	Series#: _____
Model #: _____	U.L. #: _____
Voltage: _____	Phase: _____
Amperage: _____	Service: _____
Bus Type: _____	Bus Bracing: _____
Vertical Bus: _____	Horizontal Bus: _____
Ground Bus: _____	Neutral Bus: _____
Enclosure: _____	Environ. Rating: _____

Inspection Checklist

Check: **A** – Acceptable, **R** - Needs Repair or Replacement, **NA** – Not Applicable

	Accept	Repair	NA
1. Tighten All Bolts and Screws.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Tighten All Wiring and Buss Connections.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Verify All Breakers and Fuses Have Proper Rating.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Check Bus Bracing and Clearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Check Main Grounding Connection and Size	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Inspect Ground Bus Bonding	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Check Equipment Grounds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Check Conduit Grounds and Bushings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Inspect Neutral Bus and Connections	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Check Heaters and Thermostats	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Check Ventilation and Filters.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Check for Broken or Damaged Devices.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Check Door and Panel Alignment.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Inspect Anchorage.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Check for Proper Clearances and Working Space	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Remove All Dirt and Dust Accumulation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Inspect All Paint Surfaces	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Check for Proper Wire Color Codes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Inspect all Wiring for Wire Labels.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Check for Proper Wire Terminations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Check for Proper Wire Sizes.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Inspect All Devices for Nameplates.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Check if Drawings Match Equipment.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Check Accuracy of Operation & Maintenance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Tested by: _____

Witnessed by: _____ **Date:** ____/____/____

17830-H: FACTORY TEST FORM (MCC BUCKET / CONTROL PANEL / PEDESTAL CHECKOUT FORM)

Manufacturer: _____ **Location:** _____
 _____ **Job No.:** _____
Telephone #: _____ **Fax #:** _____

**MCC Bucket /
 Control Panel /
 Pedestal:** _____

Test Result

Pass **Fail**

OVERALL PANEL INSPECTION

- | | | |
|--|--------------------------|--------------------------|
| 1. All front panel and back panel components counted securely..... | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. All wiring terminated and labeled correctly. | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. All components, wiring, and labeling accurately reflected on the drawings. | <input type="checkbox"/> | <input type="checkbox"/> |

POWER-UP INSPECTION

- | | | |
|---|--------------------------|--------------------------|
| 1. Voltage levels on load side of circuit breakers..... | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Voltage levels at the DC terminals of the power supply. | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Voltage levels at the DC power distribution terminals..... | <input type="checkbox"/> | <input type="checkbox"/> |

POWER DISTRIBUTION AND GENERAL COMPONENT TESTING

- | | | |
|---|--------------------------|--------------------------|
| 1. Power distribution to the appropriate components. | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Operation of the ancillary components such as receptacles, work lights, etc..... | <input type="checkbox"/> | <input type="checkbox"/> |

CONTROL COMPONENTS CHECKS

- | | | |
|--|--------------------------|--------------------------|
| 1. Operators (push buttons, selector switches, pilot lights) | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Inputs from External Sources | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Outputs to External Sources | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Relay Logic | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. PLC I/O and Program Verification..... | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. O/I Display Verification..... | <input type="checkbox"/> | <input type="checkbox"/> |

Notes:

1. For relay logic checks, each rung of the elementary or loop diagram is to be highlighted in yellow as they are verified for correct control functions.
2. For PLC I/O and program verification, the control strategies shall be highlighted in yellow as each logic function is tested.

Tested by: _____

Witnessed by: _____

Date: ____/____/____

END OF SECTION

APPENDIX A

Geotechnical Report, San Juan Bautista
to Hollister Sanitary Force Main Project,
San Benito County, California (Crawford
& Associates, Inc., September 2022)

GEOTECHNICAL REPORT

San Juan Bautista to Hollister Sanitary Force Main Project San Benito County, California

Prepared by:



Crawford & Associates, Inc.
1100 Corporate Way, Suite 230
Sacramento, CA 95831

September 2022

Prepared for:



Stantec Consulting Services, Inc.
3875 Atherton Road
Rocklin, CA 95765

September 6, 2022
Crawford File No. 21-719.1

Mr. Gabe Aronow
Stantec Consulting Services, Inc.
3875 Atherton Road
Rocklin, CA 95765

Subject: **GEOTECHNICAL REPORT**
San Juan Bautista to Hollister Sanitary Force Main Project
San Juan Bautista, California

Dear Mr. Aronow,

Attached is our Geotechnical Report for the San Juan Bautista to Hollister Sanitary Force Main Project in San Juan Bautista, California. We prepared this report to provide geotechnical data, conclusions, and recommendations for advancing the project to final design. Crawford & Associates, Inc. (Crawford) completed this report in accordance with our agreements dated March 10, 2021.

Please call if you have questions or require additional information.

Sincerely,

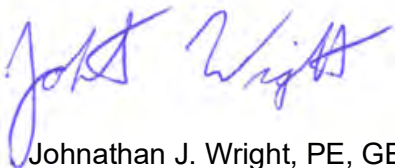
Crawford & Associates, Inc.,



Amando B. Castro, EIT
Project Engineer



Benjamin D. Crawford, PE, GE
Principal Geotechnical Engineer



Johnathan J. Wright, PE, GE
Project Manager



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1 INTRODUCTION

1.1 PURPOSE

Crawford & Associates, Inc. (Crawford) prepared this Geotechnical Report for the San Juan Bautista to Hollister Sanitary Force Main Project in San Juan Bautista, California. The purpose of this report is to provide geotechnical and geologic data and provide conclusions and recommendations for open cut and trenchless pipe installation design aspects of the project.

This report does not address other project components including the San Juan Bautista pump station facility improvements or the slip line pipe installation within the Rancho Vista housing development area which will be addressed by others.

1.2 SCOPE OF SERVICES

To prepare this report, Crawford:

- Reviewed geologic, soils, and seismic maps pertaining to the site;
- Discussed the project with Mr. Gabe Aronow, with Stantec Consulting Services, Inc. (Stantec);
- Reviewed the “Figure 1, Forcemain Pipeline Alignment Alternative – Overall”, “Figure 2, Forcemain Pipeline Alignment Alternative – Detail 1”, and “Figure 3, Forcemain Pipeline Alignment Alternative – Detail 2” provided by Stantec and dated May 5, 2021;
- Reviewed the 65% Submittal project plans provided by Stantec and dated October, 2021;
- Reviewed the 100% Submittal plant sheets “Aerial Pipe Crossing at Creek Along Prescott Road Plan and Section” and “Aerial Pipe Crossing at Creek Along First Street Plan and Section” provided by Stantec and dated April 1, 2022;
- Reviewed the “Revised Fault Ground-Rupture Investigation” report prepared by Berlogar Stevens & Associates and dated November 12, 2015;
- Reviewed the “Geotechnical Recommendations for Site Development” report prepared by Engeo Incorporated and dated December 14, 2016;
- Drilled, logged, and sampled 14 exploratory borings along the proposed pipeline alignment between July 26-28, 2021;
- Performed laboratory testing on soil samples recovered from the borings; and
- Developed conclusions and recommendations based on the data and test results.

2 PROJECT DESCRIPTION

The City of San Juan Bautista plans to decommission its waste water treatment plant (WWTP) and instead pump sewage to the Hollister WWTP for treatment. The project vicinity and approximate alignment for the open cut and trenchless pipe installation areas is shown on Figure 1 in Appendix I.

Based on conversations with Gabe Aronow with Stantec, we understand key project components shall include:

- Approximately 7.4 miles of new 10-inch diameter HDPE force main;
- Jack and bore trenchless crossing below Highway 156;
- Two pipe bridges to cross existing drainage ditches at Prescott Road about 1,900 feet northeast from First Street and at First Street about 1,100 feet southeast from Prescott Road;
- New pavement sections; and
- Remove and replace the existing San Juan Bautista pump station facility with a new facility (Geotechnical Design to be completed by others).

The proposed force main will connect the San Juan Bautista pump station facility to the Hollister WWTP. Based on the project plans, the force main will be installed through an existing 18-inch sewer main from the San Juan Bautista pump station facility to the end of the existing gravity pipe connection at a location about 100 feet north of the Rancho Way and Caetano Place intersection (approximately STA 2+75 to 25+00). The existing gravity pipe transverses through the Rancho Vista housing development area along Third Street, Rancho Way, and Caetano Place. The force main will then be installed via open trench and trenchless construction across ditches at First Street and Prescott Road and along First Street, Prescott Road, San Justo Road, Lucy Brown Road, Duncan Road, Bixby Road, Freitas Road, and Mitchell Road until it terminates at the Hollister WWTP (approximately STA 25+00 to 394+35).

3 PREVIOUS STUDIES – RANCHO VISTA DEVELOPMENT

We understand that multiple geotechnical studies have been prepared for the Rancho Vista housing development area. Berlogar Stevens & Associates prepared a “Design Level Geotechnical Investigation Report” and a “Revised Fault Ground-Rupture Investigation” report dated November 17 and 12, 2015, respectively. Furthermore, Engeo Incorporated prepared a “Geotechnical Recommendations for Site Development” report dated December 14, 2016, and included information from the aforementioned Berlogar Stevens & Associates reports. We include the report prepared by Engeo Incorporated in Appendix V.

4 SITE GEOLOGY

Published geologic mapping¹ shows surface materials at the project site as Quaternary aged River Terrace Deposits that generally consist of mostly sand and gravel with minimal amount of silt and clay. The site is located in the middle portion of the Coast Ranges Geomorphic Province² of California. This geomorphic province is characterized by a series of discontinuous northwest-trending mountain ranges that are subparallel to the active San Andreas Fault and extend from the Klamath Mountains on the north coast of California to the Transverse Ranges to the south. Crest elevations generally range from about 2,000 to 4,000 feet and up to 6,000 feet above sea level. The Coast Ranges are generally composed of thick Mesozoic and Cenozoic sedimentary strata that have a complex structure due to intense folding and faulting. The northern Coast Ranges are dominated by the irregular, knobby, landslide-topography of the Franciscan Complex. The project is located approximately 1 mile south of the San Benito River. We present a Geologic Map as Figure 3 in Appendix I.

¹ Jennings, C.W., and Strand R.G., Geologic Map of California, Santa Cruz Sheet, 1:250,000 scale, 1958

² California Geologic Survey (2002), *California Geomorphic Province*, Note 36.

5 FIELD EXPLORATION

5.1 EXPLORATORY BORINGS

Crawford performed fourteen explorations from July 26 to 28, 2021. Table 1 provides a subsurface exploration summary.

Table 1: Subsurface Exploration Summary

Boring Number	Pipeline Location	Completion Date	Drill Rig Type/ Drilling Equipment Type	Hammer Type	Hammer Efficiency (%)	Boring Depth (ft)		
A-21-001	Trenchless Crossing	07/27/21	CME 55 Truck/SSA	Automatic	82.1	41.5		
A-21-002						41.5		
A-21-003	Open-Cut Trench	07/28/21				11.5		
A-21-004						11.5		
A-21-005						11.5		
A-21-006						11.5		
A-21-008						11.5		
A-21-009						11.5		
A-21-010	Pipe Bridge & Open-Cut Trench	07/26/21				Mobile B57 Truck/SSA and Mud Rotary	52.1	11.5
R-21-011								31.5
A-21-012						11.5		
A-21-013	Open-Cut Trench	07/27/21	CME 55 Truck/SSA		82.1	11.5		
A-21-014						11.5		

Crawford retained Geo-Ex Subsurface Exploration (GeoEx) to drill and sample the borings to a maximum depth of 41.5±ft below ground surface (bgs). GeoEx used a CME 55 and a Mobile B57 truck mounted drill rig to complete the borings with 4.5-inch solid-stem auger (SSA) and 4-inch mud-rotary drilling equipment utilizing a side discharge bit.

Soil samples were recovered by means of a 2.0-inch O.D. “Standard Penetration” (SPT) split-spoon sampler with liners and a 3.0-inch O.D. “Modified California” split-spoon sampler with liners. Both samplers were advanced with standard 350 ft-lb striking force using an auto-hammer. Sampler penetration resistance was recorded to provide a field measure of relative densities and can be correlated to soils strength and bearing characteristics. Consistency of cohesive soils were obtained in the field by means of pocket penetrometer and torvane testing. The field-recorded (uncorrected) blow counts are shown on the boring logs attached in Appendix II. A hammer energy calibration test was not performed specifically for this project/site; however, previous hammer energy testing results for the CME 55 (04/03/2020) and the Mobile B57 (02/27/2018) provided by Geo-Ex found the hammer to have an energy efficiency of 82.1% and 52.1%, respectively.

Crawford’s project engineer logged the test borings consistent with the Unified Soil Classification System (USCS) and the Caltrans 2010 Logging Manual. Selected portions of recovered soil drive

samples were retained in sealed containers for laboratory testing and reference. Bulk soil samples were retained in sealed bags for laboratory testing and reference. Groundwater observations were recorded during drilling operations when encountered. At completion, the test borings were backfilled with cement grout at the completion of the field study and capped with cement and dyed black in asphalt areas.

The boring locations were measured in the field with respect to existing site features. Boring elevations were estimated using the survey data shown on the 65% plans. The test boring locations are shown on Figure 2 in Appendix I. The details of the test borings are shown on the boring logs in Appendix II.

6 SURFACE AND SUBSURFACE CONDITIONS

6.1 EXISTING PAVEMENT THICKNESSES

Crawford measured the pavement sections at various locations along the pipeline alignment. We present pavement section data in Table 2 below.

Table 2: Existing Pavement Conditions

Boring Number	Street Name	Asphalt Concrete Thickness (in)	Aggregate Base Thickness (in)
A-21-003	Mitchell Road	1	0
A-21-004	Freitas Road	3	3
A-21-007	Bixby Road	3	4
A-21-008	Duncan Road	3	3
A-21-009	San Justo Road	4	3
A-21-011	Prescott Road	4	3

6.2 SOIL CONDITIONS

We summarize soil descriptions below for the open-cut trench, trenchless crossing, and pipe bridge portions of the project. Refer to the Boring Logs in Appendix II for more detailed soil conditions.

6.2.1 OPEN-CUT TRENCH ALIGNMENT

In the open-cut trench portion of the proposed alignment, the soils encountered in the exploratory borings are generally consistent with published geologic mapping. Based on the boring data, subsurface materials are divided into two general material units, as described below.

Unit 1: This unit was encountered within the upper about 2 to 4 ft of all borings along the open-cut trench portions of the project (A-21-003 through A-21-0014) and generally consists of loose sandy silt, silty sand and silty sand with gravel with the exception of boring A-21-012 which comprised of medium stiff lean clay. This unit generally represents fill material used for roadway or shoulder fill.

Unit 2: This unit consists of granular and fine-grained soils and was encountered below Unit 1 to the maximum depth explored (31.5±ft below ground surface). We subdivide Unit 2 into the following sub-units. This unit generally represents native material below the roadway or shoulder fill (Unit 1).

Unit 2a was encountered in borings A-21-003 through A-21-008 and A-21-013 to A-21-014 and consists of stiff to hard sandy silt and lean clay with sand, and loose to medium dense to dense silty sand, clayey sand, and poorly graded sand and poorly graded sand with silt.

Unit 2b was encountered in borings A-21-009 through A-21-012 and consists of very soft to soft sandy silt and lean clay with sand, and stiff to very stiff fat clay, lean clay, and sandy lean clay.

6.2.2 TRENCHLESS CROSSING

In the trenchless crossing under Hwy 156 portion of the proposed alignment, the soils encountered in the exploratory borings are generally consistent with published geologic mapping.

East shoulder (A-21-001): The material encountered here consisted of sandy silt and medium dense poorly graded sand from ground surface to about 9 ft bgs. This material was underlain by stiff to hard sandy lean clay from about 9 ft to 26 ft bgs, then underlain by very dense poorly graded sand from 26 ft to 41.5 ft bgs.

West shoulder (A-21-002): The material encountered here consisted of lean clay with sand from ground surface to about 6 ft bgs. This material was underlain by medium dense to very dense silty sand from about 6ft to 26 ft bgs, then underlain by intermediate layers of medium stiff to stiff lean clay and dense to very dense clayey sand from about 26 ft to 41.5 ft bgs.

6.2.3 PIPE BRIDGES

Two pipe bridges are proposed to support the pipeline at drainage crossing located at Prescott Road and First Street.

Drainage Ditch at Prescott Road: At this location, boring R-21-011 encountered about 3 ft of medium dense silty sand (*Open-Cut Trench, Unit 1*). The silty sand material was underlain by stiff fat clay from about 3 ft to 23 ft bgs, which was underlain by dense poorly graded sand. A small lens of stiff lean clay was encountered in the final sample of boring R-21-011 at approximately 31 ft bgs.

Drainage Ditch at First Street: At this location, boring A-21-012 encountered about 2 ft of medium stiff lean clay (*Open-Cut Trench, Unit 1*). The lean clay material was underlain by stiff to very stiff sandy lean clay and lean clay from 2 ft to 11.5 ft bgs.

6.3 GROUNDWATER

Table 3 presents the groundwater conditions observed in the field and available from California Department of Water Resources (DWR) wells in the vicinity.

Table 3: Groundwater Conditions

Consultant/Source	Boring/Well Number	Date Measured	Approximate Location	Groundwater Depth (ft)
Crawford	A-21-001	07/26/21	Hwy 156 East Shoulder	30.0
Crawford	A-21-010	07/26/21	San Justo Road	7.0
Crawford	R-21-011	07/27/21	Prescott Road Bridge	6.0
DWR ¹	368481N1215089W001	12/23/2020	(36.8480, -121.5090)	38.5
DWR ¹	368523N1214918W001	12/23/2020	(36.8523, -121.4918)	35.4
DWR ¹	368513N1214893W001	04/26/2016	(36.8513, -121.4893)	43.6
DWR ¹	368486N1214599W001	03/01/1987	(36.8486, -121.4599)	37.0
DWR ¹	368490N1214582W001	01/04/2021	(36.8490, -121.4582)	46.6

¹Using the Department of Water Resources; <http://wdl.water.ca.gov/waterdatalibrary/>. Accessed June 14, 2021.

Based on our conversations with Stantec, local residents have supposedly encountered shallow groundwater within the upper 5 ft in the general area between San Juan Bautista and Hollister. Based on the results from our borings and the DWR wells within the project vicinity this water is likely associated with seasonal irrigation. Groundwater conditions should be expected to fluctuate with seasonal precipitation and land use throughout the project site.

7 LABORATORY TESTING

7.1 GEOTECHNICAL SOILS TESTING

We completed the following laboratory tests on representative soil samples obtained from the exploratory borings:

- Atterberg Limits (ASTM D4318)
- Corrosivity: pH and Minimum Resistivity (CTM 643); Chloride (CTM 422); Sulfate (CTM 417)
- Moisture Content / Dry Density (ASTM D2216 / D2937)
- No. 200 Sieve Wash (ASTM D1140)
- Particle Size Analysis (ASTM D422)
- R-Value (ASTM 2844)
- Unconfined Compression-Soil (ASTM D 2166)
- Sand Equivalent (CTM 217)

7.2 CORROSION

Table 4 summarizes the results of soil corrosivity tests on soil samples obtained from borings A-21-004, A-21-006, A-21-008, and A-21-012. We use Caltrans Standards as a guideline only to

describe corrosive soil conditions. The designer should consult with a corrosion engineer if the reported values are considered significant.

Table 4: Soil Corrosion Test Summary

Boring / Sample Number	Depth (ft)	Location	pH	Minimum Resistivity (Ohm-cm)	Chloride Content (ppm)	Sulfate Content (ppm)
A-21-004-1	2.5	Freitas Road	7.01	1,500	7.9	52.0
A-21-006-2	5.0	Freitas Road	7.66	720	5.5	16.1
A-21-008-2	5.0	Duncan Road	6.84	590	44.8	185.1
A-21-012-2	5.0	1 st Street	7.42	6,430	64.2	62.2

For structural elements, Caltrans considers a site to be corrosive if the chloride concentration is 500 ppm or greater, sulfate concentration is 1500 ppm or greater, or the pH is 5.5 or less.

According ACI 318, a sulfate concentration less than 1,000 parts per million (ppm) is considered negligible. A chloride content of less than 600 ppm is non-corrosive to reinforced concrete.

Based on the test results in Table 4 and per Caltrans and ACI guidelines, the site is non-corrosive to concrete and ferrous metals. The test results are only an indicator of soil corrosivity and the designer should consult with a corrosion engineer if these values are considered significant.

8 SITE SEISMICITY

8.1 CBC SEISMIC DESIGN PARAMETERS

Based on the project location, we provide the 2019 California Building Code (CBC) design parameters below in Table 5. Crawford determined the values using a site latitude of 36.8521°N and longitude of -121.4907°W, Site Class D, and using the online SEAOC/OSHPD³ Seismic Design website, which interpolates values from the ASCE 7-16 maps using the site location. We assumed that the proposed pipeline does not act as an emergency backup facility for any essential facilities (i.e. Risk Category IV structures per CBC-Table 1604-5), otherwise, Crawford should be notified to reevaluate our recommendations. We assume that the structural designer is planning to use “Exception 2” of the ASCE 7-16 Chapter 11 Section 11.4.8, and therefore a site-specific analysis is not required. This may result in higher base shears for longer period structures, therefore if the design team determines a site-specific analysis is warranted for the project then the values provided below will need to be updated.

³ <https://seismicmaps.org>

Table 5: Seismic Design Parameters CBC 2019 (ASCE 7-16 & Supplement 1)

Site Class	D
Risk Category	III
S_s – Acceleration Parameter	1.987 g
S_1 – Acceleration Parameter	0.82 g
F_a – Site Coefficient	1.2
F_v – Site Coefficient	2.5*
S_{MS} – Adjusted MCE** Spectral Response Acceleration	2.385 g
S_{M1} – Adjusted MCE** Spectral Response Acceleration	2.05 g *
S_{DS} – Design Spectral Acceleration Parameter	1.59 g
S_{D1} – Design Spectral Acceleration Parameter	1.367 g *
T_1 – Long-Period Transition Period	12 sec
Peak Ground Acceleration (PGA)	0.852
Site Modified Peak Ground Acceleration (PGA_M)	1.022

* See requirements for site specific ground motions in (ASCE 7-16) Section 11.4.8. (The value of F_v shall only be used for calculation of T_s).

** Maximum Considered Earthquake

8.2 FAULT RUPTURE

Portions of the pipeline lies within an Alquist–Priolo Earthquake Fault Zone. The California Geologic Survey (CGS) considers a fault to be active if it has shown evidence of ground displacement during the Holocene period, defined as the last 11,700 years. According to the CGS, the closest active fault is the San Andreas fault zone, Santa Cruz Mountains Section which is mapped generally along First Street within the western-most edge of the project area. At this section of the proposed pipeline, the San Andreas had a horizontal surface rupture of about 7 to 9 feet during the 1906 earthquake. In general, the San Andreas Fault moves (i.e. slip rate) approximately 0.5 to 2 inches per year. Ground movement should be expected along this section of proposed pipeline within the earthquake fault zone. See Figure 5 for the Alquist-Priolo Earthquake Fault Zone map.

Berlogar Stevens & Associates performed a site-specific fault investigation study⁴ to more accurately determine the San Andreas main trace location and to find any possible secondary fault traces for the Rancho Vista development project. A map showing the findings of the Berlogar Stevens & Associates fault investigation study is shown on Figure 2 in the Engeo report⁵ provided in Appendix V.

⁴ “Revised Fault Ground-Rupture Investigation” report prepared by Berlogar Stevens & Associates and dated November 12, 2015.

⁵ “Geotechnical Recommendations for Site Development” report prepared by Engeo Incorporated and dated December 14, 2016.

8.3 LIQUEFACTION

Liquefaction can occur when saturated, loose to medium dense, granular soils (generally within 50 feet of the surface), or specifically defined cohesive soils, are subjected to ground shaking. We used a peak ground acceleration of 0.85 g and a maximum moment magnitude of 6.7 for our analysis. The maximum moment magnitude was determined using the USGS Deaggregation Unified Hazard Tool⁶. Based on the soil characteristics and groundwater encountered the potential for liquefaction is low.

9 CONCLUSIONS AND RECOMMENDATIONS

Based on our on-site observations, field investigations, and laboratory test results, the subsurface features along the proposed alignment are suitable for the planned pipeline installation. In general, the proposed pipeline alignment is underlain by very soft to stiff fine-grained materials within approximately the western third of the project limits (*Open-Cut Trench, Unit 2b*; borings A-21-009 to A-21-012), and underlain by stiff to hard fine-grained materials and loose to medium dense granular materials within approximately the eastern two-thirds of the project limits (*Open-Cut Trench, Unit 2b*; borings A-21-003 through A-21-008 and A-21-013 to A-21-014).

Groundwater was only encountered within the upper 7 ft of borings A-21-010 and R-21-011, and at 30 ft bgs at boring A-21-001. However, based on our conversations with Stantec, local residents have supposedly encountered shallow groundwater within the upper 5 ft in the general area between San Juan Bautista and Hollister. Therefore, perched water may be encountered depending on seasonal precipitation and irrigation use throughout the proposed pipeline alignment.

The proposed pipeline alignment along First Street is generally located adjacent to the San Andreas fault and within the Alquist-Priolo Earthquake Fault zone. At this section of the proposed pipeline, the San Andreas had a horizontal surface rupture of about 7 to 9 feet during the 1906 earthquake.

Key geotechnical considerations associated with design and construction of this project include the presence of granular and soft fine-grained soils along the proposed pipeline alignment, potential shallow groundwater within the open-cut trench portions especially towards the western limits of the project area, potential fault rupture and movement of the San Andreas Fault within the Alquist-Priolo zone (generally along First Street), and support for the pipe bridges at Prescott Road and First Street.

9.1 SAN ANDREAS FAULT

The proposed pipeline alignment generally along First Street is within the Alquist-Priolo Earthquake Fault Zone. Horizontal surface rupture is difficult to predict but may be greater than 5 ft based on historical data. The designer should consider mitigation methods to minimize the surface rupture effect on the pipeline. Such mitigation measures could include flexible joints, thicker pipe sections, use of a casing, widening the trench, placing the pipe in a culvert, wrapping

⁶ <https://earthquake.usgs.gov/hazards/interactive/> accessed December 1, 2020.

the pipe in friction-reducing geotextile, or using loose backfill material such as pumice. We understand that the sewage flow will run from San Juan Bautista to Hollister, so in the scenario that the proposed pipeline is critically damaged during an earthquake event we also recommend setting a system in place to be able to re-route the sewage flow temporarily until the sewage pipe can be repaired.

In general, the San Andreas Fault moves (i.e. slip rate) approximately 0.5 to 2 inches per year. Therefore, we additionally recommend setting an inspection program in place to visually observe the pipe within this area.

9.2 OPEN-CUT PIPELINE RECOMMENDATIONS

Generally, the open-cut portions of the pipeline will have a minimum of 4 feet of cover along all segments of the pipeline.

9.2.1 SOIL LOADS ON FLEXIBLE BURIED PIPES

Soil loads on flexible buried pipes should be analyzed. Based on AWWA M11, if the flexible pipe is buried in a trench less than two times the width of the pipe, the load is computed as:

$$W_c = C_d \gamma B_d^2 \left(\frac{B_c}{B_d} \right)$$

Where:

- W_c = dead load on the conduit (lb/lin ft)
- C_d = load coefficient based on K_{μ} (presented in Section 8.1.2)
- γ = moist unit weight of backfill material (pcf)
- B_d = width of trench at top of pipe (ft)
- B_c = diameter of pipe (ft)

If the flexible pipe is installed with trenchless techniques or a wide trench (i.e. trench width is greater than two times the width of the pipe):

$$W_c = \gamma H B_c$$

Where:

- W_c = dead load on the conduit (lb/lin ft)
- γ = moist unit weight of backfill material (pcf)
- H = height of fill above top of pipe (ft)
- B_c = diameter of pipe (ft)

9.2.2 SOIL LOADS ON RIGID BURIED PIPES

Due to the lack of ductility of rigid pipelines, the dead loads and associated strain are important to analyze. The soil deadload (W_D) on the rigid pipeline in a trench may be evaluated by Marston's Formula:

$$W_D = C_d \gamma B_d^2$$

Where:

C_d = load coefficient based on $K\mu'$
 γ = moist unit weight of backfill material (pcf)
 B_d = width of trench at top of pipe (ft)

Use a moist unit weight of 135 pcf for the above calculation.

Similar to Composite Modulus of Soil Reaction, the backfill material and compaction, trench width, and installation depth are components to designing the pipeline. For an open cut installation with a ratio of the backfill depth to trench width at the top of the pipe (H/B_d) of at least 1 (i.e. backfill depth is greater than the trench width) and for a trench width at top of pipe no greater than 3 times the pipe diameter, C_d ⁷ may be calculated by:

$$C_d = \frac{1 - e^{-2K\mu' \frac{H}{B}}}{2K\mu'}$$

Where:

K = rankine's lateral earth pressure coefficient
 μ' = friction coefficient between fill material and sides of trench
 H = backfill height above the pipe crown (feet)

The combined $K\mu'$ value is dependent on backfill type, compaction, and moisture content. Using the backfill recommendations in this report, the estimated $K\mu'$ values are 0.120 for clay, 0.130 for silt, and 0.150 for sands and aggregate base.

9.2.3 THRUST RESTRAINT

Unbalanced thrust forces develop in a pipeline due to internal pressures, particularly around change of direction in the pipeline alignment. For large diameter pipelines, these thrust forces are typically counteracted by frictional resistance along the pipe and restrained joints.

Restrained joints resist thrust forces through friction between the pipe and the soil surrounding it. Per AWWA M11, the length of pipeline required to restrain each side of an alignment bend is:

$$L = \frac{PA(\cos\Delta)}{\mu(W_e + W_w + W_p)}$$

Where:

L = length of restrained or harnessed joints on each side of the bend or elbow (ft)
 P = internal pressure (psi)
 A = cross-sectional area of the pipe (in²)
 Δ = bend or elbow deflection (degrees), 0° to 90°
 μ = coefficient of friction between the pipe and the soil
 W_e = horizontal bends: two times the weight of the prism of soil over the pipe (lb/ft of pipe length)
 = vertical bends: weight of the prism of soil over the pipe (lb/ft of pipe length)
 W_p = weight of the pipe (lb/ft)

⁷ American Concrete Pipe Association (2000)

W_w = weight of the contained water (lb/ft)

The coefficient of friction between a HDPE pipe and the surrounding soil is modeled as: $\mu = \tan(0.6\phi)$, where ϕ is the soil friction angle. Assuming a soil friction angle of 36° for compacted coarse grained, angular backfill soil, we recommend using a coefficient of friction of 0.40.

Although likely unnecessary for the majority of this project, thrust blocks may also be used if additional thrust resistance is needed. Thrust block design is governed by two factors – the total thrust force and the allowable passive pressure of the soil. Allowable passive pressure will be variable throughout the alignment due to varying soil conditions. We calculated passive pressures at each of our boring locations to assess trending values along the alignment. Based on this trend and general soil material types, we provide the recommended passive pressures associated with each boring in Table 6 below. The upper 12 inches of soil should be ignored.

Table 6: Recommended Passive Pressure Values

Boring Number	Recommended Passive Pressure (psf/ft)	Assumed Depth Below Existing Grade (ft)
A-21-001	165	4
A-21-002	200	4
A-21-003	160	4
A-21-004	160	4
A-21-005	160	4
A-21-006	160	4
A-21-007	160	4
A-21-008	160	4
A-21-009	160	4
A-21-010	145	4
R-21-011	145	4
A-21-012	145	4
A-21-013	200	4
A-21-014	165	4

9.2.4 COMPOSITE MODULUS OF SOIL REACTION

Semi-rigid and flexible pipes are designed to withstand a certain amount of deflection from applied earth loads. One of the input parameters to pipe deflection equations is the Composite Modulus of Soil Reaction (CMSR). The CMSR value is influenced by native soil properties, backfill soil properties, and trench/pipe geometry. We calculated composite modulus of soil reaction values using the Howard (2011) and AWWA M11 and M45 method. This approach multiplies the modulus of soil reaction for the embedment soil (i.e. trench backfill) by a soil support combining factor, S. Using the above parameters, we selected our S values from Table 1 of “Amster Howard, TECH NOTE, A supplement to Pipeline Installation,” dated October 3, 2011. For these calculations, we assumed the trench specifications provided by the County San Benito, City of San Juan Bautista,

and City of Hollister (included in Appendix IV). We provide a brief summary of the specifications below:

- Trench Geometry
 - For a pipe diameter of 10 inches, the typical trench width should be between 12 to 20 inches greater than the pipe diameter (6 to 10 inches on each side).
- Backfill Material – Pipe Bedding and Zone
 - *City of San Juan Bautista:* Standard material for the pipe bedding and zone should consist of crushed rock (Type 3 Material).
 - *City of Hollister:* Standard material for the pipe bedding and zone should consist of Type 3 Material. The City of Hollister specifications do not define Type 3 material; therefore we assume either crushed rock or imported sandy material with a Sand Equivalent (SE) value greater than 30 is acceptable.
 - *County of San Benito:* Standard material for pipe bedding and zone is not specified.
- Backfill Material – Trench Zone
 - *City of San Juan Bautista and City of Hollister:* Standard material for the trench zone should consist of imported sandy material with a Sand Equivalent (SE) value greater than 30.
 - *County of San Benito:* Standard material for the trench zone is not specified. Therefore, we assume native soils are acceptable.
- Compaction – Pipe Bedding and Zone
 - Imported sandy material should have a relative compaction (per ASTM D1557) greater than or equal to 95%.
 - Crushed rock should be shovel-sliced beneath the haunches of the pipe.
- Compaction – Trench Zone
 - Imported sandy material should have a relative compaction (per ASTM D1557) greater than or equal to 90%.
 - Native soils should have a relative compaction (per ASTM D1557) greater than or equal to 95%.

Using these assumptions, pipe depth, size, installation type, and the geotechnical information presented herein, we calculated Composite Modulus of Soil Reaction values at each exploration location. We present our CMSR values in Table 7 below.

Table 7: Composite Modulus of Soil Reaction Values

Boring Number	Pipe Diameter (in)	Location	CMSR (psi)
A-21-001	10	Hwy 156 east shoulder	1,750
A-21-002		Hwy 156 west shoulder	1,450
A-21-003		Mitchell Road	2,800
A-21-004		Freitas Road	950
A-21-005		Freitas Road	1,450
A-21-006		Freitas Road	2,300
A-21-007		Bixby Road	1,000
A-21-008		Duncan Road	2,800

Boring Number	Pipe Diameter (in)	Location	CMSR (psi)
A-21-009		San Justo Road	850
A-21-010		San Justo Road	900
R-21-011		Prescott Road	2,300
A-21-012		1 st Street	2,300
A-21-013		Hollister WWTP (West Ponds)	1,000
A-21-014		Hollister WWTP (East Ponds)	1,700

To calculate the above results, we assumed a sand backfill and applied an E_b' (trench backfill Modulus of Soil Reaction) value of 1,600 psi. Native Moduli of Soil Reaction varied from 850 in soft silt to 5,000 in hard silt along the proposed alignment. Final design values should be calculated based on actual backfill Modulus of Soil Reaction and trench/pipe dimensions.

9.2.5 TRENCH BACKFILL

Trench backfill within the City of Hollister and City of San Bautista should be in conformance to the respective City’s standards. The County of San Benito standards do not define the material type for the trench backfill. Therefore, native soils may be used for backfill from 12 inches above the pipe to below the roadway section if permitted by the County. If imported soil is used for trench backfill material within the County of San Benito, the backfill has the following requirements:

- A maximum particle size of 3-inches with at least 15% passing the No. 200 sieve.
- Sand Equivalent >20.

9.3 JACK AND BORE PITS

We understand that trenchless installation methods may be used to install the 10-inch HDPE pipeline underneath Hwy 156 where traditional open-cut trenching methods are not feasible. Based on conversations with Stantec, we assume the Jack and Bore method will be selected to install the pipeline beneath Highway 156. To address the trenchless installation method, we completed two explorations at the Highway 156 (Borings A-21-001 and A-21-002).

9.3.1 PIT BOTTOM SUPPORT

We assumed the pit excavations will be located within 50-ft from the Hwy 156 shoulders along the proposed pipeline alignment and the bottom of the pit excavation to be at a depth of 10-ft bgs. Materials encountered at this depth are consistent with hard to stiff sandy lean clay (A-21-001) and medium dense to dense silty sand (A-21-002) at the Hwy 156 trenchless crossing locations. Soil materials encountered in borings A-21-001 and A-21-002 at a depth of 10-ft bgs are expected to provide an allowable bearing capacity of 3,500 psf to support the jack and bore equipment.

The bottom of the pit should be reviewed to confirm the in-situ soil is suitable for the stability of trenchless installation equipment. Should soft and/or loose material be encountered at the time of pit construction, 12 inches of fabric-wrapped crushed drain rock or aggregate base compacted to 90% relative compaction may be placed to provide a firm base for the jacking machine.

9.3.2 PASSIVE PRESSURES

The jack and bore pits may require a shoring system depending on various factors such as site constraints. We present the following passive pressures for the walls of the trenchless pits assuming fully drained conditions in Table 8 below.

Table 8: Trenchless Passive Pressures

Location/Boring	Passive Pressure (psf/ft)
Hwy 156 East Shoulder/ A-21-001	165
Hwy 156 West Shoulder/ A-21-002	200

Once the trenchless portion of the pipe is installed, the jacking and receiving pits should be backfilled per San Benito County requirements.

9.4 PIPE BRIDGE

We understand that the proposed pipe will traverse existing drainage ditches located at Prescott Road about 1,900 feet northeast from First Street and at First Street about 1,100 feet southeast from Prescott Road. Based on the project plans, we understand that the proposed HDPE pipe is planned to be installed through an 18- or 24-inch diameter casing that will cross the ditch and be supported by a spread foundation on each embankment.

Due to potential erosion and expected soft near surface soils along of the ditch banks, the spread foundation should be embedded to allow a minimum four feet horizontal distance from the final grade of the ditch and the top of the foundation. Furthermore, we recommend the bottom of the spread foundation be placed a minimum four feet below lowest adjacent grade due to the presence of near surface medium to high plastic clays which are susceptible to seasonal expansion and shrinkage. Controlled Low Strength Material (CLSM) or similar may be used below the bottom of footing to achieve the recommended embedment depth of 4 feet.

Provided these recommendations are followed, an allowable bearing capacity of 2,750 psf may be used for design provided the footing is a minimum width of 18 inches. This value may be increased by one-third if wind and/or seismic loads are included. For the aforementioned bearing capacity, we estimate a total static settlement less than 0.5 inch and differential settlement less than 0.25 inch. Engeo⁸ estimated up to 4.5 inches of seismically-induced settlement within the Rancho Vista housing development area which is directly adjacent to the pipe bridge at First Street ditch.

⁸ "Geotechnical Recommendations for Site Development" report prepared by Engeo Incorporated and dated December 14, 2016.

9.5 PAVEMENT

We completed three R-Value tests (CTM 301) on bulk samples of near surface soil. Test results indicate R-values of 50, 26, and 21 by stabilometer. We recommend using R-Value 21 for project pavement design based on the Caltrans Highway Design Manual.

Using varying Traffic Indices and Chapter 600 of the Caltrans Highway Design Manual (CHDM), 6th Edition, we recommend the sections shown in Table 9 below for pavement design.

Table 9: Pavement Sections

Traffic Index	R-Value 21	
	Hot Mix Asphalt (ft)	Aggregate Base (ft)
5.0	0.20	0.70
6.0	0.25	0.90
7.0	0.30	1.05
8.0	0.40	1.15

*The upper 0.2 feet of HMA may be replaced with rubberized hot mix asphalt.

Design by the Caltrans method presumes materials and construction in accordance with Caltrans “Standard Specifications”, including 95% relative compaction on all materials within 30-inches of finished grade. Inability to achieve the required compaction on the scarified materials may be used as a field criterion to identify areas requiring additional removal and/or re-compaction.

The subgrade soils should be field reviewed with respect to uniformity and suitability by the soils engineer. Any loose, disturbed or otherwise unsuitable materials should be removed to full depth and replaced with imported fill meeting the requirements of the Standard Specifications or Class 2 Aggregate Base compacted to at least 90% relative compaction.

The above pavement design assumes that free water will be absent from the structural section. Suitable surface drainage is of particular importance to limit subgrade saturation and excess free water.

9.6 CONSTRUCTION CONSIDERATIONS

9.6.1 DEWATERING

Groundwater was encountered in three borings at approximately 30-ft bgs in boring A-21-001, 7-ft bgs in boring A-21-0010, and 6-ft bgs in boring R-21-011. Groundwater observations were made during the late-summer season and seasonal fluctuation and perched groundwater in the groundwater table may occur throughout the year due to irrigation practices and seasonal precipitation.

The contractor will be responsible for designing and implementing a dewatering system to meet the requirements of the project. Perched groundwater, if encountered, is expected to be controllable with sump pumps.

9.6.2 EXCAVATABILITY

Based on the conditions observed in our subsurface explorations and our experience, the on-site soil should be excavatable with typical equipment such as backhoes and excavators. Depending on county easement dimensions and pavement configurations, the contractor may need to shore the existing roadway to accommodate traffic if there is insufficient room to properly slope the trench excavation.

9.6.3 SHORING AND TEMPORARY CONSTRUCTION SLOPES

At a minimum, all shoring and temporary construction slopes should be in accordance with current OSHA requirements. Our data indicates Cal OSHA Soil Type C will be encountered throughout the project alignment with the exception of the stiff to hard fine-grained soil layers we encountered. Isolated locations of unstable sandy soils should be expected, particularly where the trench is adjacent to existing utilities or other improvements. Traffic and construction vibrations need to be considered in shoring applications.

The contractor is responsible for all shoring and temporary slope design based on actual excavation conditions encountered during construction. Shoring will need to be conducive to the contractor's approach to managing groundwater (where needed) and the excavation.

10 LIMITATIONS

Crawford performed services in accordance with generally accepted geotechnical engineering principles and practices currently used in this area. Do not use this report for different locations and/or projects without the written consent of Crawford. Where referenced, we used ASTM or Caltrans standards as a general (not strict) *guideline* only.

Crawford based this report on the current site conditions. We assumed the soil and groundwater conditions are representative of the subsurface conditions on the site. Actual conditions between explorations will vary along the project alignment.

Our scope did not include evaluation of on-site hazardous materials.

Logs of our explorations are presented as Appendix II. The lines designating the interface between soil types are approximate. The transition between soil types may be abrupt or gradual. Our recommendations are based on the final logs, which represent our interpretation of the field logs and general knowledge of the site and geological conditions.

APPENDIX I

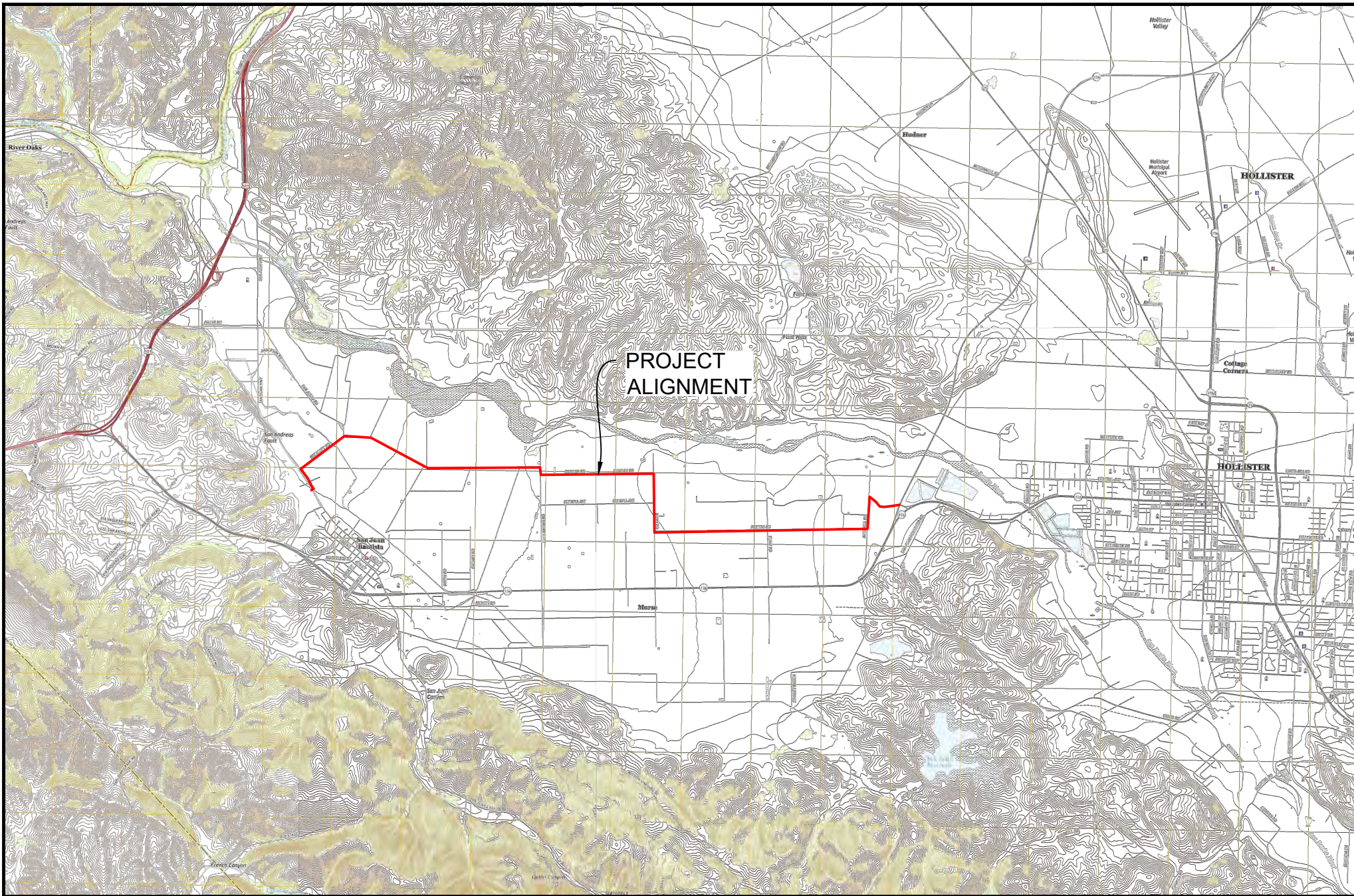
Figure 1: Vicinity Map

Figure 2: Exploration Map

Figure 3: Geologic Map

Figure 4: Fault Map

Figure 5: Alquist-Priolo Earthquake Fault Zone Map



Source:
 USGS 7.5' Topographic Maps, Chittenden, Santa Cruz County, California, 2018,
 Scale: 1:24,000
 USGS 7.5' Topographic Maps, Hollister, San Benito County, California, 2018, Scale: 1:24,000
 USGS 7.5' Topographic Maps, San Felipe, San Benito County, California, 2018, Scale: 1:24,000
 USGS 7.5' Topographic Maps, San Juan Bautista, San Benito County, California, 2018,
 Scale: 1:24,000

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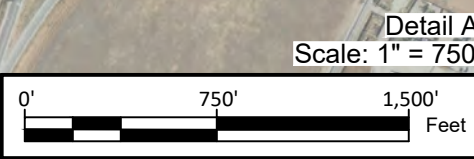
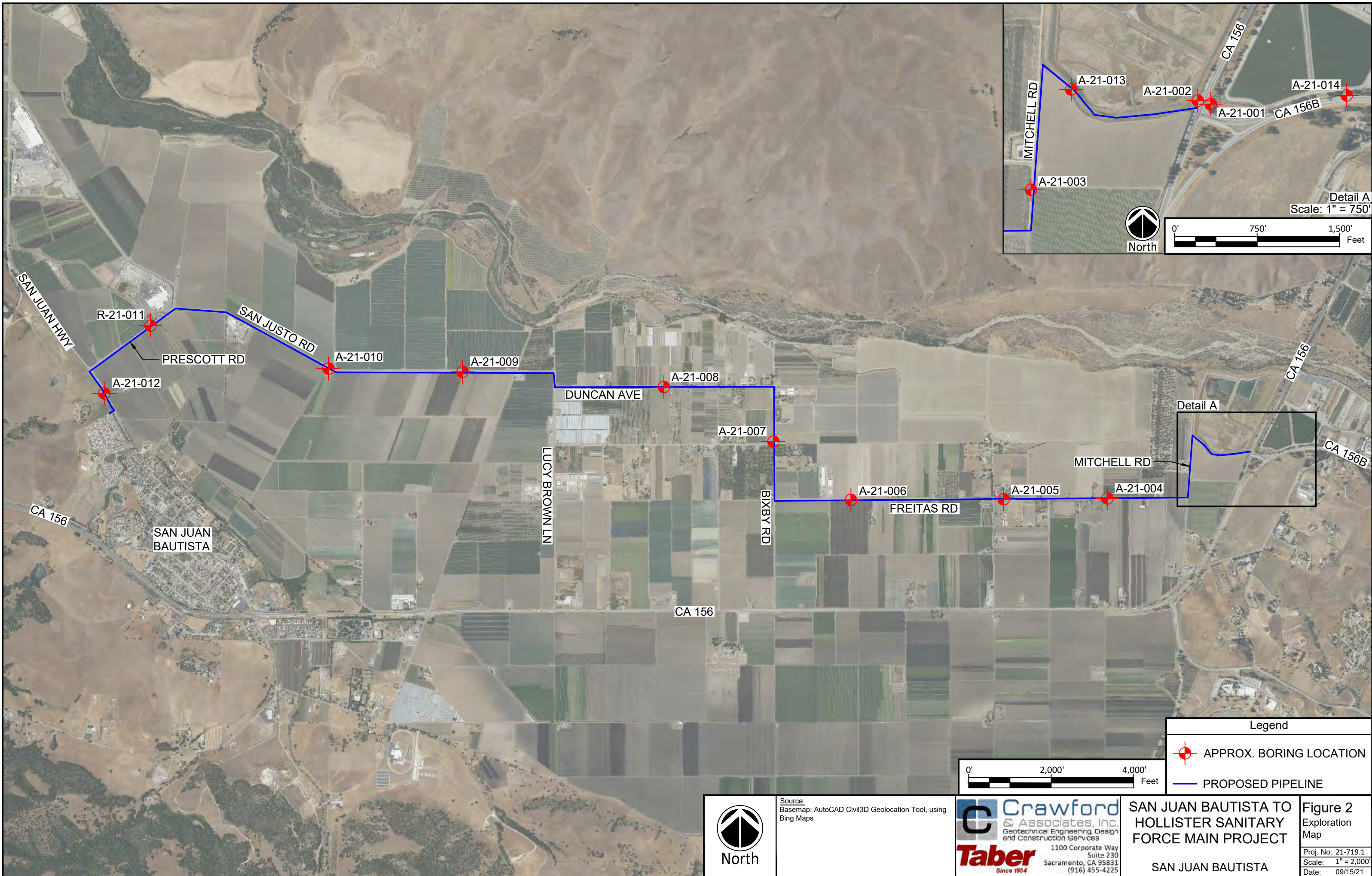
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 Suite 230
 Sacramento, CA 95831
 (916) 455-4225

**SAN JUAN BAUTISTA TO HOLLISTER
 SANITARY FORCE MAIN PROJECT**

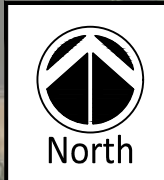
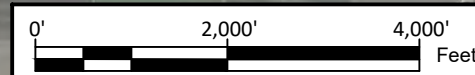
SAN JUAN BAUTISTA, CA

Figure 1
 Vicinity Map

Proj. No: 21-719.1
 Scale: 1" = 6,000'
 Date: 09/15/21



Legend	
	APPROX. BORING LOCATION
	PROPOSED PIPELINE



Source:
Basemap: AutoCAD Civil3D Geolocation Tool, using
Bing Maps

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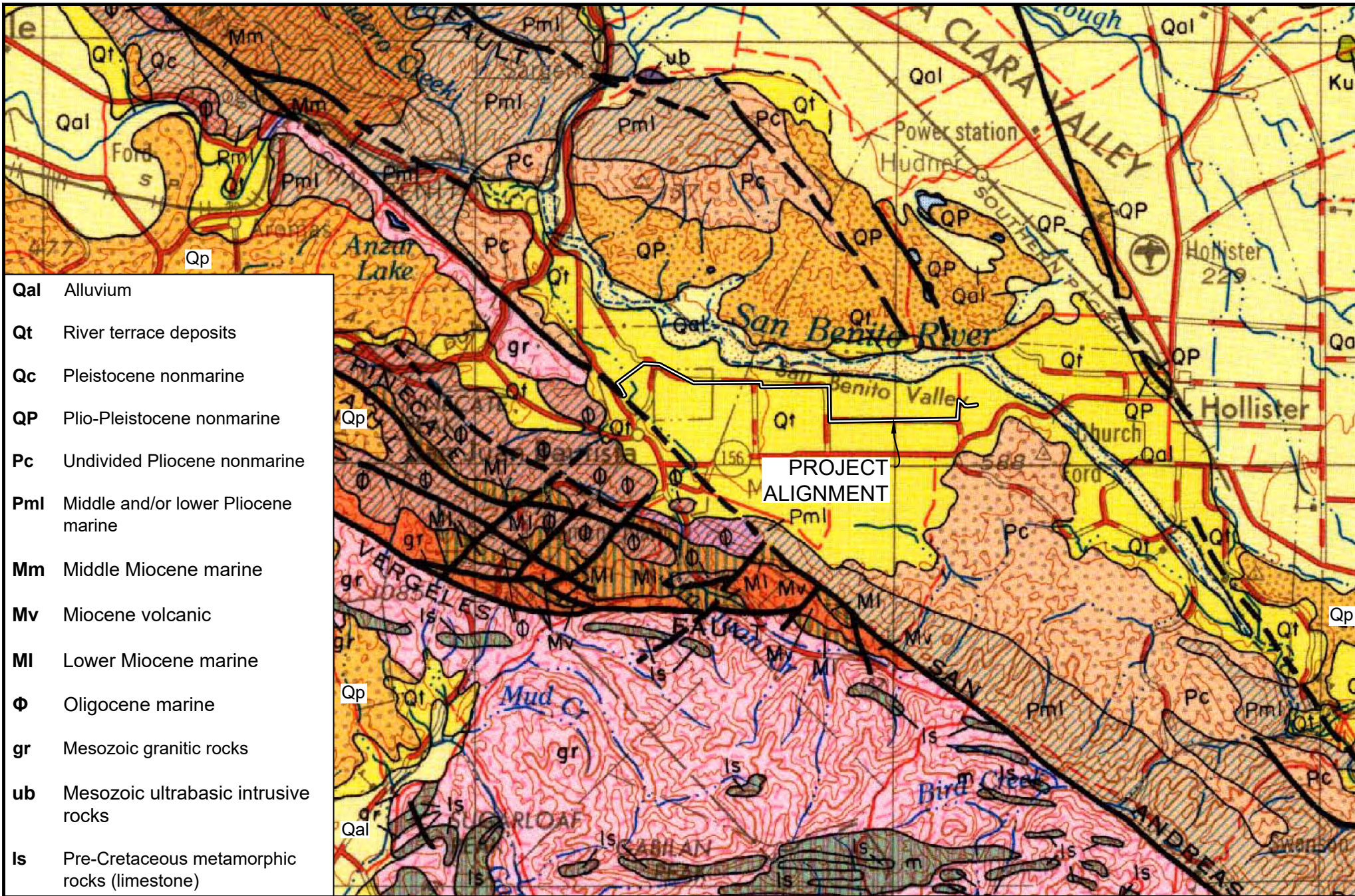
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FORCE MAIN PROJECT**

SAN JUAN BAUTISTA

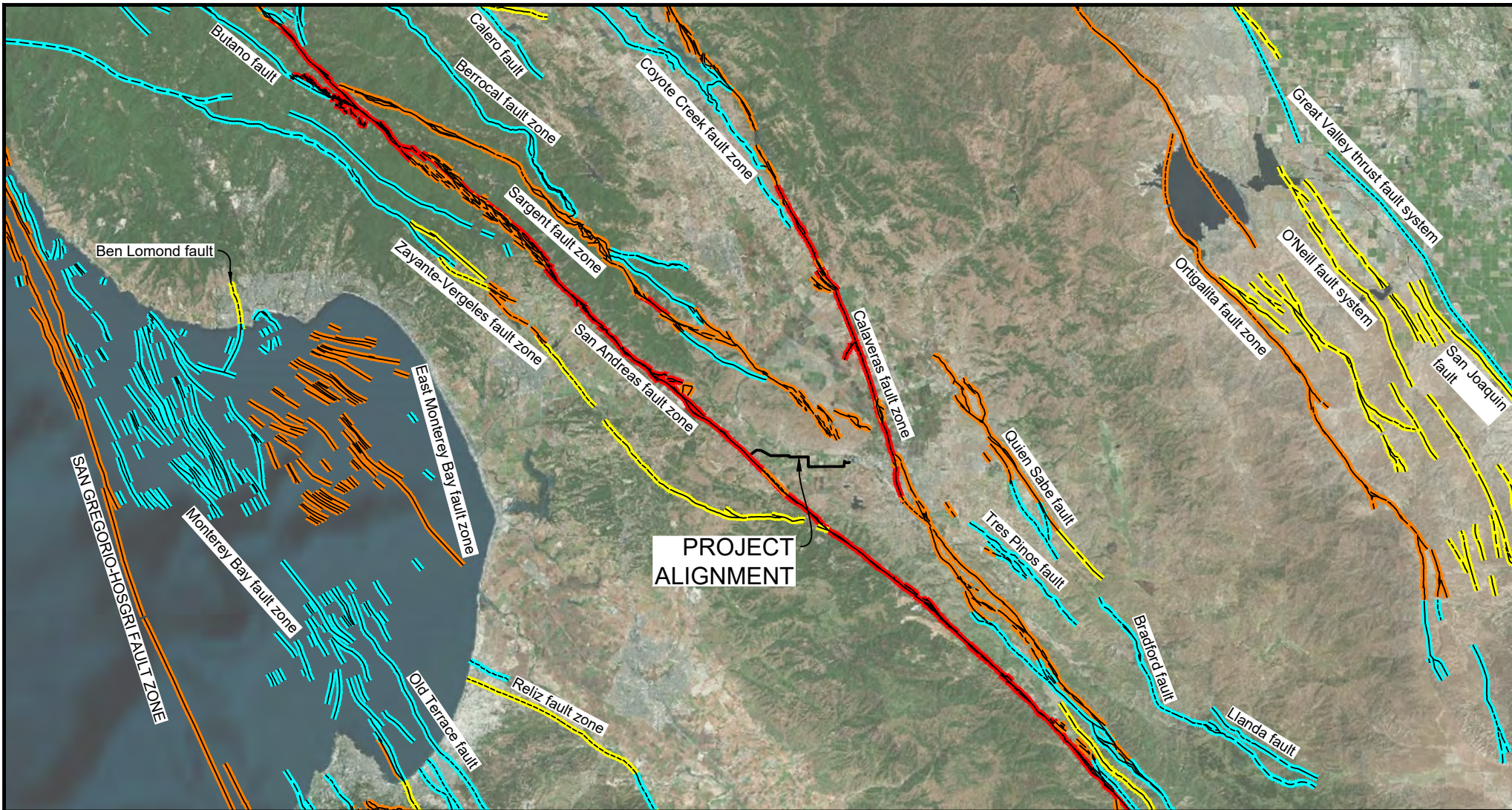
Figure 2
Exploration
Map

Proj. No: 21-719.1
Scale: 1" = 2,000'
Date: 09/15/21



- Qal** Alluvium
- Qt** River terrace deposits
- Qc** Pleistocene nonmarine
- QP** Plio-Pleistocene nonmarine
- Pc** Undivided Pliocene nonmarine
- Pml** Middle and/or lower Pliocene marine
- Mm** Middle Miocene marine
- Mv** Miocene volcanic
- MI** Lower Miocene marine
- Φ** Oligocene marine
- gr** Mesozoic granitic rocks
- ub** Mesozoic ultrabasic intrusive rocks
- Is** Pre-Cretaceous metamorphic rocks (limestone)

 North	Source: Jennings, C.W., and Strand, R.G.; <i>Geologic map of California : Santa Cruz sheet</i> ; Scale: 1:250,000; California Division of Mines and Geology, 1958.	 Crawford & Associates, Inc. Geotechnical Engineering, Design and Construction Services  Since 1954	SAN JUAN BAUTISTA TO HOLLISTER SANITARY FORCE MAIN PROJECT SAN JUAN BAUTISTA, CA	Figure 3 Geologic Map Proj. No: 21-719.1 Scale: 1" = 10,000' Date: 09/15/21
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PROJECT
ALIGNMENT

LEGEND

Quaternary Fault (Age)

- <150 years
- <15,000 years
- <130,000 years

Quaternary Fault (Age)

- <750,000 years
- <1.6 million years

Location

- Well Constrained
- - - Moderately Constrained
- - - - Inferred



North

Source:
Basemap: AutoCAD Civil3D Geolocation Tool, using Bing Maps
Fault Data: USGS GIS Data

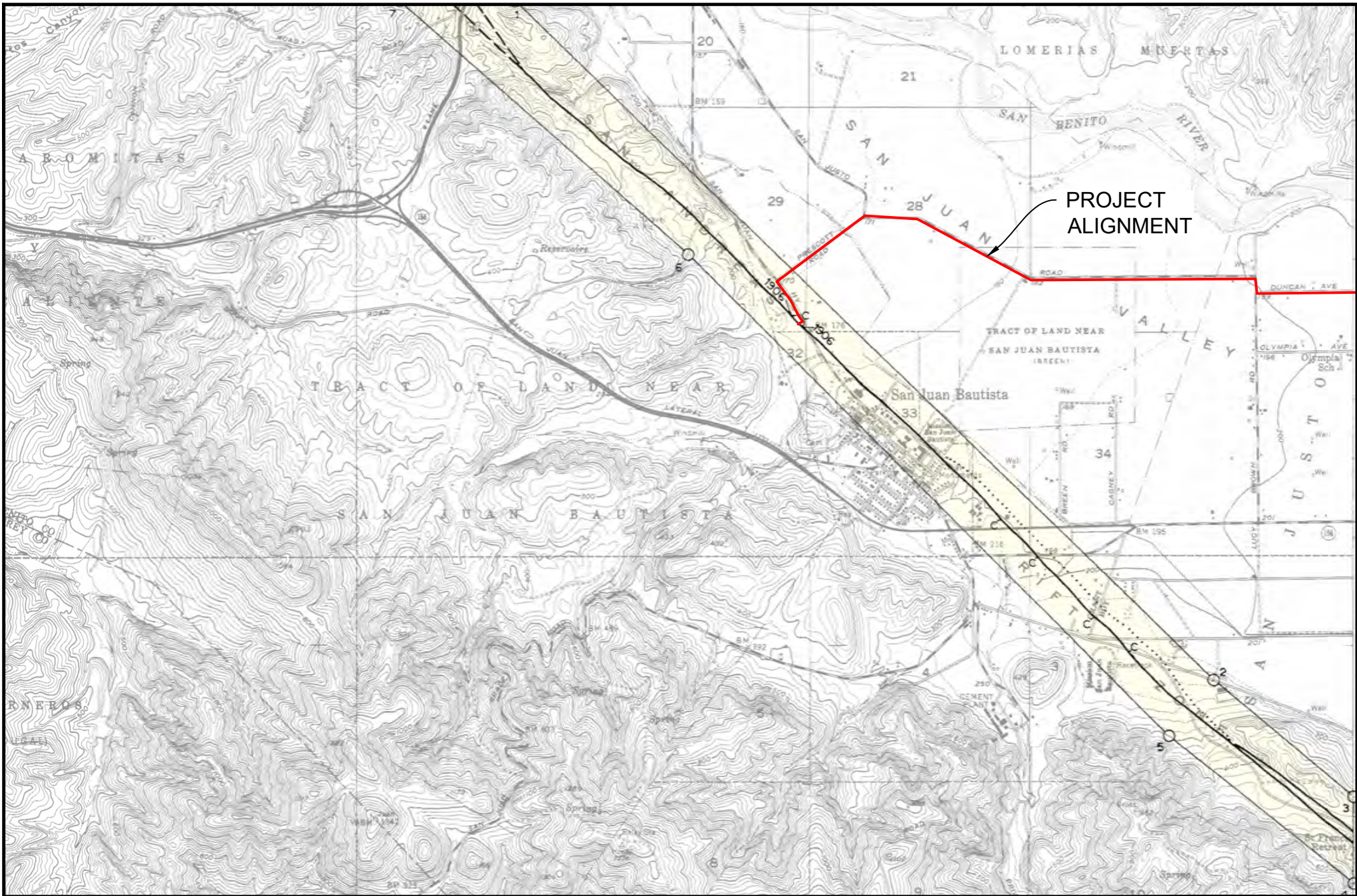
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SANITARY FORCE MAIN PROJECT**

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**Figure 4
Fault Map**

Proj. No: 21-719.1
Scale: 1" = 40,000'
Date: 09/15/21



PROJECT ALIGNMENT



North

Source: Slosson, J.E.; *Special Studies Zone; San Juan Bautista Quadrangle*; Scale: 1:24,000; California Division of Mines and Geology, 1974.

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Figure 5
 Alquist-Priolo
 Earthquake
 Fault Zone Map
 Proj. No: 21-719.1
 Scale: 1" = 3,000'
 Date: 09/22/21

APPENDIX II

Boring Log Legend Boring Logs

GROUP SYMBOLS AND NAMES

Graphic / Symbol	Group Names	Graphic / Symbol	Group Names
	Well-graded GRAVEL		Lean CLAY
	Well-graded GRAVEL with SAND		Lean CLAY with SAND
	Poorly graded GRAVEL		Lean CLAY with GRAVEL
	Poorly graded GRAVEL with SAND		SANDY lean CLAY
	Well-graded GRAVEL with SILT		SANDY lean CLAY with GRAVEL
	Well-graded GRAVEL with SILT and SAND		GRAVELLY lean CLAY
	Well-graded GRAVEL with CLAY (or SILTY CLAY)		GRAVELLY lean CLAY with SAND
	Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		SILTY CLAY
	Poorly graded GRAVEL with SILT		SILTY CLAY with SAND
	Poorly graded GRAVEL with SILT and SAND		SILTY CLAY with GRAVEL
	Poorly graded GRAVEL with CLAY (or SILTY CLAY)		SANDY SILTY CLAY
	Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		SANDY SILTY CLAY with GRAVEL
	SILTY GRAVEL		GRAVELLY SILTY CLAY
	SILTY GRAVEL with SAND		GRAVELLY SILTY CLAY with SAND
	CLAYEY GRAVEL		SANDY SILTY CLAY
	CLAYEY GRAVEL with SAND		SANDY SILTY CLAY with GRAVEL
	SILTY, CLAYEY GRAVEL		GRAVELLY SILTY CLAY
	SILTY, CLAYEY GRAVEL with SAND		GRAVELLY SILTY CLAY with SAND
	Well-graded SAND		ORGANIC lean CLAY
	Well-graded SAND with GRAVEL		ORGANIC lean CLAY with SAND
	Poorly graded SAND		ORGANIC lean CLAY with GRAVEL
	Poorly graded SAND with GRAVEL		SANDY ORGANIC lean CLAY
	Well-graded SAND with SILT		SANDY ORGANIC lean CLAY with GRAVEL
	Well-graded SAND with SILT and GRAVEL		GRAVELLY ORGANIC lean CLAY
	Well-graded SAND with CLAY (or SILTY CLAY)		GRAVELLY ORGANIC lean CLAY with SAND
	Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)		ORGANIC fat CLAY
	Poorly graded SAND with SILT		ORGANIC fat CLAY with SAND
	Poorly graded SAND with SILT and GRAVEL		ORGANIC fat CLAY with GRAVEL
	Poorly graded SAND with CLAY (or SILTY CLAY)		SANDY ORGANIC fat CLAY
	Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)		SANDY ORGANIC fat CLAY with GRAVEL
	SILTY SAND		GRAVELLY ORGANIC fat CLAY
	SILTY SAND with GRAVEL		GRAVELLY ORGANIC fat CLAY with SAND
	CLAYEY SAND		ORGANIC elastic SILT
	CLAYEY SAND with GRAVEL		ORGANIC elastic SILT with SAND
	SILTY, CLAYEY SAND		ORGANIC elastic SILT with GRAVEL
	SILTY, CLAYEY SAND with GRAVEL		SANDY elastic ELASTIC SILT
	PEAT		SANDY ORGANIC elastic SILT
	COBBLES COBBLES and BOULDERS BOULDERS		GRAVELLY ORGANIC elastic SILT
			GRAVELLY ORGANIC elastic SILT with SAND

FIELD AND LABORATORY TESTS

- C Consolidation
- CL Collapse Potential
- CP Compaction Curve
- CR Corrosion, Sulfates, Chlorides
- CU Consolidated Undrained Triaxial
- DR Drained Residual Shear Strength
- DS Direct Shear
- EI Expansion Index
- M Moisture Content
- OC Organic Content
- P Permeability
- PA Particle Size Analysis
- PI Liquid Limit, Plastic Limit, Plasticity Index
- PL Point Load Index
- PM Pressure Meter
- PP Pocket Penetrometer
- R R-Value
- SE Sand Equivalent
- SG Specific Gravity
- SW Swell Potential
- TV Pocket Torvane
- UC Unconfined Compression - Soil
- UR Unconfined Compression - Rock
- UU Unconsolidated Undrained Triaxial
- UW Unit Weight

SAMPLER GRAPHIC SYMBOLS

- Standard Penetration Test (SPT)
- Standard California Sampler (ID 2.0 in.)
- Modified California Sampler (ID 2.5 in.)
- Shelby Tube
- Piston Sampler
- NX Rock Core
- HQ Rock Core
- Bulk Sample
- Other (see remarks)

DRILLING METHOD SYMBOLS

- Auger Drilling
- Rotary Drilling
- Dynamic Cone or Hand Driven
- Diamond Core

WATER LEVEL SYMBOLS

- First Water Level Reading (during drilling)
- Static Water Level Reading (short-term)
- Static Water Level Reading (long-term)

REFERENCE: Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010) with Errata Sheet (2015).

CONSISTENCY OF COHESIVE SOILS

Descriptor	Unconfined Compressive Strength (tsf)	Pocket Penetrometer (tsf)	Torvane (tsf)	Field Approximation
Very Soft	< 0.25	< 0.25	< 0.12	Easily penetrated several inches by fist
Soft	0.25 - 0.50	0.25 - 0.50	0.12 - 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 - 1.0	0.50 - 1.0	0.25 - 0.50	Can be penetrated several inches by thumb with moderate effort
Stiff	1.0 - 2.0	1.0 - 2.0	0.50 - 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2.0 - 4.0	2.0 - 4.0	1.0 - 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

APPARENT DENSITY OF COHESIONLESS SOILS

Descriptor	SPT N ₆₀ (blows / 12 inches)
Very Loose	0 - 5
Loose	5 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	> 50

MOISTURE

Descriptor	Criteria
Dry	No discernable moisture
Moist	Moisture present, but no free water
Wet	Visible free water

PERCENT OR PROPORTION OF SOILS

Descriptor	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

SOIL PARTICLE SIZE

Descriptor	Size	
Boulder	> 12 inches	
Cobble	3 to 12 inches	
Gravel	Coarse	3/4 inch to 3 inches
	Fine	No. 4 Sieve to 3/4 inch
Sand	Coarse	No. 10 Sieve to No. 4 Sieve
	Medium	No. 40 Sieve to No. 10 Sieve
	Fine	No. 200 Sieve to No. 40 Sieve
Silt and Clay	Passing No. 200 Sieve	

PLASTICITY OF FINE-GRAINED SOILS

Descriptor	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll, and not much time is required to reach the plastic limit; it cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

CEMENTATION

Descriptor	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

REFERENCE: Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010).

LOG OF BORING A-21-001

PROJECT NO: 21-719.1	BEGIN DATE: 07/27/2021	DRILLING CONTRACTOR: Geo-Ex Subsurface Exploration
PROJECT: SJB to Hollister Sanitary Force Main	COMPLETION DATE: 07/27/2021	DRILLING METHOD: Solid-Stem Auger, Mud Rotary
LOCATION: Hollister, CA	SURFACE ELEVATION: 245.0 (ft)	DRILL RIG: CME 55 (Truck)
COUNTY: San Benito	SURFACE CONDITION: Soil	HAMMER TYPE: Automatic; 140 lbs; 30 in. drop
CLIENT: Stantec	WATER DEPTH: 30.0 ft	SAMPLER TYPE & SIZE: Bulk, MCAL (2.4" ID), SPT (1.4" ID)
LOGGED BY: ABC	READING TAKEN: 07/27/21	BOREHOLE DIAMETER: 4.0 in.
DEPTH OF BORING: 41.50 (ft)	HAMMER EFFICIENCY: 82.1 (%)	BACKFILL METHOD: Neat Cement Grout

FIELD						GRAPHIC LOG	DESCRIPTION	RECOVERY (%)	LABORATORY					DRILL METHOD	CASING DEPTH	REMARKS
ELEVATION (ft)	DEPTH (ft)	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)				PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE			
244	1	Bulk 1					SANDY SILT (ML); brownish grey; dry to moist; mostly fines; some fine SAND.	100							Hand Auger to 6.5'	
243	2														Hydro. Analysis at 0.0 ft: Silt: 37.7% Clay: 16.5%	
242	3															
241	4															
240	5	Bulk 2					Poorly-graded SAND (SP); medium dense; tan; moist; mostly fine to medium SAND; few fine GRAVEL; trace fines.	100								
239	6															
238	7	1	6	16				100							Hydro. Analysis at 7.5 ft: Silt: 1.9% Clay: 1.5%	
237	8	2	7					83			2.7		3			
236	9		9	12			SANDY lean CLAY (CL); brown; dry to moist; mostly low plasticity fines; some medium SAND.								U.C. at 9.0 ft: Strength: 1742 psf Strain at Failure: 9.7%	
235	10		5								17.8	92.1	69		Interbedded layers of sand between clay	
234	11	3	7	24	+4.5		hard; few fine SAND	100								
233	12		4													
232	13															
231	14															
230	15	4	8	13			stiff	100								
229	16		16		1.75						39.0	82.5				
228	17															
227	18															
226	19															
225	20															
224	21	5	14	63			some fine to medium SAND	100								
223	22		27				Poorly-graded SAND with GRAVEL (SP); very dense; brown/grey; dry to moist; mostly coarse to fine SAND; trace fines.									
222	23		36													
221	24															
220	25															
219	26	6	18	33				100								
218	27		15													
217	28		18													



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PROJECT NO: 21-719.1
PROJECT: SJB to Hollister Sanitary Force Main
BORING: A-21-001
ENTRY BY: OMR
CHECKED BY: ABC
SHEET # 1 of 2

ELEVATION (ft)	DEPTH (ft)	FIELD					GRAPHIC LOG	DESCRIPTION	RECOVERY (%)	LABORATORY						REMARKS		
		SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)				RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE		DRILL METHOD	CASING DEPTH
215	30		7	6			Poorly-graded SAND with GRAVEL (SP); very dense; brown/grey; dry to moist; mostly coarse to fine SAND; trace fines. trace low plasticity fines	100										
214	31			11	30													
213	32			19														
212	33																	
211	34																	
210	35		8	9			very dense	100										
209	36			18	52													
208	37			34														
207	38																	
206	39																	
205	40		9	12			few fines	100										
204	41			28	47		very dense											
203	42			19			Bottom of borehole at 41.5 ft bgs											
202	43																	
201	44																	
200	45																	
199	46																	
198	47																	
197	48																	
196	49																	
195	50																	
194	51																	
193	52																	
192	53																	
191	54																	
190	55																	
189	56																	
188	57																	
187	58																	
186	59																	
185	60																	
184	61																	
183	62																	
182	63																	



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PROJECT NO: 21-719.1
 PROJECT: SJB to Hollister Sanitary Force Main
 BORING: A-21-001
 ENTRY BY: OMR
 CHECKED BY: ABC

LOG OF BORING A-21-002

PROJECT NO: 21-719.1	BEGIN DATE: 07/27/2021	DRILLING CONTRACTOR: Geo-Ex Subsurface Exploration
PROJECT: SJB to Hollister Sanitary Force Main	COMPLETION DATE: 07/27/2021	DRILLING METHOD: Solid-Stem Auger, Mud Rotary
LOCATION: Hollister, CA	SURFACE ELEVATION: 245.0 (ft)	DRILL RIG: CME 55 (Truck)
COUNTY: San Benito	SURFACE CONDITION: Soil	HAMMER TYPE: Automatic; 140 lbs; 30 in. drop
CLIENT: Stantec	WATER DEPTH: Not Encountered	SAMPLER TYPE & SIZE: Bulk, SPT (1.4" ID), MCAL (2.4" ID)
LOGGED BY: ABC	READING TAKEN: N/A	BOREHOLE DIAMETER: 4.0 in.
DEPTH OF BORING: 41.50 (ft)	HAMMER EFFICIENCY: 82.1 (%)	BACKFILL METHOD: Neat Cement Grout

FIELD						GRAPHIC LOG	DESCRIPTION	RECOVERY (%)	LABORATORY					DRILL METHOD	CASING DEPTH	REMARKS
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT				POCKET PEN. (TSF)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)			
244	1		Bulk 1				Lean CLAY with SAND (CL); tan; dry to moist; mostly fines; some fine SAND.	100								Hydro. Analysis at 0.0 ft: Silt: 43.8% Clay: 28.3%
243	2								17			72				
242	3															
241	4															
240	5		1	4	14			100								
239	6			6			SILTY SAND (SM); medium dense; tan; mostly coarse to fine SAND; few fines.					14				Hydro. Analysis at 6.0 ft: Silt: 9.7% Clay: 4.7%
238	7			8												
237	8															
236	9															
235	10		2	2	22		dense; little fines	100								
234	11			7												
233	12			15												
232	13															
231	14															
230	15		3	13	39		very dense; trace fines	100								
229	16			20												
228	17			19												
227	18															
226	19															
225	20		4	13	38		little fines	100				24				
224	21			17												
223	22			21												
222	23															
221	24															
220	25		5	3	11			100								
219	26			4		0.75	Lean CLAY (CL); medium stiff; brown; moist; mostly low plasticity fines; few trace to fine SAND.									
218	27			7												
217	28															



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PROJECT NO: 21-719.1
 PROJECT: SJB to Hollister Sanitary Force Main
 BORING: A-21-002
 ENTRY BY: OMR
 CHECKED BY: ABC
 SHEET # 1 of 2

ELEVATION (ft)	DEPTH (ft)	FIELD					GRAPHIC LOG	DESCRIPTION	RECOVERY (%)	RQD (%)	LABORATORY						REMARKS
		SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)					PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	
215	30	X	6	10			Lean CLAY (CL); medium stiff; brown; moist; mostly low plasticity fines; few trace to fine SAND.	100									
214	31			21	55	2.50											
213	32			34			CLAYEY SAND (SC); very dense; brown; mostly fine SAND; some low plasticity fines. stiff										
212	33																
211	34						wet	100									
210	35	X	7	10													
209	36			6	15	1.75	CLAYEY SAND (SC); dense; brown; wet; mostly fine SAND; little low plasticity fines.										
208	37			9													
207	38						Bottom of borehole at 41.5 ft bgs	89									
206	39																
205	40	X	8	4													
204	41			15	45												
203	42			30													
202	43																
201	44																
200	45																
199	46																
198	47																
197	48																
196	49																
195	50																
194	51																
193	52																
192	53																
191	54																
190	55																
189	56																
188	57																
187	58																
186	59																
185	60																
184	61																
183	62																
182	63																



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PROJECT NO: 21-719.1
 PROJECT: SJB to Hollister Sanitary Force Main
 BORING: A-21-002
 ENTRY BY: OMR
 CHECKED BY: ABC

LOG OF BORING A-21-003

PROJECT NO: 21-719.1	BEGIN DATE: 07/27/2021	DRILLING CONTRACTOR: Geo-Ex Subsurface Exploration
PROJECT: SJB to Hollister Sanitary Force Main	COMPLETION DATE: 07/27/2021	DRILLING METHOD: Solid-Stem Auger
LOCATION: Hollister, CA	SURFACE ELEVATION: 250.0 (ft)	DRILL RIG: CME 55 (Truck)
COUNTY: San Benito	SURFACE CONDITION: Asphalt	HAMMER TYPE: Automatic; 140 lbs; 30 in. drop
CLIENT: Stantec	WATER DEPTH: Not Encountered	SAMPLER TYPE & SIZE: MCAL (2.4" ID), SPT (1.4" ID)
LOGGED BY: ABC	READING TAKEN: N/A	BOREHOLE DIAMETER: 4.0 in.
DEPTH OF BORING: 11.50 (ft)	HAMMER EFFICIENCY: 82.1 (%)	BACKFILL METHOD: Neat Cement Grout

FIELD						GRAPHIC LOG	DESCRIPTION	RECOVERY (%)	RQD (%)	LABORATORY					DRILL METHOD	CASING DEPTH	REMARKS
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT					POCKET PEN. (TSF)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)			
249	1						ASPHALT CONCRETE(1")									1" AC	
248	2						SANDY SILT (ML); very stiff; brown; moist; mostly low plasticity fines; some fine SAND.										
247	3		1	8 5 6	11	4.00		67			16.2	105.7	68				
246	4																
245	5		2	3 2 2	4			100									
244	6												55				
243	7						Poorly-graded SAND (SP); loose; brown; mostly fine SAND; trace fines.	67									
242	8		3	2 3 4	7												
241	9																
240	10		4	2 1 3	4		Lean CLAY with SAND (CL); brown; moist; mostly low plasticity fines; few fine SAND.	67									
239	11																
238	12						Bottom of borehole at 11.5 ft bgs										
237	13																
236	14																
235	15																
234	16																
233	17																
232	18																
231	19																
230	20																
229	21																
228	22																
227	23																
226	24																
225	25																
224	26																
223	27																
222	28																



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PROJECT NO: 21-719.1
 PROJECT: SJB to Hollister Sanitary Force Main
 BORING: A-21-003
 ENTRY BY: OMR
 CHECKED BY: ABC

LOG OF BORING A-21-004

PROJECT NO: 21-719.1	BEGIN DATE: 07/28/2021	DRILLING CONTRACTOR: Geo-Ex Subsurface Exploration
PROJECT: SJB to Hollister Sanitary Force Main	COMPLETION DATE: 07/28/2021	DRILLING METHOD: Solid-Stem Auger
LOCATION: Hollister, CA	SURFACE ELEVATION: 242.50 (ft)	DRILL RIG: CME 55 (Truck)
COUNTY: San Benito	SURFACE CONDITION: Soil	HAMMER TYPE: Automatic; 140 lbs; 30 in. drop
CLIENT: Stantec	WATER DEPTH: Not Encountered	SAMPLER TYPE & SIZE: Bulk, SPT (1.4" ID), MCAL (2.4" ID)
LOGGED BY: ABC	READING TAKEN: N/A	BOREHOLE DIAMETER: 4.0 in.
DEPTH OF BORING: 11.50 (ft)	HAMMER EFFICIENCY: 82.1 (%)	BACKFILL METHOD: Neat Cement Grout

FIELD						GRAPHIC LOG	DESCRIPTION	RECOVERY (%)	RQD (%)	LABORATORY					DRILL METHOD	CASING DEPTH	REMARKS
ELEVATION (ft)	DEPTH (ft)	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)					PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE			
242	1	Bulk 1				ASPHALT CONCRETE(3") AGGREGATE BASE(3")	100									3" AC 3" AB R-value: 50	
241	2					SILTY SAND (SM); loose; brown; moist; mostly fine to coarse SAND; little fines.	100										
240	3	Bulk 2	5 3 4	7								43					
239	4					very loose	83										
238	5	2	4 2 3	5													
237	6																
236	7												10.7	101.2	32		Chem. Analysis at 3.5 ft: Soil pH: 7.01 Min. Resistivity: 1,500 ohm-cm Chloride: 7.9 ppm Sulfate: 52.0 ppm
235	8	3	2 4 5	9		Poorly-graded SAND (SP); loose; brown; moist; mostly fine to coarse SAND; trace fines.	100										
234	9																
233	10	4	2 3 2	5			100										
232	11																
231	12					Bottom of borehole at 11.5 ft bgs											
230	13																
229	14																
228	15																
227	16																
226	17																
225	18																
224	19																
223	20																
222	21																
221	22																
220	23																
219	24																
218	25																
217	26																
216	27																
215	28																
214																	



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PROJECT NO: 21-719.1
PROJECT: SJB to Hollister Sanitary Force Main
BORING: A-21-004
ENTRY BY: OMR
CHECKED BY: ABC
SHEET # 1 of 1

LOG OF BORING A-21-005

PROJECT NO: 21-719.1	BEGIN DATE: 07/28/2021	DRILLING CONTRACTOR: Geo-Ex Subsurface Exploration
PROJECT: SJB to Hollister Sanitary Force Main	COMPLETION DATE: 07/28/2021	DRILLING METHOD: Solid-Stem Auger
LOCATION: Hollister, CA	SURFACE ELEVATION: 230.50 (ft)	DRILL RIG: CME 55 (Truck)
COUNTY: San Benito	SURFACE CONDITION: Soil	HAMMER TYPE: Automatic; 140 lbs; 30 in. drop
CLIENT: Stantec	WATER DEPTH: Not Encountered	SAMPLER TYPE & SIZE: Bulk, MCAL (2.4" ID), SPT (1.4" ID)
LOGGED BY: ABC	READING TAKEN: N/A	BOREHOLE DIAMETER: 4.0 in.
DEPTH OF BORING: 11.50 (ft)	HAMMER EFFICIENCY: 82.1 (%)	BACKFILL METHOD: Neat Cement Grout

FIELD						GRAPHIC LOG	DESCRIPTION	RECOVERY (%)	RQD (%)	LABORATORY					DRILL METHOD	CASING DEPTH	REMARKS
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT					POCKET PEN. (TSF)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)			
230	1		Bulk 1				SILTY SAND with GRAVEL (SM); medium dense; brown; moist; mostly fine to coarse SAND; few fine GRAVEL; little fines.	100									
229	2																
228	3		Bulk 2	4	15		Poorly-graded SAND (SP); medium dense; tan; dry to moist; mostly fine SAND; trace fines.	100			2.7	86.4	5				
227	4			6													
226	5			9													
225	6		2	2	7		loose	83									
224	7			3													
223	8		3	4	14		medium dense	100									
222	9			6													
221	10		4	2	14			100									
220	11			6													
219	12			8			Bottom of borehole at 11.5 ft bgs										
218	13																
217	14																
216	15																
215	16																
214	17																
213	18																
212	19																
211	20																
210	21																
209	22																
208	23																
207	24																
206	25																
205	26																
204	27																
203	28																
202																	



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PROJECT NO: 21-719.1
 PROJECT: SJB to Hollister Sanitary Force Main
 BORING: A-21-005
 ENTRY BY: OMR
 CHECKED BY: ABC

LOG OF BORING A-21-006

PROJECT NO: 21-719.1	BEGIN DATE: 07/28/2021	DRILLING CONTRACTOR: Geo-Ex Subsurface Exploration
PROJECT: SJB to Hollister Sanitary Force Main	COMPLETION DATE: 07/28/2021	DRILLING METHOD: Solid-Stem Auger
LOCATION: Hollister, CA	SURFACE ELEVATION: 222.0 (ft)	DRILL RIG: CME 55 (Truck)
COUNTY: San Benito	SURFACE CONDITION: Soil	HAMMER TYPE: Automatic; 140 lbs; 30 in. drop
CLIENT: Stantec	WATER DEPTH: Not Encountered	SAMPLER TYPE & SIZE: MCAL (2.4" ID), Bulk
LOGGED BY: ABC	READING TAKEN: N/A	BOREHOLE DIAMETER: 4.0 in.
DEPTH OF BORING: 11.50 (ft)	HAMMER EFFICIENCY: 82.1 (%)	BACKFILL METHOD: Neat Cement Grout

FIELD						GRAPHIC LOG	DESCRIPTION	RECOVERY (%)	RQD (%)	LABORATORY					DRILL METHOD	CASING DEPTH	REMARKS
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT					POCKET PEN. (TSF)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)			
221	1		Bulk 1				SILTY SAND (SM); brown; moist; mostly fine to coarse SAND; few fine GRAVEL; little to few low plasticity fines fines.	100									
220	2																
219	3		Bulk 2	4	7		SANDY SILT (ML); stiff; brown; moist; mostly low plasticity fines fines; some fine SAND.	100			20.5	96.8	84				
218	4			3		1.25											
217	5		2	2				100									
216	6			4	14	1.75											
215	7		Bulk 3	10			Poorly-graded SAND (SP); medium dense; tan; moist; mostly fine SAND; trace fines.	100									
214	8		3	4	15			83									
213	9			7													
212	10		4	2													
211	11			6	13		few fines	100									
210	12			7			Bottom of borehole at 11.5 ft bgs										
209	13																
208	14																
207	15																
206	16																
205	17																
204	18																
203	19																
202	20																
201	21																
200	22																
199	23																
198	24																
197	25																
196	26																
195	27																
194	28																

Chem. Analysis at 5.5 ft:
 Soil pH: 7.66
 Min. Resistivity: 7,200 ohm-cm
 Chloride: 5.5 ppm
 Sulfate: 16.1 ppm



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PROJECT NO: 21-719.1
 PROJECT: SJB to Hollister Sanitary Force Main
 BORING: A-21-006
 ENTRY BY: OMR
 CHECKED BY: ABC
 SHEET # 1 of 1

LOG OF BORING A-21-007

PROJECT NO: 21-719.1	BEGIN DATE: 07/28/2021	DRILLING CONTRACTOR: Geo-Ex Subsurface Exploration
PROJECT: SJB to Hollister Sanitary Force Main	COMPLETION DATE: 07/28/2021	DRILLING METHOD: Solid-Stem Auger
LOCATION: Hollister, CA	SURFACE ELEVATION: 219.50 (ft)	DRILL RIG: CME 55 (Truck)
COUNTY: San Benito	SURFACE CONDITION: Asphalt	HAMMER TYPE: Automatic; 140 lbs; 30 in. drop
CLIENT: Stantec	WATER DEPTH: Not Encountered	SAMPLER TYPE & SIZE: Bulk, MCAL (2.4" ID)
LOGGED BY: ABC	READING TAKEN: N/A	BOREHOLE DIAMETER:
DEPTH OF BORING: 11.50 (ft)	HAMMER EFFICIENCY: 82.1 (%)	BACKFILL METHOD: Neat Cement Grout

FIELD						GRAPHIC LOG	DESCRIPTION	RECOVERY (%)	RQD (%)	LABORATORY					DRILL METHOD	CASING DEPTH	REMARKS
ELEVATION (ft)	DEPTH (ft)	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)					PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE			
219	1	Bulk 1				ASPHALT CONCRETE(3") AGGREGATE BASE(4")	100								3" AC 4" AB		
218	2					SILTY SAND (SM); medium dense; brown; moist; mostly fine to coarse sand; little fines.											
217	3	Bulk 2	3	10		loose	100										
216	4		5							9.2	90.7	40					
215	5																
214	6	2	2	8		clay lense	83										
213	7		3														
212	8	3	2	7		some fines	67										
211	9		3														
210	10	4	2	6		very loose; wet	67										
209	11		3			Bottom of borehole at 11.5 ft bgs											
208	12		3														
207	13																
206	14																
205	15																
204	16																
203	17																
202	18																
201	19																
200	20																
199	21																
198	22																
197	23																
196	24																
195	25																
194	26																
193	27																
192	28																
191																	



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PROJECT NO: 21-719.1
 PROJECT: SJB to Hollister Sanitary Force Main
 BORING: A-21-007
 ENTRY BY: OMR
 CHECKED BY: ABC

LOG OF BORING A-21-008

PROJECT NO: 21-719.1	BEGIN DATE: 07/26/2021	DRILLING CONTRACTOR: Geo-Ex Subsurface Exploration
PROJECT: SJB to Hollister Sanitary Force Main	COMPLETION DATE: 07/26/2021	DRILLING METHOD: Solid-Stem Auger
LOCATION: Hollister, CA	SURFACE ELEVATION: 211.0 (ft)	DRILL RIG: CME 55 (Truck)
COUNTY: San Benito	SURFACE CONDITION: Asphalt	HAMMER TYPE: Automatic; 140 lbs; 30 in. drop
CLIENT: Stantec	WATER DEPTH: Not Encountered	SAMPLER TYPE & SIZE: Bulk, MCAL (2.4" ID)
LOGGED BY: ABC	READING TAKEN: N/A	BOREHOLE DIAMETER: 4.0 in.
DEPTH OF BORING: 11.50 (ft)	HAMMER EFFICIENCY: 82.1 (%)	BACKFILL METHOD: Neat Cement Grout

FIELD						GRAPHIC LOG	DESCRIPTION	RECOVERY (%)	LABORATORY					DRILL METHOD	CASING DEPTH	REMARKS
ELEVATION (ft)	DEPTH (ft)	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)				PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE			
210	1	Bulk 1				ASPHALT CONCRETE(3") AGGREGATE BASE(4")	100								3" AC 4" AB R-value: 26 Chem. Analysis at 6.0 ft: Soil pH: 6.84 Min. Resistivity: 5,900 ohm-cm Chloride: 44.8 ppm Sulfate: 185.1 ppm	
209	2					SANDY SILT (ML); very stiff; brown; moist; mostly low plasticity fines; little to some fine SAND. hard very stiff stiff Bottom of borehole at 11.5 ft bgs	44									
208	3	1	5 4 5	9	4.00						72					
207	4															
206	5	2	4 4 5	9	4.25											
205	6									19.3	98.3					
204	7															
203	8	3	6 9 12	21	2.50											
202	9															
201	10	4	4 6 10	16	1.25											
200	11															
199	12															
198	13															
197	14															
196	15															
195	16															
194	17															
193	18															
192	19															
191	20															
190	21															
189	22															
188	23															
187	24															
186	25															
185	26															
184	27															
183	28															



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PROJECT NO: 21-719.1
 PROJECT: SJB to Hollister Sanitary Force Main
 BORING: A-21-008
 ENTRY BY: OMR
 CHECKED BY: ABC

LOG OF BORING A-21-009

PROJECT NO: 21-719.1	BEGIN DATE: 07/26/2021	DRILLING CONTRACTOR: Geo-Ex Subsurface Exploration
PROJECT: SJB to Hollister Sanitary Force Main	COMPLETION DATE: 07/26/2021	DRILLING METHOD: Solid-Stem Auger
LOCATION: Hollister, CA	SURFACE ELEVATION: 192.0 (ft)	DRILL RIG: Mobile B57 (Truck)
COUNTY: San Benito	SURFACE CONDITION: Asphalt	HAMMER TYPE: Automatic; 140 lbs; 30 in. drop
CLIENT: Stantec	WATER DEPTH: Not Encountered	SAMPLER TYPE & SIZE: Bulk, SPT (1.4" ID), MCAL (2.4" ID)
LOGGED BY: ABC	READING TAKEN: N/A	BOREHOLE DIAMETER: 4.0 in.
DEPTH OF BORING: 11.50 (ft)	HAMMER EFFICIENCY: 52.1 (%)	BACKFILL METHOD: Neat Cement Grout

FIELD						GRAPHIC LOG	DESCRIPTION	RECOVERY (%)	RQD (%)	LABORATORY					DRILL METHOD	CASING DEPTH	REMARKS
ELEVATION (ft)	DEPTH (ft)	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)					PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE			
191	1	Bulk 1				ASPHALT CONCRETE(4") AGGREGATE BASE(3")	100								4" AC 3" AB		
190	2					SILTY SAND with GRAVEL (SM); medium dense; brown; moist; mostly fine to coarse SAND; trace fine GRAVEL; little fines. SANDY SILT (ML); very stiff; brown; moist; mostly fines; little fine SAND.	33										
189	3	1	6 6 6	12	3.00												
188	4					soft											
187	5	2	2 3 4	7	0.50												
186	6																
185	7	3	2 3 4	7	0.25												
184	8					very soft	83										
183	9	4	2 4 4	8	0.25												
182	10																
181	11																
180	12					Bottom of borehole at 11.5 ft bgs											
179	13																
178	14																
177	15																
176	16																
175	17																
174	18																
173	19																
172	20																
171	21																
170	22																
169	23																
168	24																
167	25																
166	26																
165	27																
164	28																



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PROJECT NO: 21-719.1
 PROJECT: SJB to Hollister Sanitary Force Main
 BORING: A-21-009
 ENTRY BY: OMR
 CHECKED BY: ABC

LOG OF BORING A-21-010

PROJECT NO: 21-719.1	BEGIN DATE: 07/26/2021	DRILLING CONTRACTOR: Geo-Ex Subsurface Exploration
PROJECT: SJB to Hollister Sanitary Force Main	COMPLETION DATE: 07/26/2021	DRILLING METHOD: Solid-Stem Auger
LOCATION: Hollister, CA	SURFACE ELEVATION: 184.0 (ft)	DRILL RIG: Mobile B57 (Truck)
COUNTY: San Benito	SURFACE CONDITION: Soil	HAMMER TYPE: Automatic; 140 lbs; 30 in. drop
CLIENT: Stantec	WATER DEPTH: 7.0 ft	SAMPLER TYPE & SIZE: Bulk, SPT (1.4" ID), MCAL (2.4" ID)
LOGGED BY: ABC	READING TAKEN: 07/26/21	BOREHOLE DIAMETER: 4.0 in.
DEPTH OF BORING: 11.50 (ft)	HAMMER EFFICIENCY: 52.1 (%)	BACKFILL METHOD: Neat Cement Grout

FIELD						GRAPHIC LOG	DESCRIPTION	RECOVERY (%)	RQD (%)	LABORATORY					DRILL METHOD	CASING DEPTH	REMARKS
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT					POCKET PEN. (TSF)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)			
183	1		Bulk 1				SILTY SAND with GRAVEL (SM); loose; brown; moist; mostly coarse to fine SAND; trace fine GRAVEL; little fines.	100									
182	2																
181	3		1	4 3 4	7			50									
180	4											32					
179	5		2	3 3 3	6	0.50	Lean CLAY with SAND (CL); soft; brown; moist; mostly low plasticity fines; little fine SAND.	67									
178	6											85					
177	7																
176	8		3	3 3 4	7	0.25	very soft	100		24	44	36.2	88.1			Tv = 2.0 tsf	
175	9																
174	10		4	3 4 6	10	0.25		100									
173	11																
172	12						Bottom of borehole at 11.5 ft bgs										
171	13																
170	14																
169	15																
168	16																
167	17																
166	18																
165	19																
164	20																
163	21																
162	22																
161	23																
160	24																
159	25																
158	26																
157	27																
156	28																



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PROJECT NO: 21-719.1
 PROJECT: SJB to Hollister Sanitary Force Main
 BORING: A-21-010
 ENTRY BY: OMR
 CHECKED BY: ABC

LOG OF BORING R-21-011

PROJECT NO: 21-719.1	BEGIN DATE: 07/26/2021	DRILLING CONTRACTOR: Geo-Ex Subsurface Exploration
PROJECT: SJB to Hollister Sanitary Force Main	COMPLETION DATE: 07/26/2021	DRILLING METHOD: Solid-Stem Auger, Mud Rotary
LOCATION: Hollister, CA	SURFACE ELEVATION: 172.0 (ft)	DRILL RIG: Mobile B57 (Truck)
COUNTY: San Benito	SURFACE CONDITION: Soil	HAMMER TYPE: Automatic; 140 lbs; 30 in. drop
CLIENT: Stantec	WATER DEPTH: 6.0 ft	SAMPLER TYPE & SIZE: Bulk, MCAL (2.4" ID), SPT (1.4" ID)
LOGGED BY: ABC	READING TAKEN: 07/26/21	BOREHOLE DIAMETER: 4.0 in.
DEPTH OF BORING: 31.50 (ft)	HAMMER EFFICIENCY: 52.1 (%)	BACKFILL METHOD: Neat Cement Grout

FIELD						GRAPHIC LOG	DESCRIPTION	RECOVERY (%)	RQD (%)	LABORATORY					DRILL METHOD	CASING DEPTH	REMARKS
ELEVATION (ft)	DEPTH (ft)	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)					PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE			
171	1	Bulk 1				ASPHALT CONCRETE(4") AGGREGATE BASE(3")	100								4" AC 3" AC		
170	2					SILTY SAND (SM); medium dense; brown; moist; mostly medium SAND; little fines.									R-value: 21		
169	3					Fat CLAY (CH); stiff, brown; moist; mostly high plasticity fines; little SAND.											
168	4																
167	5	1	5	17	1.50		83		21	58	29.0	93.6	89				
166	6																
165	7																
164	8																
163	9																
162	10	2	7	35		grey; medium plasticity, medium dry strength fines; few to trace fine SAND	100							Switched to Mud Rotary			
161	11																
160	12																
159	13																
158	14																
157	15	3	3	3			0										
156	16		1	3													
155	17		2														
154	18																
153	19																
152	20	4	3	16	1.75		39										
151	21		7	16													
150	22		9														
149	23					Poorly-graded SAND (SP); dense; grey; wet to moist; mostly coarse to fine SAND; trace to few fines.											
148	24																
147	25	5	17	56			100										
146	26		24														
145	27		32														
144	28																



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PROJECT NO: 21-719.1
PROJECT: SJB to Hollister Sanitary Force Main
BORING: R-21-011
ENTRY BY: OMR
CHECKED BY: ABC
SHEET # 1 of 2

ELEVATION (ft)	DEPTH (ft)	FIELD				GRAPHIC LOG	DESCRIPTION	RECOVERY (%)	RQD (%)	LABORATORY						REMARKS		
		SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT					POCKET PEN. (TSF)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE		DRILL METHOD	CASING DEPTH
142	30		6	6			Poorly-graded SAND (SP); dense; grey; wet to moist; mostly coarse to fine SAND; trace to few fines.	100										
141	31			10	24		Lean CLAY (CL); stiff; grey; moist; mostly medium plasticity fines; trace fine SAND. Bottom of borehole at 31.5 ft bgs											
140	32			14		1.50												
139	33																	
138	34																	
137	35																	
136	36																	
135	37																	
134	38																	
133	39																	
132	40																	
131	41																	
130	42																	
129	43																	
128	44																	
127	45																	
126	46																	
125	47																	
124	48																	
123	49																	
122	50																	
121	51																	
120	52																	
119	53																	
118	54																	
117	55																	
116	56																	
115	57																	
114	58																	
113	59																	
112	60																	
111	61																	
110	62																	
109	63																	



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PROJECT NO: 21-719.1
 PROJECT: SJB to Hollister Sanitary Force Main
 BORING: R-21-011
 ENTRY BY: OMR
 CHECKED BY: ABC

LOG OF BORING A-21-012

PROJECT NO: 21-719.1	BEGIN DATE: 07/26/2021	DRILLING CONTRACTOR: Geo-Ex Subsurface Exploration
PROJECT: SJB to Hollister Sanitary Force Main	COMPLETION DATE: 07/26/2021	DRILLING METHOD: Solid-Stem Auger
LOCATION: Hollister, CA	SURFACE ELEVATION: 174.0 (ft)	DRILL RIG: Mobile B57 (Truck)
COUNTY: San Benito	SURFACE CONDITION: Soil	HAMMER TYPE: Automatic; 140 lbs; 30 in. drop
CLIENT: Stantec	WATER DEPTH: Not Encountered	SAMPLER TYPE & SIZE: MCAL (2.4" ID), Bulk
LOGGED BY: ABC	READING TAKEN: N/A	BOREHOLE DIAMETER: 4.0 in.
DEPTH OF BORING: 11.50 (ft)	HAMMER EFFICIENCY: 52.1 (%)	BACKFILL METHOD: Neat Cement Grout

FIELD						GRAPHIC LOG	DESCRIPTION	RECOVERY (%)	RQD (%)	LABORATORY					DRILL METHOD	CASING DEPTH	REMARKS
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT					POCKET PEN. (TSF)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)			
173	1						Lean CLAY (CL); medium stiff; grey; moist; mostly low plasticity fines.									10.0 ft of reinforced concrete pavement Chem. Analysis at 5.5 ft: Soil pH: 7.42 Min. Resistivity: 6,430 ohm-cm Chloride: 64.2 ppm Sulfate: 62.2 ppm	
172	2						SANDY lean CLAY (CL); stiff; brown; moist; mostly low plasticity fines; little fine SAND.										
171	3	X	1	3 4 5	9	1.75		67			27.4	94.3	82				
170	4																
169	5	X	Bulk 1	2 6 7	13	1.25		100									
168	6																
167	7						Lean CLAY (CL); stiff; brown; moist; mostly low plasticity fines; few to trace fine SAND.										
166	8	X	3	5 8 11	19	1.75		56									
165	9																
164	10	X	4	6 9 10	19	2.25	very stiff	67									
163	11						Bottom of borehole at 11.5 ft bgs										
162	12																
161	13																
160	14																
159	15																
158	16																
157	17																
156	18																
155	19																
154	20																
153	21																
152	22																
151	23																
150	24																
149	25																
148	26																
147	27																
146	28																



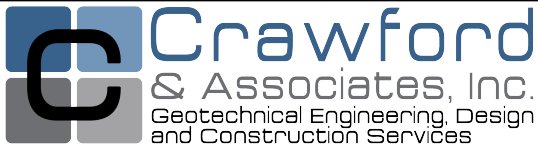
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PROJECT NO: 21-719.1
PROJECT: SJB to Hollister Sanitary Force Main
BORING: A-21-012
ENTRY BY: OMR
CHECKED BY: ABC
SHEET # 1 of 1

LOG OF BORING A-21-013

PROJECT NO: 21-719.1	BEGIN DATE: 07/27/2021	DRILLING CONTRACTOR: Geo-Ex Subsurface Exploration
PROJECT: SJB to Hollister Sanitary Force Main	COMPLETION DATE: 07/27/2021	DRILLING METHOD: Solid-Stem Auger
LOCATION: Hollister, CA	SURFACE ELEVATION: 249.50 (ft)	DRILL RIG: CME 55 (Truck)
COUNTY: San Benito	SURFACE CONDITION: Soil	HAMMER TYPE: Automatic; 140 lbs; 30 in. drop
CLIENT: Stantec	WATER DEPTH: Not Encountered	SAMPLER TYPE & SIZE: Bulk, MCAL (2.4" ID), SPT (1.4" ID)
LOGGED BY: ABC	READING TAKEN: N/A	BOREHOLE DIAMETER: 4.0 in.
DEPTH OF BORING: 11.50 (ft)	HAMMER EFFICIENCY: 82.1 (%)	BACKFILL METHOD: Neat Cement Grout

FIELD						GRAPHIC LOG	DESCRIPTION	RECOVERY (%)	RQD (%)	LABORATORY					DRILL METHOD	CASING DEPTH	REMARKS
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT					POCKET PEN. (TSF)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)			
249	1		Bulk 1				SILTY SAND (SM); dense; tan; moist to dry; mostly fine SAND; little low plasticity fines.	100									
248	2																
247	3		1	30	51			83									hard pan
246	4			25							7.1	119.7					
245	5			26													
244	6		2	2	6		loose	89									
243	7			3													
242	8		3	3	4		some low plasticity fines	100									
241	9			2													
240	10			2													
239	11		4	4	9		medium dense; trace fines	100									
238	12			4			Bottom of borehole at 11.5 ft bgs										
237	13			5													
236	14																
235	15																
234	16																
233	17																
232	18																
231	19																
230	20																
229	21																
228	22																
227	23																
226	24																
225	25																
224	26																
223	27																
222	28																
221																	



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PROJECT NO: 21-719.1
 PROJECT: SJB to Hollister Sanitary Force Main
 BORING: A-21-013
 ENTRY BY: OMR
 CHECKED BY: ABC

LOG OF BORING A-21-014

PROJECT NO: 21-719.1	BEGIN DATE: 07/27/2021	DRILLING CONTRACTOR: Geo-Ex Subsurface Exploration
PROJECT: SJB to Hollister Sanitary Force Main	COMPLETION DATE: 07/27/2021	DRILLING METHOD: Solid-Stem Auger
LOCATION: Hollister, CA	SURFACE ELEVATION: 245.0 (ft)	DRILL RIG: CME 55 (Truck)
COUNTY: San Benito	SURFACE CONDITION: Soil	HAMMER TYPE: Automatic; 140 lbs; 30 in. drop
CLIENT: Stantec	WATER DEPTH: Not Encountered	SAMPLER TYPE & SIZE: Bulk, MCAL (2.4" ID)
LOGGED BY: ABC	READING TAKEN: N/A	BOREHOLE DIAMETER: 4.0 in.
DEPTH OF BORING: 11.50 (ft)	HAMMER EFFICIENCY: 82.1 (%)	BACKFILL METHOD: Neat Cement Grout

FIELD						GRAPHIC LOG	DESCRIPTION	RECOVERY (%)	LABORATORY					DRILL METHOD	CASING DEPTH	REMARKS		
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT				POCKET PEN. (TSF)	RQD (%)	PLASTIC LIMIT	LIQUID LIMIT	MOISTURE (%)				D. DENSITY (PCF)	% PASSING 200 SIEVE
244	1		Bulk 1				SILTY SAND (SM); medium dense; brown; moist; mostly fine SAND; little low plasticity fines.	100										
243	2						Poorly-graded SAND (SP); medium dense; brown; moist to dry; mostly fine SAND; trace fines.	83			3.7	98.0	7					
242	3	X	1	3 5 8	13													
241	4						coarse to fine SAND	83			3.9	100.2	4					
240	5																	
239	6	X	2	3 6 10	16													
238	7																	
237	8	X	3	12 13 18	31			100										
236	9						dense	100										
235	10																	
234	11	X	4	7 13 21	34		Bottom of borehole at 11.5 ft bgs											
233	12																	
232	13																	
231	14																	
230	15																	
229	16																	
228	17																	
227	18																	
226	19																	
225	20																	
224	21																	
223	22																	
222	23																	
221	24																	
220	25																	
219	26																	
218	27																	
217	28																	



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PROJECT NO: 21-719.1
 PROJECT: SJB to Hollister Sanitary Force Main
 BORING: A-21-014
 ENTRY BY: OMR
 CHECKED BY: ABC

APPENDIX III

Laboratory Test Results



Project Name: San Juan Bautista to Hollister Sanitary Force Main
 CAInc File No: 21-719.1
 Date: 8/26/21
 Technician: CAP/BWD/LAD

MOISTURE-DENSITY TESTS - D2216/D7263

	1	2	3	4	5
Sample No.	R-21-001-2A	R-21-001-4A	A-21-003-1A	A-21-004-2A	A-21-005-1A
USCS Symbol	CL	CL	ML	SM	SP
Depth (ft.)	9.0-9.5	16.0-16.5	3.5-4.0	6.0-6.5	3.5-4.0
Sample Length (in.)	2.818	5.401	5.717	5.201	5.083
Diameter (in.)	1.411	2.401	2.394	2.383	2.390
Sample Volume (ft ³)	0.00255	0.01415	0.01489	0.01343	0.01320
Total Mass Soil+Tube (g)	243.3	735.9	1107.8	971.8	818.8
Mass of Tube (g)	117.9	0.0	278.1	289.3	287.9
Tare No.	1009	104	2018	1003	2036
Tare (g)	123.0	14.2	125.3	125.6	123.8
Wet Soil + Tare (g)	324.4	74.3	401.0	438.9	413.1
Dry Soil + Tare (g)	294.0	57.5	362.6	408.6	405.6
Dry Soil (g)	171.0	43.3	237.3	283.0	281.8
Water (g)	30.4	16.9	38.4	30.3	7.5
Moisture (%)	17.8	39.0	16.2	10.7	2.7
Dry Density (pcf)	92.1	82.5	105.7	101.2	86.4

Notes:



Project Name: San Juan Bautista to Hollister Sanitary Force Main
 CAInc File No: 21-719.1
 Date: 8/26/21
 Technician: CAP/BWD/LAD

MOISTURE-DENSITY TESTS - D2216/D7263

	1	2	3	4	5
Sample No.	A-21-006-1A	A-21-007-1A	A-21-008-2A	A-21-009-2A	A-21-010-3A
USCS Symbol	ML	SM	ML	ML	CL
Depth (ft.)	3.5-4.0	3.5-4.0	6.0-6.5	6-6.5	8.5-9.0
Sample Length (in.)	5.610	5.565	5.810	5.989	5.096
Diameter (in.)	2.386	2.375	2.400	2.374	2.371
Sample Volume (ft ³)	0.01452	0.01426	0.01521	0.01534	0.01301
Total Mass Soil+Tube (g)	1041.9	929.2	1081.8	1105.0	985.0
Mass of Tube (g)	274.4	288.2	273.1	280.9	276.9
Tare No.	R8	2015	A6	P10	G11
Tare (g)	130.8	122.2	13.7	131.5	13.4
Wet Soil + Tare (g)	509.9	383.2	96.5	511.7	97.5
Dry Soil + Tare (g)	445.5	361.2	83.1	415.9	75.2
Dry Soil (g)	314.7	239.0	69.4	284.4	61.8
Water (g)	64.4	22.0	13.4	95.8	22.3
Moisture (%)	20.5	9.2	19.3	33.7	36.2
Dry Density (pcf)	96.8	90.7	98.3	88.6	88.1

Notes:



Project Name: San Juan Bautista to Hollister Sanitary Force Main
 CAInc File No: 21-719.1
 Date: 8/26/21
 Technician: CAP/BWD/LAD

MOISTURE-DENSITY TESTS - D2216/D7263

	1	2	3	4	5
Sample No.	R-21-011-1B	A-21-012-1A	A-21-013-1A	A-21-014-1A	A-21-014-2A
USCS Symbol	CH	CL	SM	SP	SP
Depth (ft.)	5.5-6.0	3.5-4.0	3.5-4.0	3.5-4.0	6.0-6.5
Sample Length (in.)	5.975	5.265	6.008	5.525	5.490
Diameter (in.)	2.389	2.398	2.394	2.374	2.392
Sample Volume (ft ³)	0.01550	0.01375	0.01565	0.01415	0.01428
Total Mass Soil+Tube (g)	1122.1	1007.0	1167.0	933.3	955.5
Mass of Tube (g)	273.6	257.3	256.6	281.4	281.1
Tare No.	135	158	H21	2031	B5
Tare (g)	14.1	14.2	13.3	129.1	126.4
Wet Soil + Tare (g)	72.0	115.8	76.9	486.5	421.2
Dry Soil + Tare (g)	59.0	93.9	72.7	473.7	410.1
Dry Soil (g)	44.9	79.7	59.4	344.6	283.7
Water (g)	13.0	21.8	4.2	12.8	11.1
Moisture (%)	29.0	27.4	7.1	3.7	3.9
Dry Density (pcf)	93.6	94.3	119.7	98.0	100.2

Notes:

Project Name: San Juan Bautista to Hollister Sanitary Force Main

CAInc File No: 21-719.1

Date: 8/19/21

Technician: BWD

200 Wash - ASTM D1140
Method A

Max Particle Size (100% Passing)	Standard Sieve Size	Recommended Min Mass of Test Specimens
2 mm or less	No. 10	20 g
4.75 mm	No. 4	100 g
9.5 mm	3/8 "	500 g
19.0 mm	3/4 "	2.5 kg
37.5 mm	1 1/2 "	10 kg
75.0 mm	3 "	50 kg

Table from 6.2 of ASTM D1140

Sample No.	R-21-001-2A	A-21-002-4B	A-21-003-1A	A-21-003-2	A-21-004-1A
USCS Symbol	CL	SM	ML	ML	SM
Depth (ft.)	9	20.5	3.5	5.5	2.5
Tare No.	2009	2003	2018	1002	2020
Tare (g)	123	123.2	125.3	125.6	124.6
Dry Soil + Tare (g)	294	328.2	362.6	319.1	344.4
Dry Mass before (g)	171.0	205.0	237.3	193.5	219.8
Dry Mass after (g)	52.6	155.9	74.9	87.0	124.9
Percent Fines (%)	69	24	68	55	43

Notes:

Project Name: San Juan Bautista to Hollister Sanitary Force Main

CAInc File No: 21-719.1

Date: 8/23/21

Technician: BWD

200 Wash - ASTM D1140
Method A

Max Particle Size (100% Passing)	Standard Sieve Size	Recommended Min Mass of Test Specimens
2 mm or less	No. 10	20 g
4.75 mm	No. 4	100 g
9.5 mm	3/8 "	500 g
19.0 mm	3/4 "	2.5 kg
37.5 mm	1 1/2 "	10 kg
75.0 mm	3 "	50 kg

Table from 6.2 of ASTM D1140

Sample No.	A-21-004-2A	A-21-005-1A	A-21-006-1A	A-21-007-1A	A-21-008-1A
USCS Symbol	SM	SP	ML	SM	ML
Depth (ft.)	6	3.5	3.5	3.5	3.5
Tare No.	1003	2036	R8	2015	P2
Tare (g)	125.6	123.8	130.8	122.2	126.4
Dry Soil + Tare (g)	408.6	405.6	445.5	361.2	368.3
Dry Mass before (g)	283.0	281.8	314.7	239.0	241.9
Dry Mass after (g)	191.4	267.8	50.7	143.5	67.3
Percent Fines (%)	32	5	84	40	72

Notes:

Project Name: San Juan Bautista to Hollister Sanitary Force Main

CAInc File No: 21-719.1

Date: 8/23/21

Technician: BWD/CAP

200 Wash - ASTM D1140
 Method A

Max Particle Size (100% Passing)	Standard Sieve Size	Recommended Min Mass of Test Specimens
2 mm or less	No. 10	20 g
4.75 mm	No. 4	100 g
9.5 mm	3/8 "	500 g
19.0 mm	3/4 "	2.5 kg
37.5 mm	1 1/2 "	10 kg
75.0 mm	3 "	50 kg

Table from 6.2 of ASTM D1140

Sample No.	A-21-009-1A	A-21-009-2A	A-21-010-2A	A-21-011-1A	A-21-012-1B
USCS Symbol	ML	ML	CL	CH	CL
Depth (ft.)	3.5	6	6	6	3
Tare No.	R16	P10	2025	2424	2033
Tare (g)	129	131.5	125.8	126.8	127.5
Dry Soil + Tare (g)	304.7	415.9	290.6	456.9	288
Dry Mass before (g)	175.7	284.4	164.8	330.1	160.5
Dry Mass after (g)	41.6	0.9	24.5	37.1	28.9
Percent Fines (%)	76	100	85	89	82

Notes:

Project Name: San Juan Bautista to Hollister Sanitary Force Main

CAInc File No: 21-719.1

Date: 8/23/21

Technician: BWD

200 Wash - ASTM D1140
 Method A

Max Particle Size (100% Passing)	Standard Sieve Size	Recommended Min Mass of Test Specimens
2 mm or less	No. 10	20 g
4.75 mm	No. 4	100 g
9.5 mm	3/8 "	500 g
19.0 mm	3/4 "	2.5 kg
37.5 mm	1 1/2 "	10 kg
75.0 mm	3 "	50 kg

Table from 6.2 of ASTM D1140

Sample No.	A-21-013-2A	A-21-014-1A	A-21-014-2A		
USCS Symbol	SM	SP-SM	SP		
Depth (ft.)	6	3.5	6		
Tare No.	2008	2031	R5		
Tare (g)	122.8	129.1	126.4		
Dry Soil + Tare (g)	311.6	473.7	410.1		
Dry Mass before (g)	188.8	344.6	283.7		
Dry Mass after (g)	100.4	320.7	272.9		
Percent Fines (%)	47	7	4		

Notes:

Project Name: San Juan Bautista to Hollister Sanitary Force Main

CAInc File No: 21-719.1

Date: 8/26/21

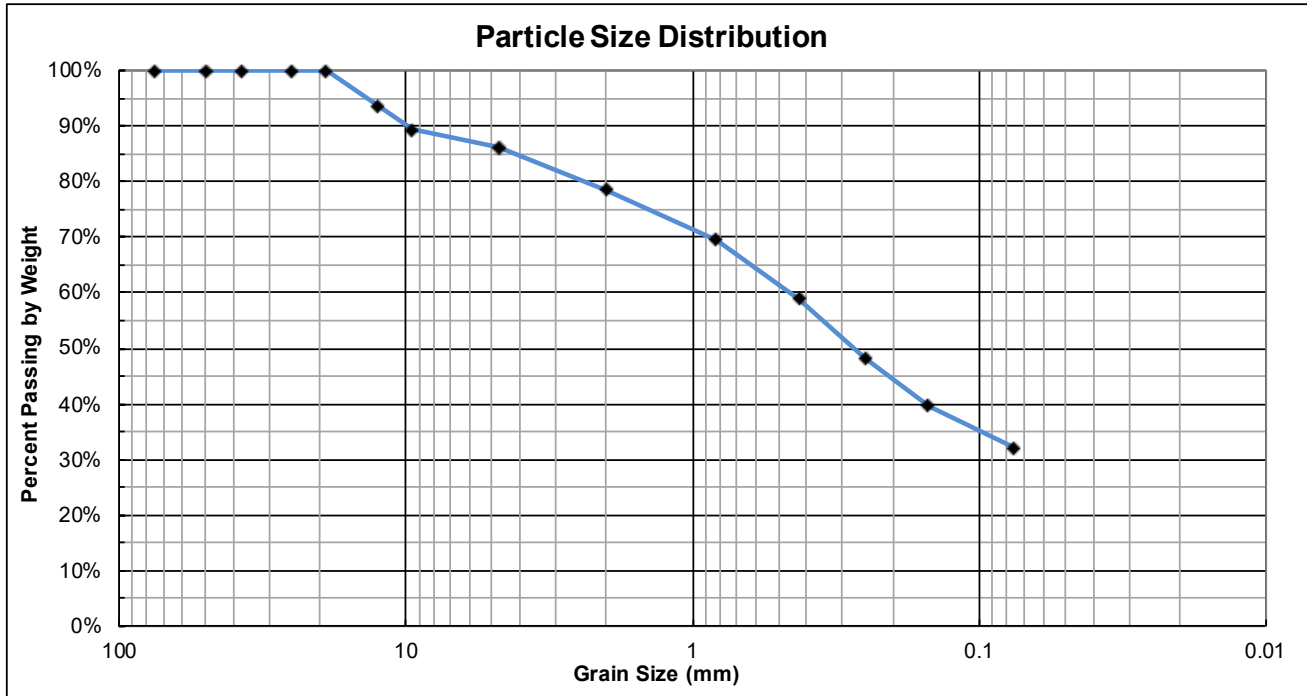
Technician: BWD

Sample ID: A-21-010-1A

Depth (ft): 3.5

USCS Classification: SILTY SAND (SM)

ASTM 6913 - Method A



% Cobble	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt/Clay
0	0	14	7	20	27	32
	14		54			32

		Sieve #	Opening mm	Cummulative Mass Retained (g)	% Passing
Cobbles		3"	75	0.0	100%
Gravel	Coarse	2"	50	0.0	100%
		1-1/2"	37.5	0.0	100%
		1"	25.0	0.0	100%
		3/4"	19.0	0.0	100%
	Fine	1/2"	12.5	11.6	93%
		3/8"	9.50	18.9	89%
Sand	Coarse	#4	4.75	24.7	86%
		#10	2.00	38.3	79%
		#20	0.825	54.2	70%
	Medium	#40	0.425	73.1	59%
		#60	0.250	92.3	48%
Fine	#100	0.150	107.5	40%	
Silt/Clay		#200	0.075	121.1	32%

Coefficient of Uniformity	Coefficient of Curvature
Cu = NA	Cc = NA

Project Name: San Juan Bautista to Hollister Sanitary Force Main

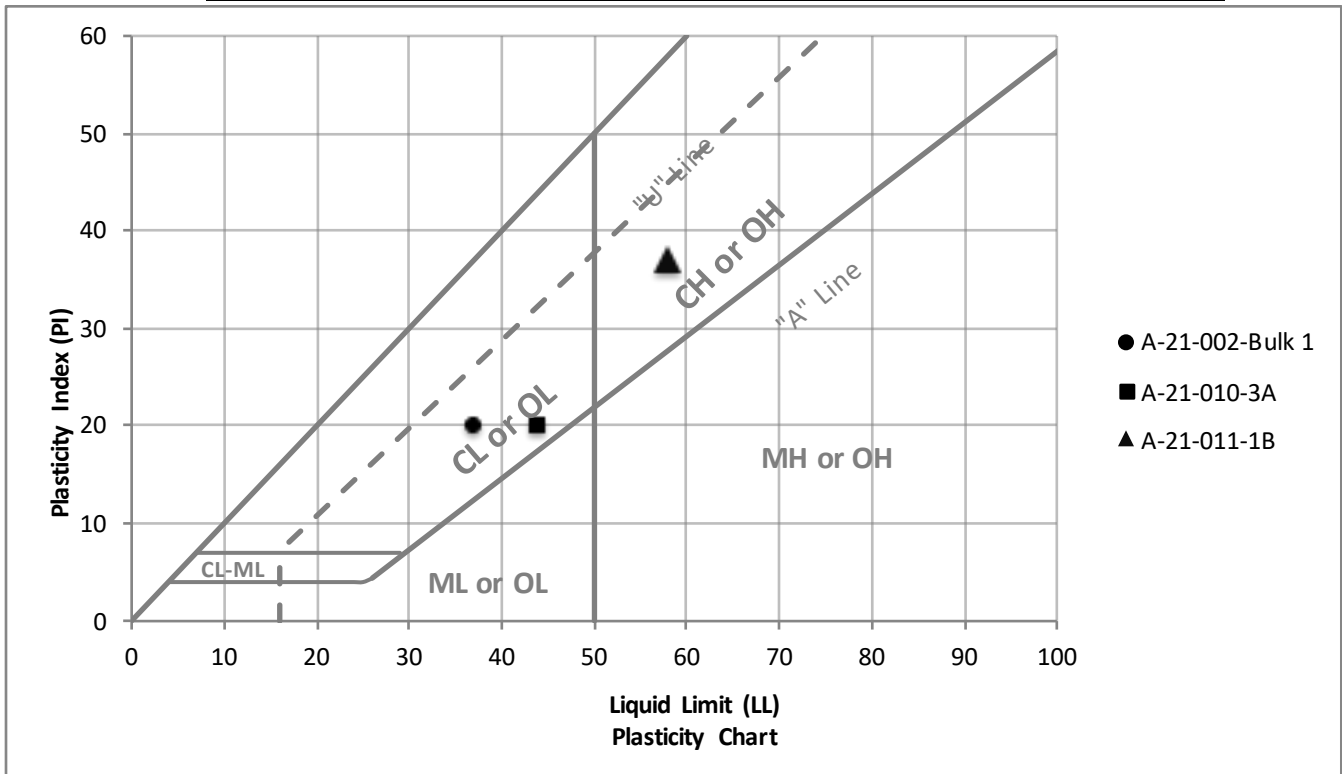
CAInc File No: 21-719.1

Date: 8/24/21

Technician: LAD

Plastic Index - ASTM D4318

Sample ID	Depth (ft)	Liquid Limit	Plastic Limit	PI
A-21-002-Bulk 1	0-5.0	37	17	20
A-21-010-3A	8.5-9.0	44	24	20
A-21-011-1B	5.5-6.0	58	21	37



Project Name: SJB to Hollister Sanitary Force Main

CAInc File No: 21-719.1

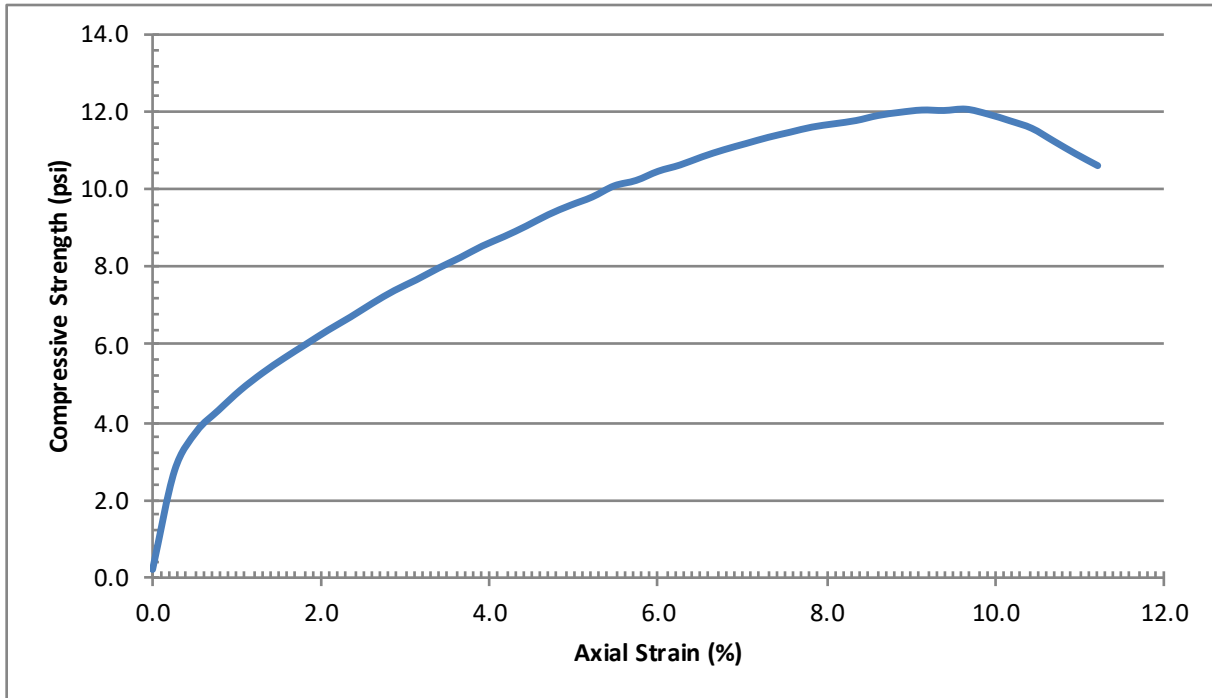
Date: 8/24/21

Technician: BWD

Sample ID: A-21-001-4A Depth (ft): 16.0-16.5

USCS Classification: CL

UNCONFINED COMPRESSION TEST - D2166



Dry Density (pcf) 82.5

Water Content (%) 39.0

Unconfined Compressive Strength (psi) 12.1

Unconfined Compressive Strength (psf) 1742

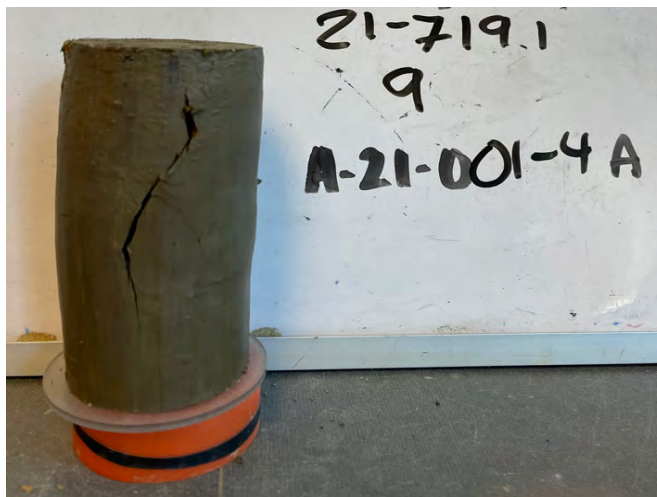
Average Height (in) 5.401

Average Diameter (in) 2.401

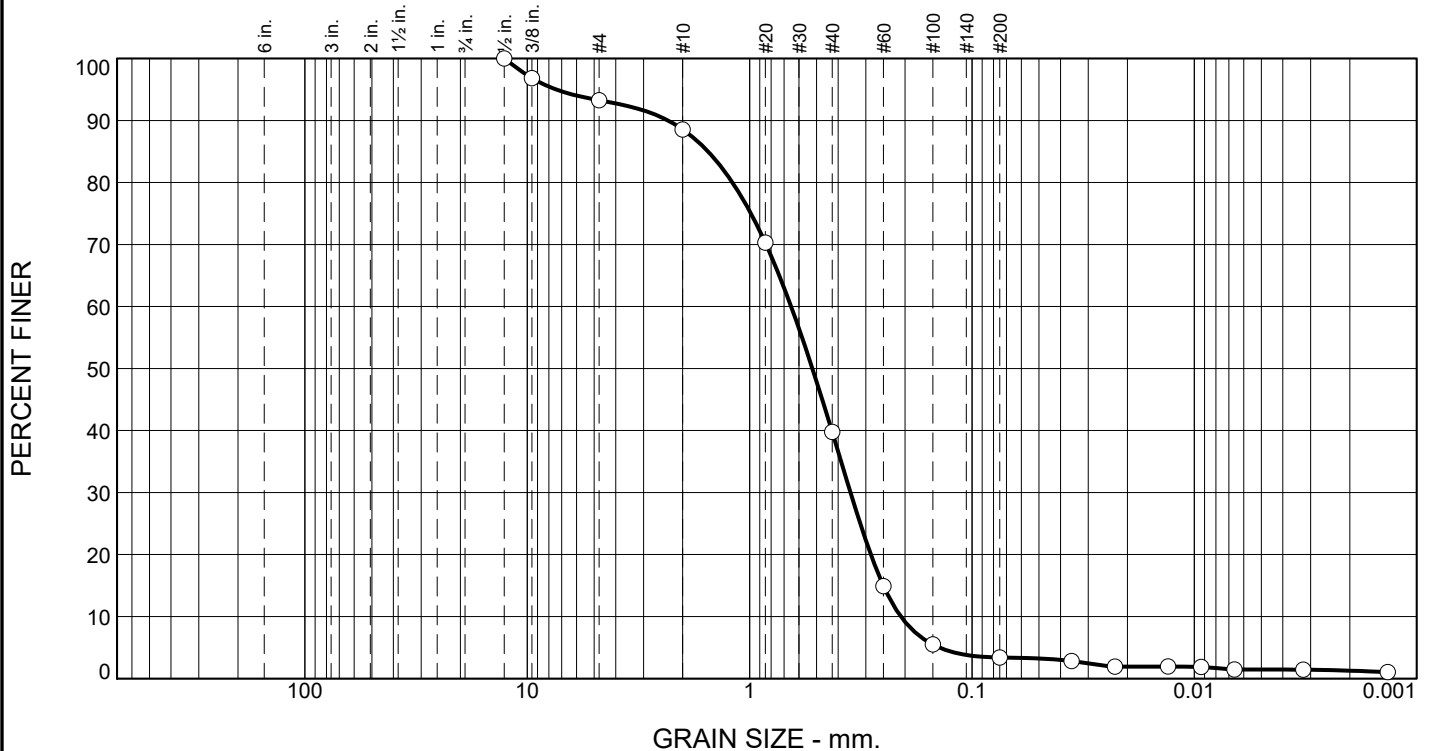
Rate of strain (%) 1.4

Strain at Failure (%) 9.7

Notes:



Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	6.7	4.7	48.8	36.4	1.9	1.5

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.5	100.0		
.375	96.8		
#4	93.3		
#10	88.6		
#20	70.3		
#40	39.8		
#60	14.9		
#100	5.5		
#200	3.4		
0.0357 mm.	2.8		
0.0228 mm.	1.9		
0.0131 mm.	1.9		
0.0093 mm.	1.9		
0.0066 mm.	1.5		
0.0032 mm.	1.4		
0.0014 mm.	1.0		

Material Description

Atterberg Limits (ASTM D 4318)

PL= _____ LL= _____ PI= _____

Classification

USCS (D 2487)= SP AASHTO (M 145)= _____

Coefficients

D₉₀= 2.3289 D₈₅= 1.5385 D₆₀= 0.6509
D₅₀= 0.5220 D₃₀= 0.3519 D₁₅= 0.2507
D₁₀= 0.2088 C_u= 3.12 C_c= 0.91

Remarks

Date Received: _____ Date Tested: 8/20/21

Tested By: KW

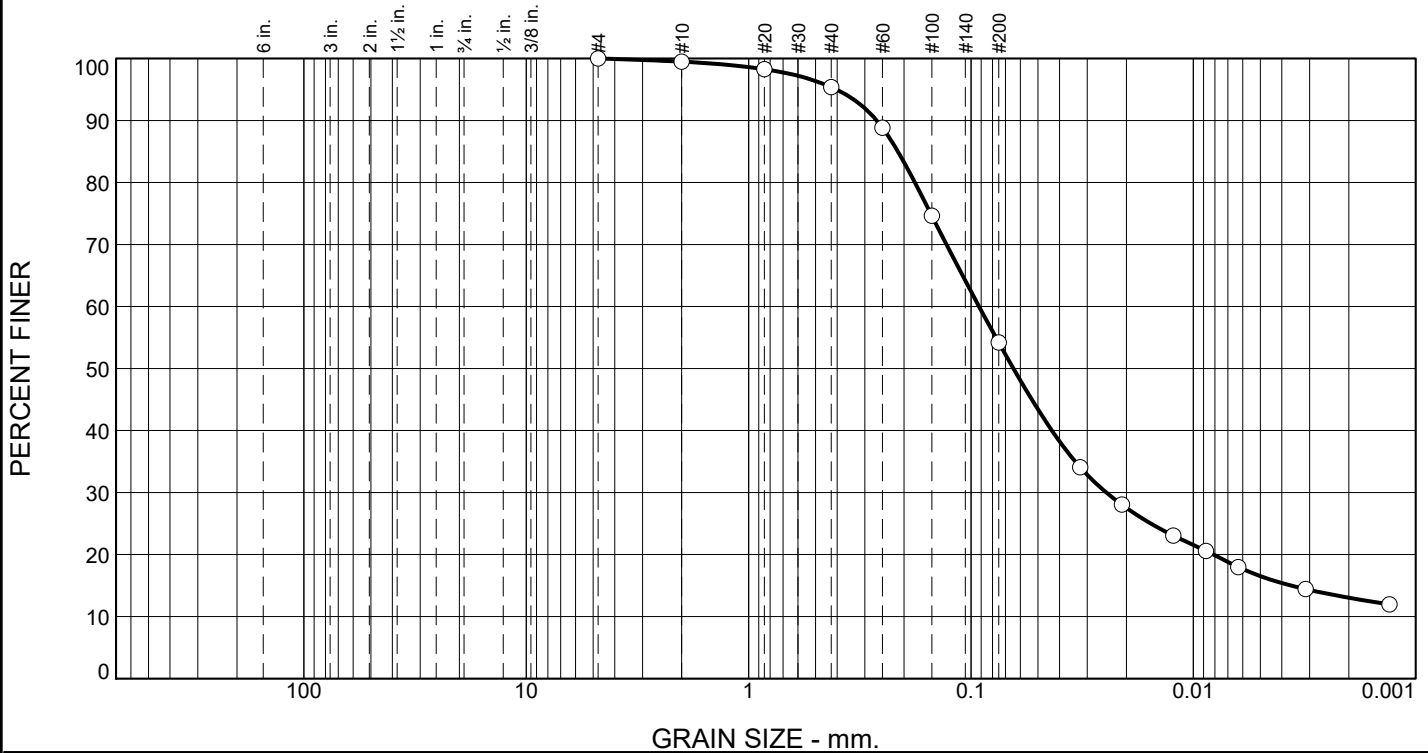
Checked By: NR

Title: Lab Manager

* (no specification provided)

Sample Number: A-21-001-1A Depth: 7.5-8 Date Sampled: _____

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.5	4.1	41.2	37.7	16.5

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.5		
#20	98.3		
#40	95.4		
#60	88.8		
#100	74.6		
#200	54.2		
0.0323 mm.	34.1		
0.0210 mm.	28.1		
0.0123 mm.	23.1		
0.0088 mm.	20.6		
0.0063 mm.	18.0		
0.0031 mm.	14.4		
0.0013 mm.	12.0		

* (no specification provided)

Material Description

Atterberg Limits (ASTM D 4318)

PL= _____ LL= _____ PI= _____

Classification

USCS (D 2487)= _____ AASHTO (M 145)= _____

Coefficients

D₉₀= 0.2655 D₈₅= 0.2130 D₆₀= 0.0920
D₅₀= 0.0644 D₃₀= 0.0246 D₁₅= 0.0036
D₁₀= _____ C_u= _____ C_c= _____

Remarks _____

Date Received: _____ Date Tested: 8/20/21

Tested By: KW

Checked By: MR

Title: Lab Manager

Sample Number: A-21-001-Bulk 1

Depth: 0-5

Date Sampled: _____

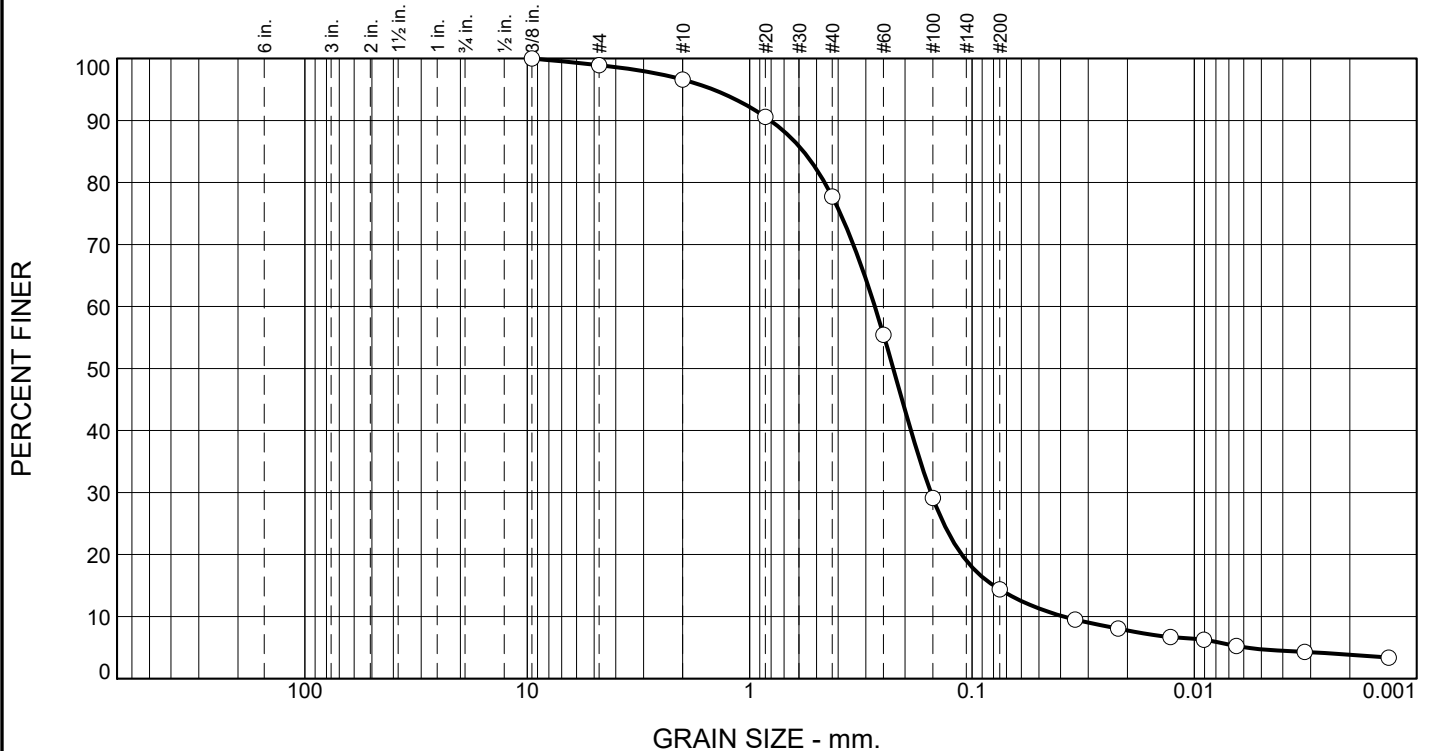
GEOCON CONSULTANTS, INC.

Client: Crawford and Associates
Project: SJB to Hollister Sanitary Force Main

Project No: S9763-05-230

Figure _____

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.1	2.3	18.9	63.3	9.7	4.7

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.375	100.0		
#4	98.9		
#10	96.6		
#20	90.6		
#40	77.7		
#60	55.4		
#100	29.1		
#200	14.4		
0.0344 mm.	9.5		
0.0220 mm.	8.1		
0.0128 mm.	6.7		
0.0091 mm.	6.3		
0.0065 mm.	5.3		
0.0032 mm.	4.3		
0.0013 mm.	3.4		

* (no specification provided)

Material Description

Atterberg Limits (ASTM D 4318)

PL= _____ LL= _____ PI= _____

Classification

USCS (D 2487)= _____ AASHTO (M 145)= _____

Coefficients

D₉₀= 0.8063 D₈₅= 0.5724 D₆₀= 0.2734
D₅₀= 0.2259 D₃₀= 0.1532 D₁₅= 0.0798
D₁₀= 0.0387 C_u= 7.07 C_c= 2.22

Remarks

Date Received: _____ Date Tested: 8/20/21

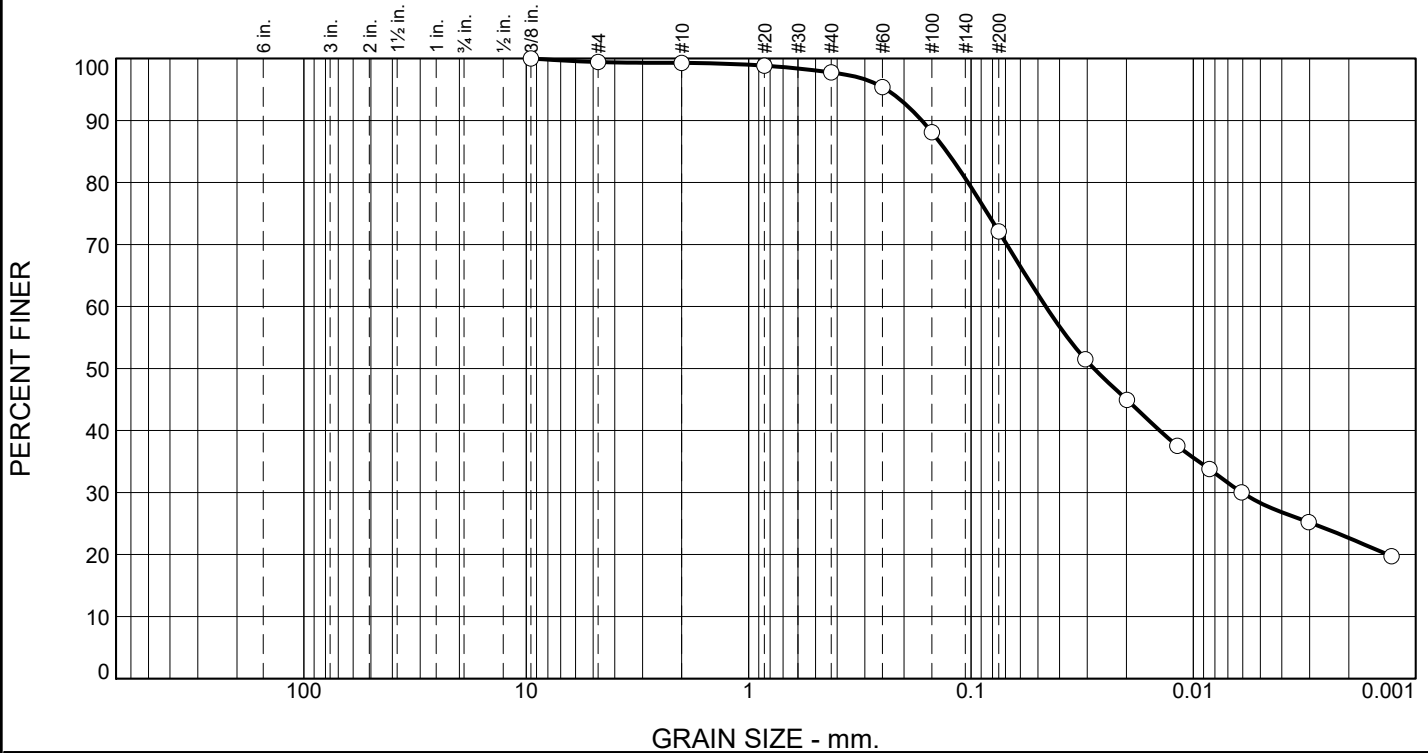
Tested By: KW

Checked By: MR

Title: Lab Manager

Sample Number: A-21-002-1A Depth: 6-6.5 Date Sampled: _____

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.6	0.1	1.5	25.7	43.8	28.3

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.375	100.0		
#4	99.4		
#10	99.3		
#20	98.8		
#40	97.8		
#60	95.4		
#100	88.1		
#200	72.1		
0.0306 mm.	51.5		
0.0199 mm.	45.0		
0.0118 mm.	37.5		
0.0085 mm.	33.8		
0.0061 mm.	30.0		
0.0030 mm.	25.2		
0.0013 mm.	19.7		

* (no specification provided)

Material Description

Atterberg Limits (ASTM D 4318)

PL= _____ LL= _____ PI= _____

Classification

USCS (D 2487)= _____ AASHTO (M 145)= _____

Coefficients

D₉₀= 0.1663 D₈₅= 0.1286 D₆₀= 0.0461
D₅₀= 0.0280 D₃₀= 0.0061 D₁₅= _____
D₁₀= _____ C_u= _____ C_c= _____

Remarks

Date Received: _____ Date Tested: 8/20/21

Tested By: KW

Checked By: MR

Title: Lab Manager

Sample Number: A-21-002-Bulk 1

Depth: 0-5

Date Sampled:

GEOCON CONSULTANTS, INC.

Client: Crawford and Associates
Project: SJB to Hollister Sanitary Force Main

Project No: S9763-05-230

Figure



MOISTURE / DENSITY TESTS ASTM D2216

PROJECT NAME: SJB to Hollister Sanitary PROJECT NUMBER: S9763-05-230
 DATE: 8/19/2021 TESTED BY: KW LAB NUMBER: _____ SHEET of

SAMPLE ID	A-21-001-1A								
DEPTH OF SAMPLE (ft)	7.5-8								
SAMPLE DIAMETER (mm)									
SAMPLE HEIGHT (mm)									
TARE NO.	B1								
WET WT.+TARE (gm.)	350.3								
DRY WT.+TARE (gm.)	344.7								
TARE WT. (gm.)	137.7								
Sample Volume (cu. mm)									
Sample Volume (cu. ft)									
Tube and Sample									
Tube									
Pocket Penetrometer (PP)									
WT. OF WATER (gm.)	5.6								
WT. OF DRY SOIL (gm.)	207.0								
WATER CONTENT (%)	2.7%								
WET (BULK) DENSITY (pcf)									
DRY DENSITY (PCF)									

200 Wash ASTM D1140

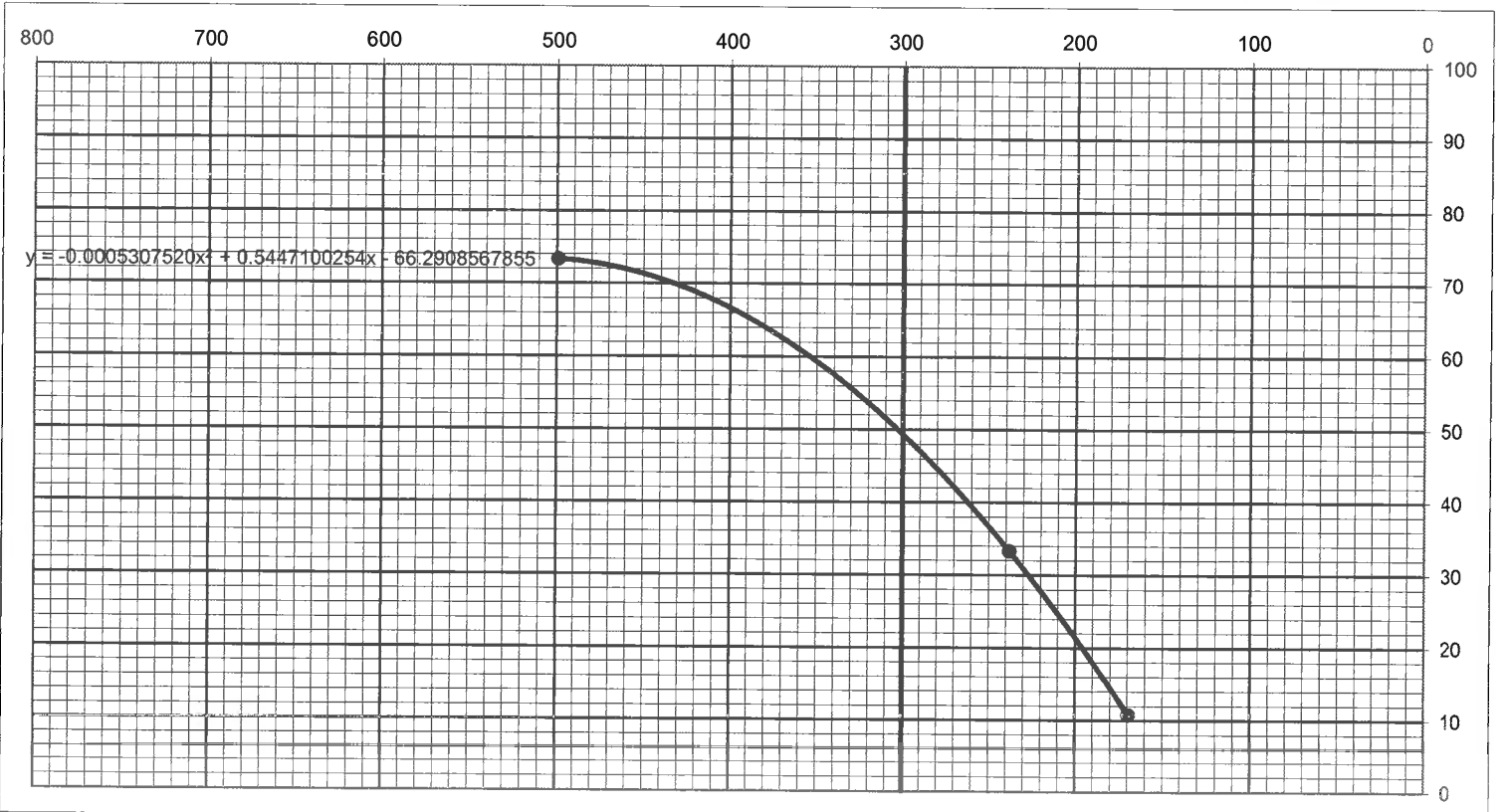
Wash Method (A or B)									
Soak Time Start									
Soak Time End									
Total Soak Time									
DRY WT. AFTER WASH + TARE (gm)									
DRY WT. AFTER WASH (gm)									
% PASSING NO. 200									

Method A to be used for non-cohesive materials only, **Method B** to be used for materials exhibiting plastic behavior
Minimum Soak Time for Method A = 10 minutes, Minimum Soak Time of Method B = 2 hours

Sample Description (ASTM D2487/D2488)									
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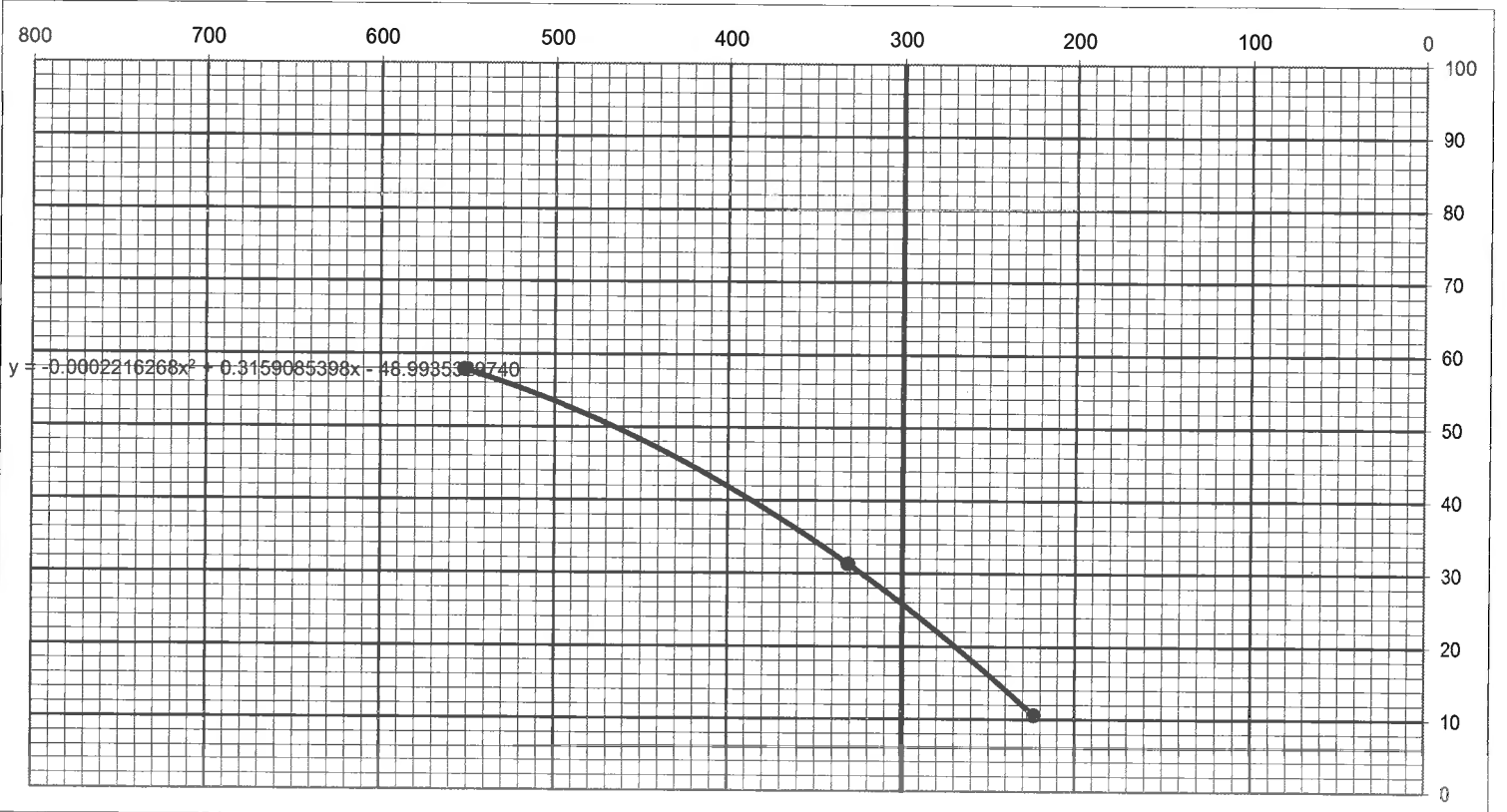
RESISTANCE VALUE
California Test Method No. 301

Job Number:	4151-001.00	Date Tested:	8/25/2021	R-value:	50
Project:	Crawford (SJB to Hollister 21-719.1)			Sample :	A-21-004-Bulk
Classification of Material:	SM, Silty Sand with Gravel (9%), Brown			Technician:	KM
Initial Sample Weight	1170	1150	1100		
Mold Number	F	E	D		
Air Pressure-PSI	350	350	350		
Initial Moisture %	8.3	8.3	8.3		
Water Added ml/g	5	20	30		
Water Added %	0.5	1.9	3.0		
Final Moist %	8.7	10.2	11.2		
Soil + Mold Weight-Grams	3238	3193	3194		
Mold Weight-Grams	2067	2027	2073		
Soil Weight-Grams	1171	1166	1121		
Height of Sample-Inches	2.53	2.48	2.41		
Density-PCF	129.0	129.3	126.7		
Dial Reading (x.0001 inches)	35	8	4		
Expansion Pressure (psf)	152	35	17		
Stabilometer at 1000 lbs.	16	37	54		
2000 lbs.	29	84	129		
Displacement	4.1	4.53	4.58		
Exudation Pressure-Lbs	6270	2990	2130		
Exudation-PSI	499	238	170		
R-Value Calculated	73	33	12		
Corrected R-Value	73	33	11		



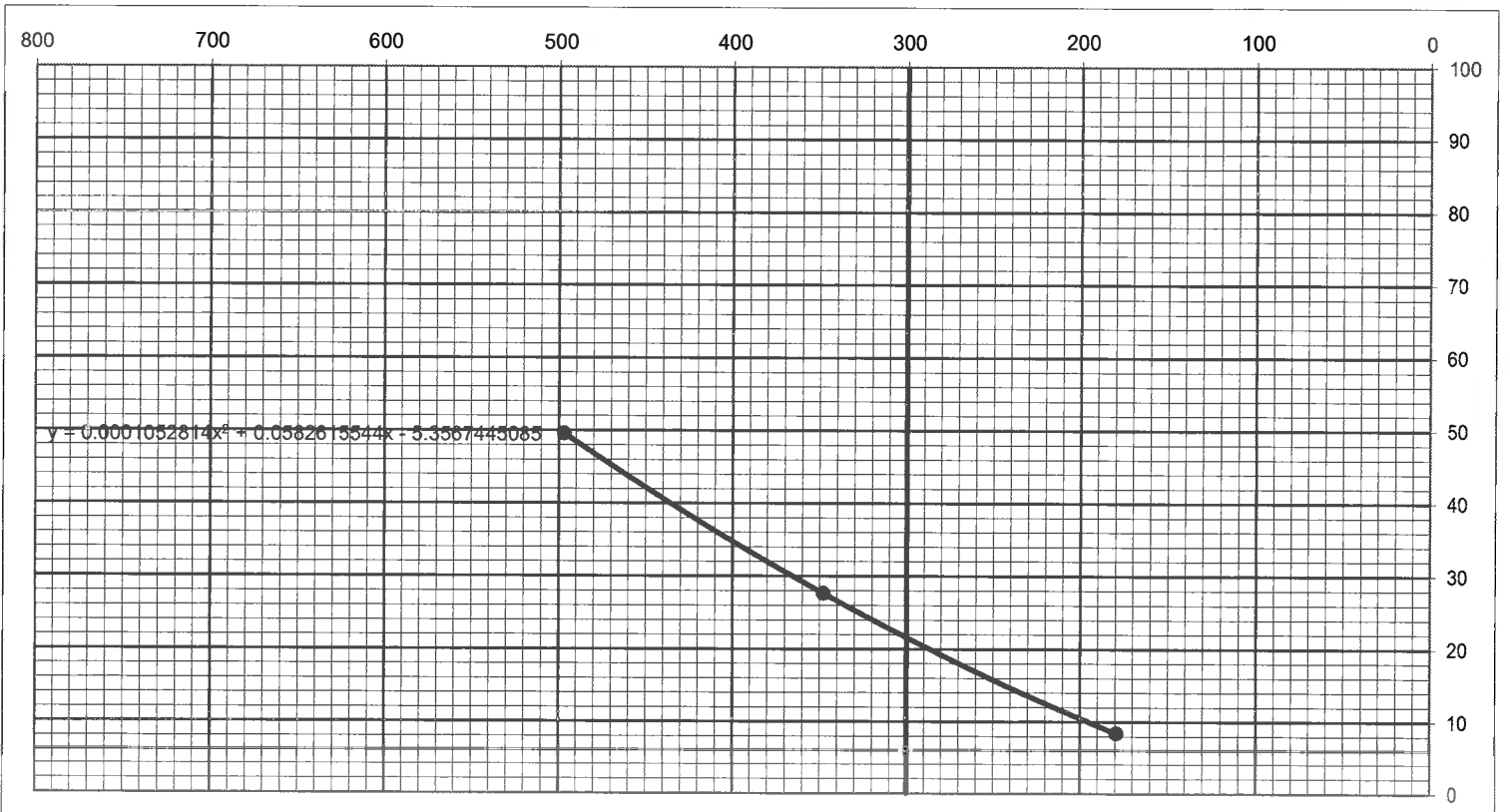
RESISTANCE VALUE
California Test Method No. 301

Job Number:	4151-001.00	Date Tested:	8/25/2021	R-value:	26
Project:	Crawford (SJB to Hollister 21-719.1)			Sample :	A-21-009-Bulk
Classification of Material:	SM, Silty Clayey Sand with minor Gravel (8%)			Technician:	KM
Initial Sample Weight	1150	1120	1120		
Mold Number	B	A	C		
Air Pressure-PSI	350	350	350		
Initial Moisture %	8.3	8.3	8.3		
Water Added ml/g	12	20	30		
Water Added %	1.1	1.9	2.9		
Final Moist %	9.4	10.3	11.2		
Soil + Mold Weight-Grams	3245	3224	3223		
Mold Weight-Grams	2086	2088	2084		
Soil Weight-Grams	1159	1136	1139		
Height of Sample-Inches	2.43	2.42	2.43		
Density-PCF	132.0	129.0	127.7		
Dial Reading (x.0001 inches)	60	13	6		
Expansion Pressure (psf)	260	56	26		
Stabilometer at 1000 lbs.	22	37	53		
2000 lbs.	50	91	131		
Displacement	3.75	3.85	4.4		
Exudation Pressure-Lbs	6930	4160	2810		
Exudation-PSI	552	331	224		
R-Value Calculated	59	33	11		
Corrected R-Value	58	31	11		



RESISTANCE VALUE
California Test Method No. 301

Job Number:	4151-001.00	Date Tested:	8/25/2021	R-value:	21
Project:	Crawford (SJB to Hollister 21-719.1)			Sample : A-21-011-Bulk	
Classification of Material:	SC, Clayey Sand with minor Gravel (8%)			Technician: KM	
Initial Sample Weight	1170	1150	1120		
Mold Number	F	E	D		
Air Pressure-PSI	350	350	250		
Initial Moisture %	10.2	10.2	10.2		
Water Added ml/g		10	20		
Water Added %		1.0	2.0		
Final Moist %	10.2	11.2	12.2		
Soil + Mold Weight-Grams	3233	3187	3202		
Mold Weight-Grams	2067	2029	2073		
Soil Weight-Grams	1166	1158	1129		
Height of Sample-Inches	2.40	2.44	2.40		
Density-PCF	133.5	129.3	127.0		
Dial Reading (x.0001 inches)	26	12	5		
Expansion Pressure (psf)	113	52	22		
Stabilometer at 1000 lbs.	26	39	60		
2000 lbs.	58	98	137		
Displacement	4.06	3.91	4.17		
Exudation Pressure-Lbs	6240	4370	2250		
Exudation-PSI	497	348	179		
R-Value Calculated	52	29	9		
Corrected R-Value	50	28	8		





GEOCON
CONSULTANTS, INC.

3160 GOLD VALLEY DR - SUITE 800 - RANCHO CORDOVA, CA 95742
PHONE 916.852.9118 - FAX 916.852.9132

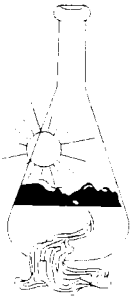
SAND EQUIVALENT LABORATORY TEST RESULTS CTM 217

Project Name San Juan Bautista to Hollister Sanitary Force **Project No.** S9763-05-230 **Date** 11/5/21

Sample Type Soil **Tested by** AD

Sample ID	Sand Equivalent Test Results	Specification	Pass/Fail
A-21-003-1B	8	--	--
A-21-014-1B	35	--	--
A-21-014-Bulk 1	28	--	--

Mark Repking, PG
Laboratory Manager



Sunland Analytical

11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 08/25/2021
Date Submitted 08/18/2021

To: Carmelo Pagan
Crawford & Associates, Inc.
1100 Corporate Way Suite 230
Sacramento, CA 95831

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 21-719.1 SJB TO HOL. Site ID : A-21-004-1A+1B.
Thank you for your business.

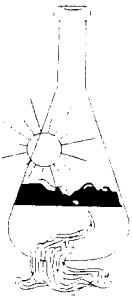
* For future reference to this analysis please use SUN # 85560-178398.

EVALUATION FOR SOIL CORROSION

Soil pH	7.01		
Minimum Resistivity	1.50 ohm-cm (x1000)		
Chloride	7.9 ppm	00.00079	%
Sulfate	52.0 ppm	00.00520	%

METHODS

pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m



Sunland Analytical

11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 08/25/2021
Date Submitted 08/18/2021

To: Carmelo Pagan
Crawford & Associates, Inc.
1100 Corporate Way Suite 230
Sacramento, CA 95831

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager *RH*

The reported analysis was requested for the following location:
Location : 21-719.1 SJB TO HOL. Site ID : A21-006-2B5-6.5.
Thank you for your business.

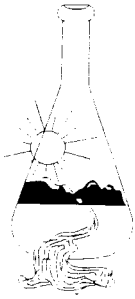
* For future reference to this analysis please use SUN # 85560-178399.

EVALUATION FOR SOIL CORROSION

Soil pH	7.66		
Minimum Resistivity	0.72	ohm-cm (x1000)	
Chloride	5.5 ppm	00.00055	%
Sulfate	16.1 ppm	00.00161	%

METHODS

pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m



Sunland Analytical

11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 08/25/2021
Date Submitted 08/18/2021

To: Carmelo Pagan
Crawford & Associates, Inc.
1100 Corporate Way Suite 230
Sacramento, CA 95831

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 21-719.1 SJB TO HOL. Site ID : A21-008-2A5-6.5.
Thank you for your business.

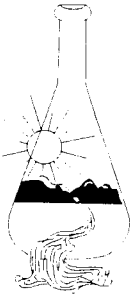
* For future reference to this analysis please use SUN # 85560-178400.

EVALUATION FOR SOIL CORROSION

Soil pH	6.84		
Minimum Resistivity	0.59	ohm-cm (x1000)	
Chloride	44.8 ppm	00.00448	%
Sulfate	185.1 ppm	00.01851	%

METHODS

pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m



Sunland Analytical

11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 08/25/2021
Date Submitted 08/18/2021

To: Carmelo Pagan
Crawford & Associates, Inc.
1100 Corporate Way Suite 230
Sacramento, CA 95831

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 21-719.1 SJB TO HOL. Site ID : A21-012-2B.
Thank you for your business.

* For future reference to this analysis please use SUN # 85560-178401.

EVALUATION FOR SOIL CORROSION

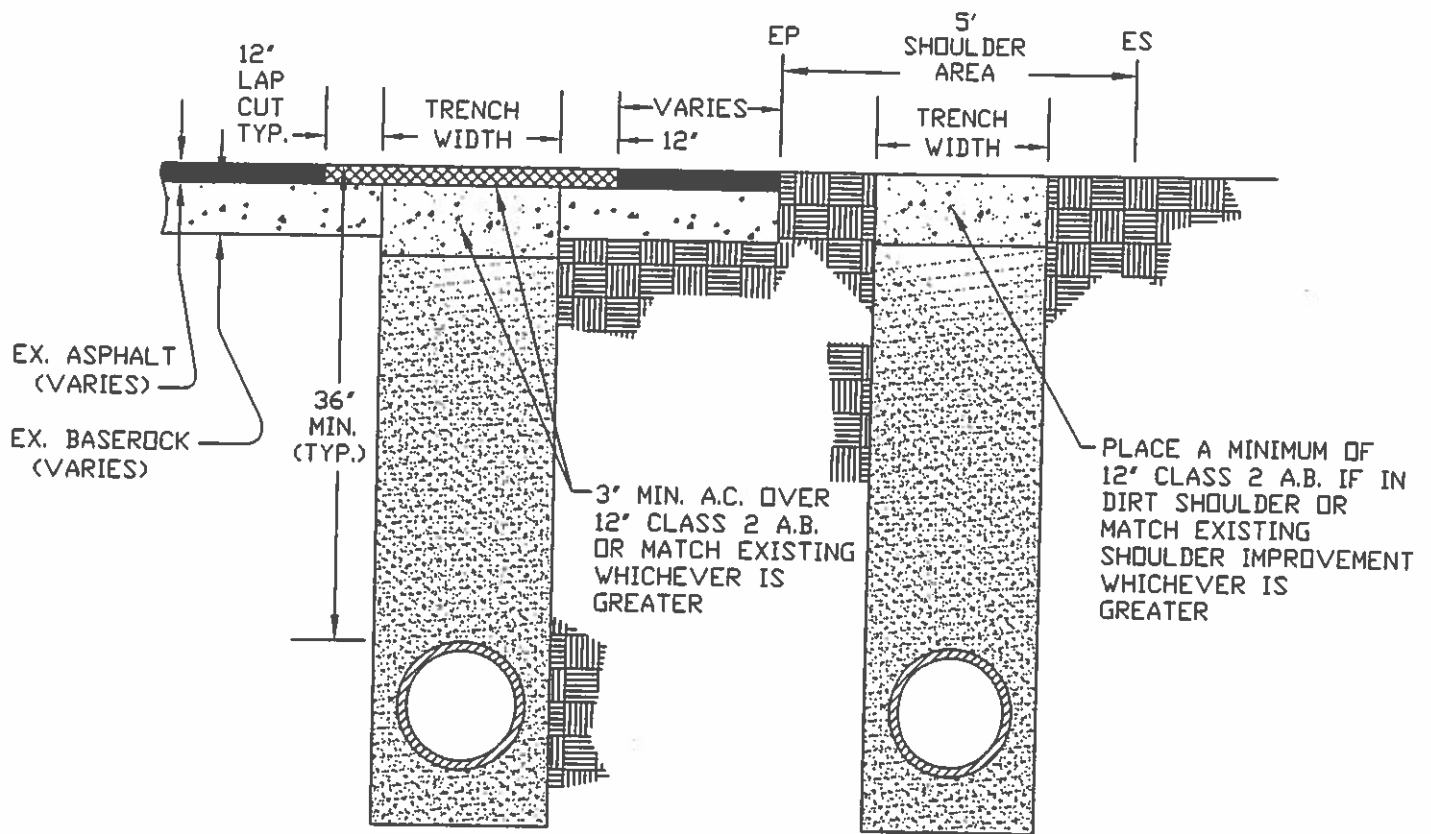
Soil pH	7.42		
Minimum Resistivity	6.43	ohm-cm (x1000)	
Chloride	64.2 ppm	00.00642	%
Sulfate	62.2 ppm	00.00622	%

METHODS

pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

APPENDIX IV

County And City Trench Details



NOTES:

1. THE DEPTH OF ASPHALT SURFACING SHALL MATCH THE EXISTING ASPHALT THICKNESS. A MINIMUM 3' ASPHALT THICKNESS IS REQUIRED.
2. IF THE EDGE OF TRENCH IS EQUAL TO OR LESS THAN 2' FROM GUTTER LIP OR EDGE OF PAVEMENT, REPLACE ROAD SURFACE TO TO GUTTER LIP OR EDGE OF PAVEMENT.
3. ALL TRENCH BACKFILL SHALL BE COMPACTED TO 95% RELATIVE COMPACTION WITHIN THE ROADWAY AND THE SHOULDER AREA 5' FROM EDGE OF PAVEMENT.
4. BACKFILL FOR THE AREA OUTSIDE OF THE 5' SHOULDER AREA SHALL BE COMPACTED TO 90% RELATIVE COMPACTION.
5. AREAS OUTSIDE OF THE 5' SHOULDER AREA CAN BE BACKFILLED TO THE FINISH GRADE WITH NATIVE MATERIAL AT 90% COMPACTION.

△		
△		
△		
No.	Revised	By
DRWN.-J.C.S.		
Scale	NONE	



TRENCH RESTORATION

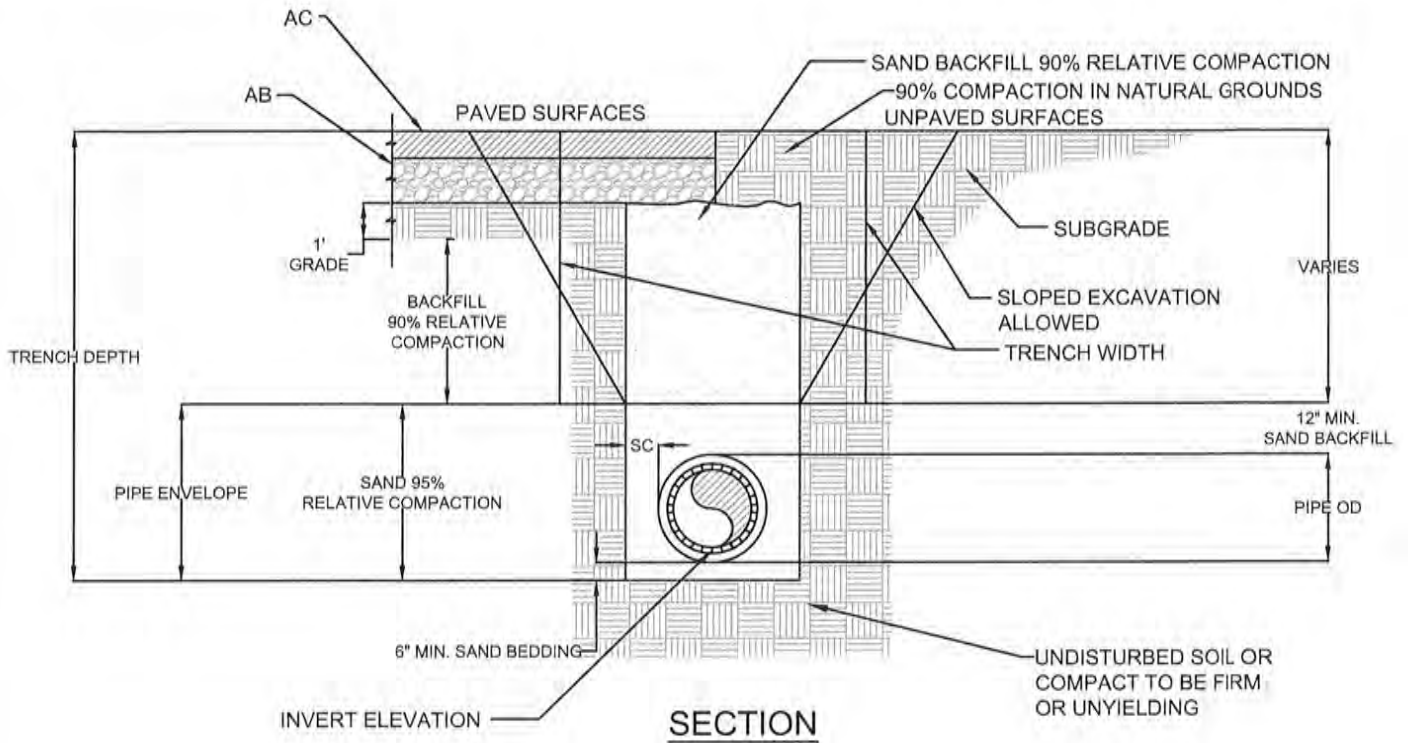
COUNTY OF SAN BENITO
DEPARTMENT OF PUBLIC WORKS

Approved by

Director of Public Works
Date: JULY, 2008

Drawing No.

TR-1



S.C. = SIDE CLEARANCE	
NOMINAL PIPE SIZE	SIDE CLEARANCE
UP TO AND INCLUDING 15"	6" MIN.-10" MAX.
OVER 15"	8" MIN.-12" MAX.

NOTES:

1. SEE STANDARD PLAN E-4 FOR TRENCH RESTORATION ON IMPROVED / UNIMPROVED STREETS.
2. SAND BEDDING & BACKFILL MINIMUM SAND EQUIVALENT OF 30.
3. SIDE CLEARANCE EXCEEDING MAXIMUM SHALL USE CEMENT-SAND SLURRY OR CLASS II AGGREGATE BASE.
4. EXCAVATIONS TO COMPLY WITH CAL-OSHA REQUIREMENTS/REGULATIONS

TITLE: PIPE BEDDING AND TRENCH / BACKFILL			
DRAWN BY: STAFF	SCALE: NONE	APPROVED:	STANDARD PLAN
REVIEWED BY: DANNY HILLSTOCK	REVISED: OCTOBER, 2019		E-3-1 <small>SHEET 1 OF 2</small>
CITY OF HOLLISTER ENGINEERING DEPARTMENT		<small>CITY ENGINEER: DANNY HILLSTOCK LIC. NO. 70647</small> <div style="text-align: right; margin-top: 10px;"> 11-3-19 <small>DATE</small> </div>	

GENERAL BACKFILL REQUIREMENTS

1. ALL EXISTING, NEW AND FUTURE ROADWAY AREAS WITH TRENCH WIDTH GREATER THAN 2' AND LESS THAN 5'- IMPORTED SANDY MATERIAL WITH S.E. > 30 OR CLASS II AB.
2. ALL EXISTING NEW AND FUTURE ROADWAY AREAS WHERE TRENCH WIDTH EXCEEDS 5' AND OPEN FIELDS OUTSIDE PLANNED AND PRESENT RIGHT-OF-WAYS-NATIVE MATERIAL WITH 2" MAXIMUM GRADATION IS ALLOWED WITH APPROVAL BY THE CITY ENGINEER.
3. EXISTING ROADWAYS WITH TRENCH WIDTHS OF 2' OR LESS OR HAVING LESS THAN 25 SQ. FEET OR WHEN DIRECTED IN ANY EXISTING ROADWAY TRENCH - BACKFILL BE CLASS 100-E-100 P.C.C.

BEDDING REQUIREMENTS :- (SEE BEDDING TYPES BELOW)

WATER PIPES

- D.I. PIPE - TYPE 1 OR 2
- P.V.C. PIPE - TYPE 1
- POLYETHYLENE TUBING - TYPE 1

SANITARY SEWER PIPE

- P.V.C. OR A.B.S. - TYPE 1 OR 3
- P.V.C. SCH. 40 OR A.B.S. SOLID WALL S.D.R. 26- TYPE 1 OR 3
- H.D.P.E. PROFILED WALL PIPE - TYPE 3

MINIMUM DEPTH OF COVER FROM TOP OF PIPE TO FINISH GRADE FOR ALL SANITARY SEWER INSTALLATIONS SHALL BE 3 FEET, UNLESS PRIOR APPROVAL HAS BEEN OBTAINED FROM THE CITY ENGINEER. FOR COVER LESS THAN 3 FEET, SOLID WALL SDR 23.5 PIPE SHALL BE USED. TYPE 3 BEDDING SHALL BE USED IN ALL CASES WHEN DEPTH TO INVERT IS LESS THAN 3 FEET.

STORM DRAIN PIPE

- REINFORCED CONCRETE PIPE - TYPES 1, 2, OR 3.
- H.D.P.E. PROFILE PIPE AND P.V.C. SOLID WALL SDR 26 PIPE - TYPE 1 OR 3

BEDDING TYPES

- TYPE 1 - SANDY MATERIAL WITH S.E.> 30. HAND TAMP BOTTOM SEGMENT PRIOR TO PLACING PIPES.
- TYPE 2 - IN FREE DRAINING GRANULAR NATIVE MATERIAL.

TITLE:

PIPE BEDDING AND TRENCH BACKFILL-NOTES

AUTOCAD BY:
STAFF

SCALE:
NONE

APPROVED:

STANDARD PLAN

REVIEWED BY:
DANNY HILLSTOCK

REVISED:
OCTOBER, 2019


CITY ENGINEER: DANNY HILLSTOCK LIC. NO. 70647

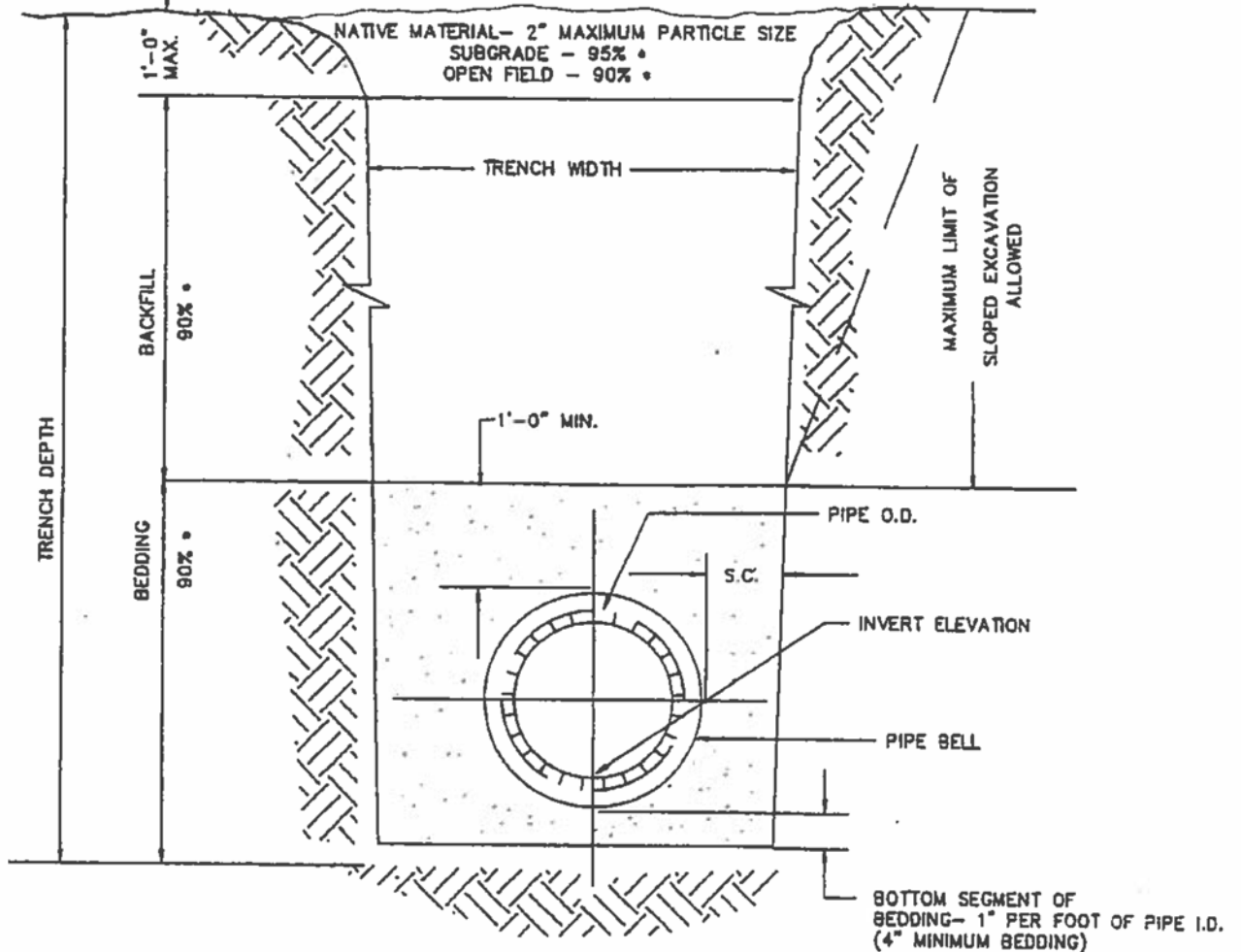
11-5-19
DATE

E-3-2

CITY OF HOLLISTER
ENGINEERING DEPARTMENT

SHEET 2 OF 2

SUBGRADE ELEVATION



SECTION

NOTES:

1. (•) INDICATES MINIMUM RELATIVE COMPACTION.
2. SEE DETAIL SHEET E-2 FOR TRENCH RESTORATION ON IMPROVED STREETS.

(SEE BEDDING AND BACKFILL REQUIREMENTS)

S.C. = SIDE CLEARANCE

NORMAL PIPE SIZE	SIDE CLEARANCE
UP TO AND INCLUDING 15"	6" MIN. - 10" MAX.
OVER 15"	8" MIN.

PIPE BEDDING AND TRENCH BACKFILL

CITY OF SAN JUAN BAUTISTA

STANDARD PLANS

APPROVED: _____

DATE	APRIL 30, 1992
REVISED	
DETAIL	F - 1 - 1

GENERAL BACKFILL REQUIREMENTS

1. ALL EXISTING, NEW AND FUTURE ROADWAY AREAS WITH TRENCH WIDTH GREATER THAN 2' AND LESS THAN 6' - IMPORTED SANDY MATERIAL WITH S.E. > 30.
2. ALL EXISTING NEW AND FUTURE ROADWAY AREAS WHERE TRENCH WIDTH EXCEEDS 6' AND OPEN FIELDS OUTSIDE PLANNED AND PRESENT RIGHT-OF-WAYS - NATIVE MATERIAL WITH 2" MAXIMUM GRADATION.
3. EXISTING ROADWAYS WITH TRENCH WIDTHS OF 2' OR LESS OR HAVING LESS THAN 25 SQ. FEET OR WHEN DIRECTED IN ANY EXISTING ROADWAY TRENCH - CLASS 100-E-100 P.C.C.

BEDDING REQUIREMENTS:

WATER PIPES

- D.I. PIPE - TYPE 1 OR 2
- P.V.C. PIPE - TYPE 1
- POLYETHYLENE TUBING - TYPE 1

SANITARY SEWER PIPE

- P.V.C. OR A.B.S. COMPOSITE TRUSS PIPE - TYPE 1 OR 3
 - P.V.C. SCH. 40 OR A.B.S. SOLID WALL S.D.R. 23.5 - TYPE 1 OR 3
 - P.V.C. SOLID WALL S.D.R. 35.0 - TYPE 3
 - H.D.P.E. PROFILED WALL PIPE - TYPE 3
- MINIMUM DEPTH OF COVER FROM TOP OF PIPE TO FINISH GRADE FOR ALL SANITARY SEWER INSTALLATIONS SHALL BE 3 FEET, UNLESS PRIOR APPROVAL HAS BEEN OBTAINED FROM THE CITY ENGINEER. FOR COVER LESS THAN 3 FEET, COMPOSITE TRUSS AND SOLID WALL SDR 23.5 PIPE SHALL BE USED. TYPE 3 BEDDING SHALL BE USED ALL CASES WHEN DEPTH TO INVERT IS LESS THAN 3 FEET.

STORM DRAIN PIPE

- REINFORCED CONCRETE PIPE - TYPES 1, 2, OR 3.
- H.D.P.E. PROFILE PIPE AND P.V.C. SOLID WALL SDR 35.0 PIPE - TYPE 1 OR 3

BEDDING TYPES

- TYPE 1 - SANDY MATERIAL WITH S.E. > 30. HAND TAMP BOTTOM SEGMENT PRIOR TO PLACING PIPES.
- TYPE 2 - IN FREE DRAINING GRANULAR NATIVE MATERIALS, HAND EXCAVATE AND SHAPE BOTTOM OF TRENCH TO SUPPORT PIPE TO MIN. DEPTH OF O.D./3. REMAINING BEDDING TO BE SANDY MATERIAL WITH S.E. > 30.
- TYPE 3 - CRUSHED AGG. BASE MATERIAL OR CRUSHED MISCELLANEOUS BASE MATERIAL OF FINE GRADATION.

PIPE BEDDING AND TRENCH BACKFILL - NOTES

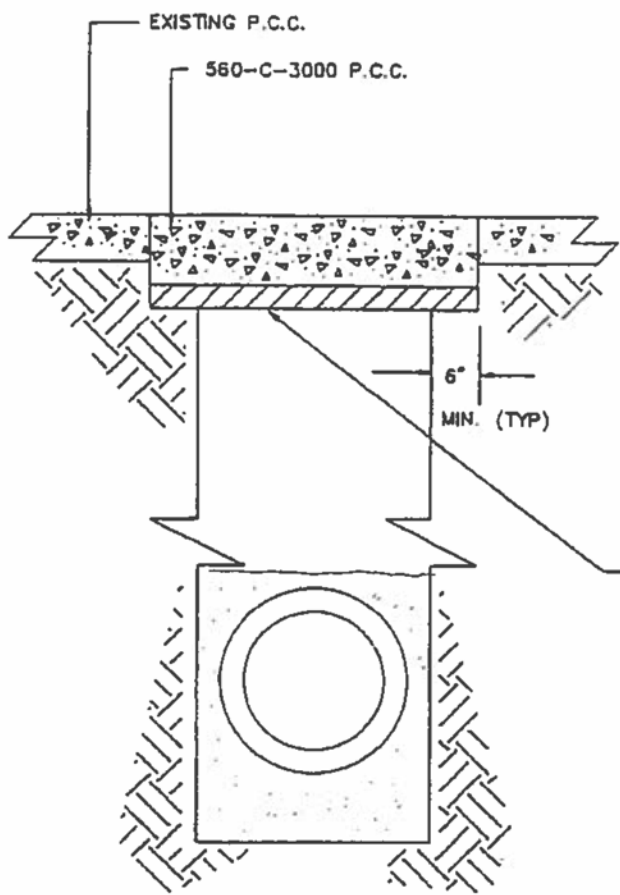
CITY OF SAN JUAN BAUTISTA

STANDARD PLANS

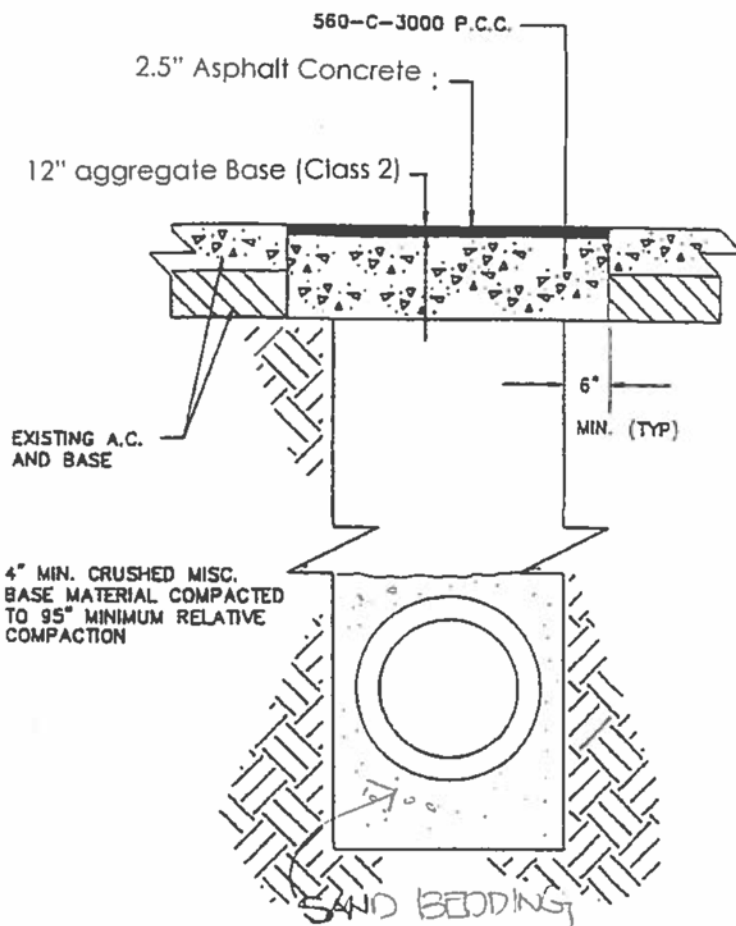
APPROVED: _____

DATE	APRIL 30, 1992
REVISED	
DETAIL	F-1-2

SHEET 2 OF 2



TYPE - C



TYPE - D

GENERAL NOTES:

1. EXISTING A.C. OR P.C.C. SHALL BE CUT AND REMOVED IN SUCH A MANNER SO AS NOT TO TEAR, BULGE, BREAK, OR DISPLACE ADJACENT PAVEMENT. EDGES SHALL BE CLEAN AND VERTICAL. ALL CUTS SHALL BE PARALLEL OR PERPENDICULAR TO STREET CENTERLINE, WHEN PRACTICAL.
2. SEE STANDARD PLANS E-1-1 AND E-1-2 FOR PIPE BEDDING AND TRENCH BACKFILL REQUIREMENTS.

NOTES TYPE - C

1. CONCRETE SHALL BE EQUAL THICKNESS TO EXISTING P.C.C. WITH A MINIMUM OF 7 INCHES.

NOTES TYPE - D

1. A.C. SHALL BE HOT PLANT MIX. A.C. SHALL BE LAID DOWN USING A SPREADER BOX WHEN TRENCH WIDTH EXCEEDS 4 FEET.
2. CONCRETE TO BE PLACED TO DEPTH OF EXISTING BASE WITH A MINIMUM THICKNESS OF 7 INCHES.
3. A TACK COAT OF ASPHALTIC EMULSION OR PAVING ASPHALT SHALL BE APPLIED TO THE A.C. AT ALL CONTACT SURFACES AND TO ALL CONCRETE PRIOR TO PLACING THE NEW A.C.
4. A.C. RESURFACING SHALL BE SEAL COATED WITH AN EMULSIFIED ASPHALT AND COVERED WITH CLEAN SAND.
5. NOT TO BE USED UNLESS SHOWN ON THE PLANS OR APPROVED BY THE PUBLIC WORKS INSPECTOR.

TRENCH RESURFACING

CITY OF SAN JUAN BAUTISTA

STANDARD PLANS

APPROVED: Roger Grimsley City Engineer

DATE	January 2014
REVISED	
DETAIL	F-2-1 SHEET 2 OF 2

APPENDIX V

Engeo Report for Rancho Vista Housing Development



RANCHO VISTA
SAN JUAN BAUTISTA, CALIFORNIA

**GEOTECHNICAL RECOMMENDATIONS FOR
SITE DEVELOPMENT**

Submitted to:

Mr. Edward Cornejo
Meritage Homes
1671 East Monte Vista Avenue, Suite 214
Vacaville, California 95688

Prepared by:

ENGEO Incorporated

December 14, 2016

Project No.

13170.000.000

Project No.
13170.000.000

December 14, 2016

Mr. Edward Cornejo
Meritage Homes
1671 East Monte Vista Avenue, Suite 214
Vacaville, CA 95688

Subject: Rancho Vista
San Juan Bautista, California

GEOTECHNICAL RECOMMENDATIONS FOR SITE DEVELOPMENT

Dear Mr. Cornejo:

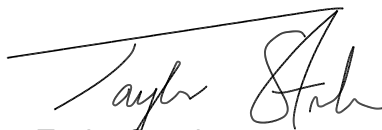
As requested, we prepared the following geotechnical recommendations for site development for the proposed residential development in San Juan Bautista, California. The accompanying report presents our recommendations based on the existing geotechnical information and site development plans.

Our findings indicate that the study area is suitable for the proposed development provided the recommendations contained in this report are incorporated into design, and implemented during construction. The main geotechnical considerations for the planned development include potential seismic-induced settlement of liquefiable layers; compressibility of soils susceptible to settlement when subject to heavy structural loads; seismic shaking and expansive soils.

We are pleased to have been of service to you on this project and are prepared to consult further with you and your design team as the project progresses. If you have any questions or comments regarding this report, please call and we will be glad to discuss them with you.

Sincerely,

ENGEO Incorporated



Taylor Strack
ts/sdh/cjn



Steve Harris, GE



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LIST OF SELECTED REFERENCES

FIGURES

APPENDIX A – Field Explorations

APPENDIX B – Laboratory Testing

APPENDIX C – Piezometer Data

APPENDIX D – Liquefaction Analysis

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

As shown in the reference section of this report, previous geotechnical studies have been performed on the subject site. Since the time that the original geotechnical report recommendations were prepared for the subject site, the grading and improvement plans have been finalized which includes importing on the order of 150,000 cubic yards of soil and significantly raising the site grades to achieve the design grades. The purpose of this report is to provide updated geotechnical recommendations for site development based on the existing geotechnical data and review of the grading and improvement plans.

This report was prepared for the exclusive use of our client and their consultants for design and construction of this project. In the event that any changes are made in the character, design, or layout of the development, we must be contacted to review the conclusions and recommendations contained in this report to evaluate whether modifications are recommended. This document may not be reproduced in whole or in part by any means whatsoever, nor may it be quoted or excerpted without our express written consent.

1.2 SITE LOCATION AND DESCRIPTION

The 28.35 -acre Property consists of two parcels located southwest of the intersection of First Street (San Juan Highway) and Road D. The parcels include Assessor's Parcel Numbers (APN) 02-220-009 (27.48 acres), and 012-100-018 (0.87 acres). The site is bound by a residential development to the southeast and undeveloped land to the north, southwest, east and west.

1.3 PROPOSED DEVELOPMENT

Based on our review of the updated grading plans and discussions with you, it is our understanding that site improvements will include construction of approximately 86 one- to two-story wood-frame single-family houses, a detention pond, retaining walls, roadways, underground utilities and associated improvements. In addition, we understand grades will be raised throughout the site from approximately 2 to 10 feet. Structural loads were not provided but are considered to be representative for this type of construction.

2.0 RECOMMENDATIONS

The recommendations included in this report, along with other sound engineering practices, should be incorporated in the design and construction of the project. At the time of this report, site grading has already commenced and it is our understanding that the grading is being performed in accordance with the original project geotechnical report. The following grading recommendations should be adhered to from the date of this report moving forward.

2.1 ACCEPTED MATERIALS

Based on our review of the referenced documents, it is our understanding that a single source of import has been reviewed and approved by others from a geotechnical and environmental standpoint. We should be informed if an alternative import source is planned for the site. Import materials should be submitted to, and approved by, the Geotechnical Engineer prior to delivery

at the site. Based on our review, we understand import materials vary in plasticity index from approximately 2 to 18. If additional import material is needed to complete the project, it should have a plasticity index similar to the currently approved import material.

2.2 LIQUEFACTION AND SEISMIC SETTLEMENT

Soil liquefaction results from loss of strength during cyclic loading, such as imposed by earthquakes. Soils most susceptible to liquefaction are clean, loose, saturated, uniformly graded, fine-grained sands. Empirical evidence indicates that loose to medium-dense gravels, silty sands, and low- to moderate-plasticity silts and clays may be susceptible to liquefaction. In addition, sensitive high-plasticity soils may be susceptible to significant strength loss (cyclic softening) as a result of significant cyclic loading. In addition, densification of loose granular soils above the groundwater level can cause settlement due to earthquake-induced vibrations. Based on our analysis, the subsurface explorations performed on the site encountered potentially liquefiable sands, densification of dry sands, and moderately susceptible clayey soils for cyclic softening materials below the ground surface.

We evaluated the liquefaction potential of the site soil with CPT data using methods published by Idriss and Boulanger (2014). Our analyses were performed using a PGA_M of 1.0 and a M_w 8.0 earthquake; the PGA value is based on the 2016 California Building Code, and the earthquake magnitude is associated with an earthquake on the San Andreas Fault. We assumed groundwater to be at approximately 5 feet below the original ground surface and approximately 5 to 10 feet of additional fill placed at the site to reach the proposed site elevations in our analysis. Based on our analysis, various layers of the subsurface material may be susceptible to densification and settlement during a strong seismic event. Our results, presented in Appendix D, indicate that total seismically induced settlements are estimated to be up to 4 ½ inches. We provide recommendations for total and differential settlements to use for foundation design in Section 2.5. Our analysis is also summarized in Appendix D.

2.3 FILL PLACEMENT

All fills should be placed in thin lifts, with the lift thickness not to exceed 8 inches or the depth of penetration of the compaction equipment used, whichever is less.

The following compaction control requirements should be applied to onsite expansive materials.

Test Procedures:	ASTM D-1557
Required Moisture Content:	Not less than 5 percentage points above optimum moisture content
Required Relative Compaction:	Between 85 and 90 percent in the upper 5 feet and 90 percent below 5 feet

The following compaction control requirements should be applied to moderately expansive import soil or chemically treated soil.

Test Procedures:	ASTM D-1557
Required Moisture Content:	Not less than 3 percentage points above optimum moisture
Minimum Relative Compaction:	Not less than 90 percent in the upper 5 feet and 95 percent below 5 feet

Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material. Additional compaction recommendations may be developed during construction.

2.4 CONSOLIDATION SETTLEMENT

As discussed in Section 1.3, fill placement is proposed to be on the order of 5 to 10 feet on a majority of the proposed pads. Based on our review of the existing explorations, we believe fill placement will cause recompression settlement of clayey soils throughout the site. Settlements are expected to be on the order of 2 to 3 inches based on the proposed fill thickness of 5 to 10 feet. Based on the interbedded subsurface stratigraphy providing additional drainage paths, we believe settlements should occur rapidly after fill placement. We anticipate that 90 percent of the settlement should occur within approximately 3 months following the completion of mass grading. We expect the potential for differential settlement due to consolidation settlement to be low. The above settlements are based on limited laboratory testing and uncorrelated estimates to the maximum past pressure and consolidation properties.

2.5 POST-TENSIONED MAT FOUNDATIONS

We developed structural improvement recommendations using data obtained from previous field exploration, laboratory test results, and engineering analysis. We recommend that the single-family structures be supported on post-tensioned (PT) mat foundations to mitigate potential impacts from expansive soil and liquefaction.

We recommend that the proposed single-family structures be supported on post-tensioned (PT) mat foundations bearing on engineered fill. We recommend that PT mats be at least 10 inches thick and have a thickened edge at least 2 inches greater than the mat thickness. The thickened edge should be at least 12 inches wide.

Design PT mats for an average allowable bearing pressure of 1,500 pounds per square foot (psf) for dead-plus-live loads, with maximum localized bearing pressures of 1,500 psf at column or wall loads. Allowable bearing pressures can be increased by one-third for all loads including wind or seismic. The post-tensioned slabs should be designed to withstand 2 inches of differential settlement due to liquefaction and dry sand dynamic settlement. Due to the amount of imported engineered fill being placed on the pads, a stiffness coefficient of $L/240$ should be considered for the design, however the actual stiffness coefficient should be determined by the structural engineer. The PT mats should be designed using the criteria presented in Table 2.5-1 below.

TABLE 2.5-1: Post-Tension Design Criteria

CONDITION	CENTER LIFT	EDGE LIFT
Edge Moisture Variation Distance, e_m (feet)	8.6	4.3
Differential Soil Movement, y_m (inches)	0.3	0.7

The above design criteria are based on the procedure presented by the Post-Tensioning Institute “Design of Post-Tensioned Slabs-on-Ground” Third Edition, including appropriate addenda (2004).

2.6 DECOUPLING SYSTEM

We evaluated the need for a foundation decoupling system at the northeast portion of the site. Based on our review of the updated grading plans and recently revised peer reviewed fault study References 12, and 3, respectively; no previous traces or evidence of surface faulting at the subject site was indicated. In addition, based on our review of the relative distance of the mapped fault and the existing ditch to the proposed building pads, foundation type and pad elevation, we believe the risk for significant sympathetic movement and lateral spreading is low at the eastern portion of the site. Therefore, mitigation of lateral spreading and surface faulting within the proposed building footprints using a foundation decoupling system will provide little to no benefit and is not recommended.

2.7 VAPOR TRANSMISSION

Underlay PT mats with a moisture reduction system as recommended below. In addition, moisture condition the pad subgrade to a moisture content at least 4 percentage points above optimum prior to foundation construction. The subgrade should not be allowed to dry prior to concrete placement. We also recommend that we be retained to observe the prepour moisture conditions to check that our report recommendations have been followed.

When buildings are constructed with concrete slab-on-grade, such as post-tensioned mats, water vapor from beneath the slab will migrate through the slab and into the building. This water vapor can be reduced but not stopped. Vapor transmission can negatively affect floor coverings and lead to increased moisture within a building. When water vapor migrating through the slab would be undesirable, we recommend the following to reduce, but not stop, water vapor transmission upward through the slab-on-grade.

1. Install a vapor retarder membrane directly beneath the slab. Seal the vapor retarder at all seams and pipe penetrations. Vapor retarders shall conform to Class A vapor retarder in accordance with ASTM E 1745-11 "Standard Specification for Plastic Water Vapor Retarders used in Contact with Soil or Granular Fill under Concrete Slabs".
2. Concrete shall have a concrete water-cement ratio of no more than 0.50.
3. Provide inspection and testing during concrete placement to check that the proper concrete strength and water cement ratio are used.
4. Moist cure slabs for a minimum of 3 days or use other equivalent curing specific by the structural engineer.

2.8 2016 CBC SEISMIC DESIGN PARAMETERS

Based on the subsurface conditions encountered and local seismic sources, the following 2016 California Building Code (CBC) seismic design parameters should be used for design. Note that the final 2016 CBC is not yet available; however, based on our review of draft versions, the procedure to determine the seismic design criteria will remain unchanged from the 2013 CBC. We should revisit this assessment when the 2016 CBC is published.

TABLE 2.8-1: 2016 CBC Seismic Design Parameters
Latitude: 36.85497°, Longitude: -121.54605°

PARAMETER	DESIGN VALUE
Site Soil Classification	D
Mapped MCE _R Spectral Response Acceleration at Short Periods, S _S (g)	2.60
Mapped MCE _R Spectral Response Accelerations at 1-second Periods, S ₁ (g)	1.25
Short-Period Site Coefficient, F _A	1.0
Long-Period Site Coefficient, F _V	1.5
MCE _R Spectral Response Acceleration at Short Periods, S _{MS} (g)	2.60
MCE _R Spectral Response Acceleration at 1-second Periods, S _{M1} (g)	1.87
Design Spectral Response Acceleration at Short Periods, S _{DS} (g)	1.73
Design Spectral Response Acceleration at 1-second Periods, S _{D1} (g)	1.25
Site Coefficient, F _{PGA}	1.0
MCE Geometric Mean Peak Ground Acceleration, PGA _M (g)	1.0
Long period transition-period, T _L	12 sec

MCE_R = Risk-Targeted Maximum Considered Earthquake
MCE = Maximum Considered Earthquake

2.9 SECONDARY SLAB-ON-GRADE CONSTRUCTION

This section provides guidelines for secondary slabs such as exterior walkways, steps, and sidewalks. Secondary slabs-on-grade should be constructed structurally independent of the foundation system. This allows slab movement to occur with a reduced potential for foundation distress. Where secondary slab-on-grade construction is anticipated, care must be exercised in attaining a near-saturation condition of the subgrade soil before concrete placement.

Secondary slabs-on-grade should be designed specifically for their intended use and loading requirements. Cracking of conventional slabs should be expected as a result of concrete shrinkage and the expansive soils at the site. Slabs-on-grade should be reinforced for control of cracking, and frequent control joints should be provided to control the cracking. Such reinforcement should be designed by the Structural Engineer. In our experience, welded wire mesh may not be sufficient to control slab cracking. There are numerous measures that can be implemented to improve the performance of exterior slabs including extending the select fill placed below the building to areas where exterior slabs will be constructed. We would be pleased to consult with you in this regard if desired.

Secondary slabs-on-grade should have a minimum thickness of 4 inches. A 4-inch-thick layer of clean crushed rock or gravel should be placed under slabs. Exterior slabs should be constructed with thickened edges extending at least beneath the crushed rock or gravel into compacted soil to reduce water infiltration. Slabs should slope away from the buildings at a slope of at least 2 percent to prevent water from flowing toward the building.

2.10 RETAINING WALLS

Unrestrained drained retaining walls constructed on level ground may be designed using active equivalent fluid pressures as follows.

TABLE 2.10-1: Active Equivalent Fluid Pressures

BACKFILL SLOPE CONDITION (HORIZONTAL:VERTICAL)	ACTIVE PRESSURE (POUNDS PER CUBIC FOOT)	SEISMIC EARTH PRESSURE (POUNDS PER CUBIC FOOT)
Level	45	45
3:1	60	55

Restrained walls should be designed as drained retaining walls using an at-rest fluid pressure of 75 pcf for level backfill conditions.

In accordance with 2016 California Building Code requirements, foundation walls and retaining walls supporting more than 6 feet of backfill height are to be designed for dynamic seismic lateral earth pressures corresponding to design earthquake ground motions. We recommend the above dynamic seismic lateral earth pressure be added to the active pressure shown above and be calculated using a triangular distribution. This pressure should be applied at 0.6H from the bottom of the wall or as inverted triangular distribution.

Passive pressures acting on foundations may be assumed as 300 pcf provided that the area in front of the retaining wall is level for a distance of at least 10 feet or three times the depth of foundation and keyway, whichever is greater. The upper 1 foot of soil should be excluded from passive pressure computations. The friction factor for sliding resistance may be assumed as 0.30. It is recommended that retaining wall footings be designed using an allowable bearing pressure of 1,500 psf. The wall footings should extend to a depth of at least 24 inches. Appropriate safety factors against overturning and sliding should be incorporated into the design calculations.

Appropriate surcharge loads from buildings, hardscape, and vehicles should be incorporated when the surcharge loading is situated above a 1:1 (horizontal:vertical) line of projection extending up the rear base edge of the bottom of the footing. A uniform horizontal surcharge load of 50 percent of the vertical surcharge load should be assumed to act over the height of the wall.

All walls retaining at least 2 feet of soil should be provided with drainage facilities to prevent the build-up of hydrostatic pressures behind the walls. Wall drainage may be provided using a 4-inch-diameter perforated pipe embedded in either free-draining gravel surrounded by synthetic filter fabric (minimum 6-ounce) or Class 2 permeable material. The width of the drain blanket should be at least 12 inches, and the drain blanket should extend to about 1 foot below the finished grades. The upper 1 foot of wall backfill should consist of compacted site soils. Drainage should be discharged into solid pipes and directed to an outlet approved by the Civil Engineer. Synthetic filter fabric should meet the minimum requirement listed in the Supplemental Recommendations and be preapproved by the Geotechnical Engineer prior to delivery.

All backfill should be placed in accordance with the recommendations provided above for engineered fill. Light equipment should be used during backfill compaction to reduce possible overstressing of the walls. The foundation details and structural calculations for retaining walls should be submitted for review.

Due to the potential for liquefaction induced settlement at the subject site and the potential for different types of walls, supplemental recommendations may be needed to design the walls once the wall types and locations are known.

2.11 PAVEMENT DESIGN

The following pavement design is provided based on assumed Traffic Index and subgrade resistance values (R-value). The Traffic Index should be determined by the Civil Engineer or appropriate public agency. The sections provided below should be reviewed and revised, if applicable, based on R-value tests performed on samples of actual subgrade materials recovered at the time of grading.

2.11.1 Flexible Pavement

At this time, R-Value testing has not been performed on the proposed import material that will be located within the pavement subgrade. For preliminary design purposes, we estimate that site soil will have a resistance (R-value) value of 5. The following preliminary pavement sections have been determined based on an assumed R-value of 5 according to the method contained in Topic 608 of Highway Design Manual by CALTRANS (revised August 5, 1988). Alternative-I considers a standard pavement design consisting of asphalt concrete and aggregate base over import subgrade soil. Alternative-II considers a chemically treated subgrade soil, and assumes an R-value of 40 for the treated subgrade.

TABLE 2.11.1-1: Flexible Pavement Design

TRAFFIC INDEX (TI)	ALTERNATIVE I R-VALUE OF 5 (UNTREATED SUBGRADE)		ALTERNATIVE II R-VALUE OF 40 (CHEMICALLY TREATED SUBGRADE)	
	AC (INCHES)	AB (INCHES)	AC (INCHES)	AB (INCHES)
5.0	4	8	4	6
6.0	4	12	4	6
7.0	4	16	4	7

Notes: AC is asphalt concrete
AB is aggregate base Class 2 Material with minimum R = 78

The chemical treatment should consist of 3 to 5 percent high calcium lime or quick lime plus within the upper 15 inches of pavement subgrade soil. The amount of lime required should be based upon an assumed 125 pcf for the soil density. Once subgrade is achieved, the subgrade soil should be tested for pH and sulfate content to determine amount of lime needed. The actual subgrade material should also be tested for R-value which could reduce the above pavement design thicknesses above.

2.11.2 Pavement Subgrade Preparation

Pavement construction and all materials (hot mix asphalt and aggregate base) should comply with the requirements of the Standard Specifications of the State of California Division of Highways, and the following minimum requirements.

- All pavement subgrades should be scarified to a depth of 10 to 12 inches below finished subgrade elevation, moisture conditioned to above optimum moisture content, and compacted to at least 95 percent relative compaction.
- Subgrade soils should be in a stable, non-pumping condition at the time aggregate baserock materials are placed and compacted. Proof-rolling with a heavy wheel-loaded piece of construction equipment should be implemented. Yielding materials should be

appropriately mitigated, with suitable mitigation measures developed in coordination with the client, contractor and Geotechnical Engineer.

- Adequate provisions must be made such that the subgrade soils and aggregate baserock materials are not allowed to become saturated.
- Aggregate baserock materials should meet current Caltrans specifications for Class 2 aggregate baserock and should be compacted to at least 95 percent of maximum dry density at a moisture content of at least optimum. Proof-rolling with a heavy wheel-loaded piece of construction equipment should be implemented after placement and compaction of the aggregate base. Yielding materials should be appropriately mitigated, with suitable mitigation measures developed in coordination with the client, contractor and Geotechnical Engineer.
- Hot mix asphalt paving materials should meet current Caltrans specifications and City requirements.
- A pavement edge drain should be installed to help collect and transport potential subsurface seepage.

2.12 SURFACE AND SUBSURFACE DRAINAGE

Based on our review of the referenced grading plans and historic piezometer data, the groundwater should be sufficiently deeper than the proposed grades. However, as discussed above we recommend a pavement edge drain be installed at the edge of the proposed pavement areas to collect nuisance and landscape water as well as potential occasional spikes in the groundwater.

The building pads should be positively graded at all times to provide for rapid removal of surface water runoff away from the foundation system and to prevent ponding of water under the foundation or seepage toward the foundation system at any time during or after construction. Ponded water may cause undesirable soil swell and loss of strength. As a minimum requirement, finished grades should have slopes of at least 3 percent within 5 feet from the exterior walls and at right angles to allow surface water to drain positively away from the structure. For paved areas, the slope gradient can be reduced to 2 percent.

All surface water should be collected and discharged into outlets approved by the Civil Engineer. Landscape mounds must not interfere with this requirement.

All roof stormwater should be collected and directed to downspouts. Stormwater from roof downspouts should not be allowed to discharge directly onto the ground surface in close proximity to the foundation system, such as through the use of splashblocks. Rather, stormwater from roof downspouts should be directed to a solid pipe that discharges into the street or to an outlet approved by the Civil Engineer. If this is not acceptable, we recommend downspouts discharge at least 5 feet away from foundations and the minimum gradient within 5 feet from the foundation should be increased from 3 to 5 percent. Alternatively, engineered stormwater systems can be developed under the guidance of ENGEO.

2.13 UTILITIES

It is recommended that utility trench backfilling be done under the observation of the Geotechnical Engineer. Ideally, pipe zone backfill (i.e. material beneath and immediately surrounding the pipe) should consist of native material less than $\frac{3}{4}$ inch in maximum dimension compacted in accordance with recommendations provided above for engineered fill. Trench zone backfill (i.e. material placed between the pipe zone backfill and the ground surface) should also consist of native soil compacted in accordance with recommendations for engineered fill. Controlled density fill is also suitable for pipe zone and trench zone backfill.

If required by local agencies, where import material is used for pipe zone backfill, we recommend it consist of quarry fines, fine- to medium-grained sand, or a well-graded mixture of sand and gravel and that this material not be used within 2 feet of finish subgrades. This material should be compacted to at least 90 percent relative compaction at a moisture content of not less than optimum.

In general, uniformly graded gravel should not be used for pipe or trench zone backfill due to the potential for migration of soil into the relatively large void spaces present in this type of material and for movement of water along trenches backfilled with this type of material. If uniformly graded gravel is used, we recommend that it be encapsulated in 6-ounce filter fabric. Providing outlet locations into manholes or catch basins for water collected in granular trench backfill should also be considered.

All utility trenches entering the buildings and paved areas should be provided with an impervious seal where the trenches pass under or through the building perimeter or curb lines. The impervious plug should extend at least 3 feet to both sides of the crossing and should be placed below, around, and above the utility pipe such that it is entirely in contact with the trench walls and pipe. This is to prevent surface water percolation into the import sand or gravel pipe zone backfill under foundations and pavements where such water would remain trapped in a perched condition.

Care should be exercised where utility trenches are located beside foundation areas. Utility trenches constructed parallel to foundations should be located entirely above a plane extending down from the lower edge of the footing at an angle of 45 degrees. Utility companies and Landscape Architects should be made aware of this information.

Utility trenches in public areas to be paved should be constructed in accordance with the City requirements or approved alternatives. Compaction of backfill by jetting should not be allowed at this site.

3.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report is issued with the understanding that it is the responsibility of the owner to transmit the information and recommendations of this report to developers, contractors, buyers, architects, engineers, and designers for the project so that the necessary steps can be taken by the contractors and subcontractors to carry out such recommendations in the field. The conclusions and recommendations contained in this report are solely professional opinions.

The professional staff of ENGEO Incorporated strives to perform its services in a proper and professional manner with reasonable care and competence but is not infallible. There are risks of earth movement and property damages inherent in land development. We are unable to eliminate all risks or provide insurance; therefore, we are unable to guarantee or warrant the results of our services.

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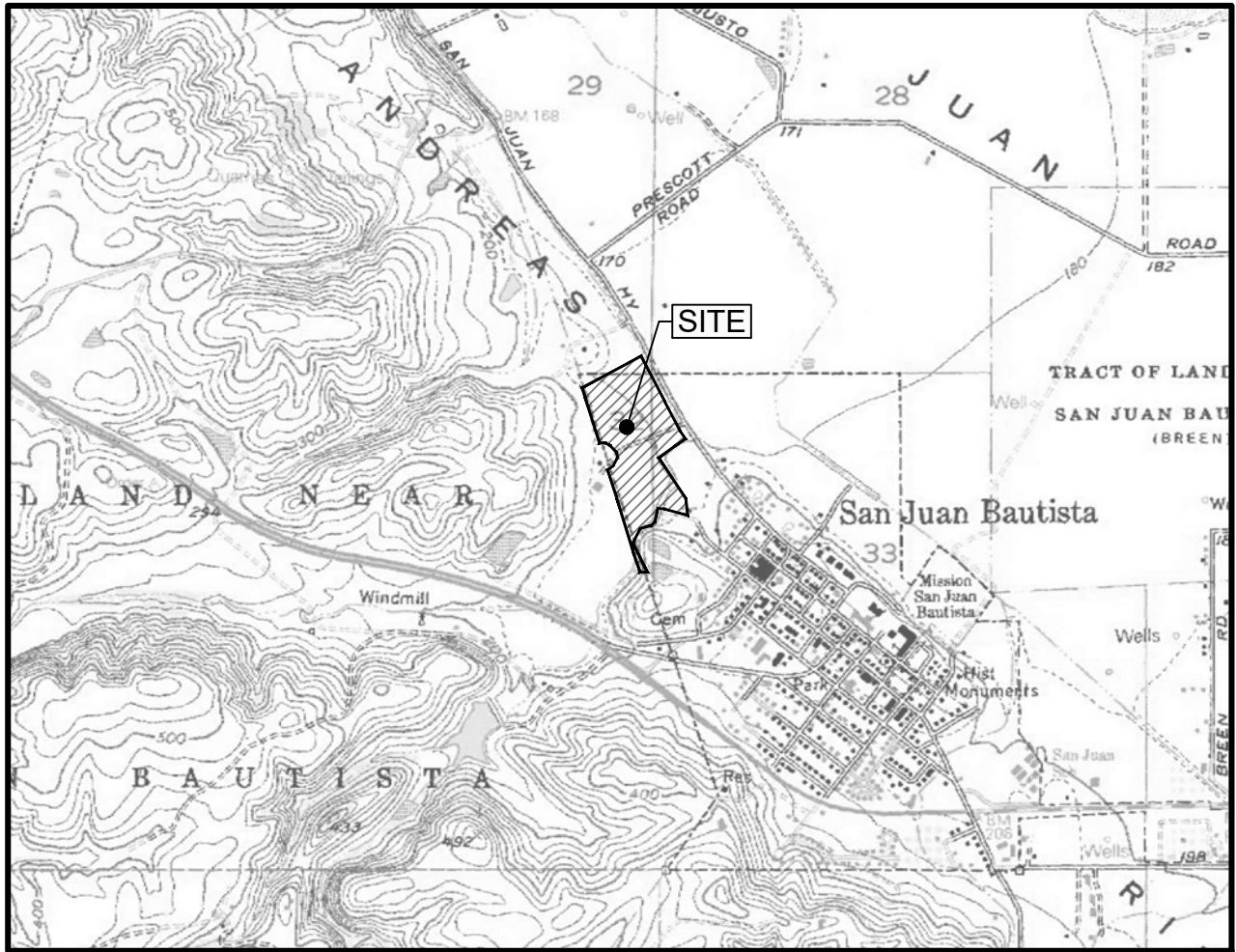


FIGURES

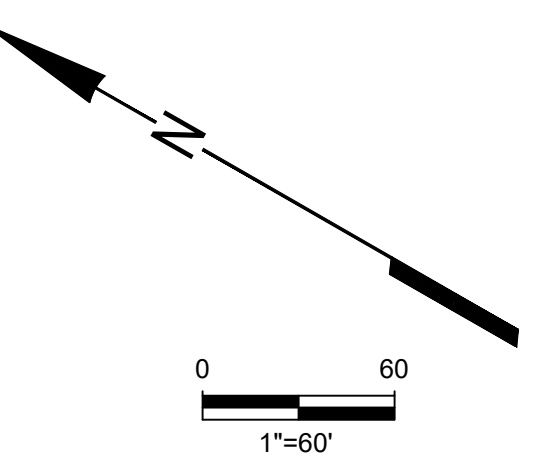
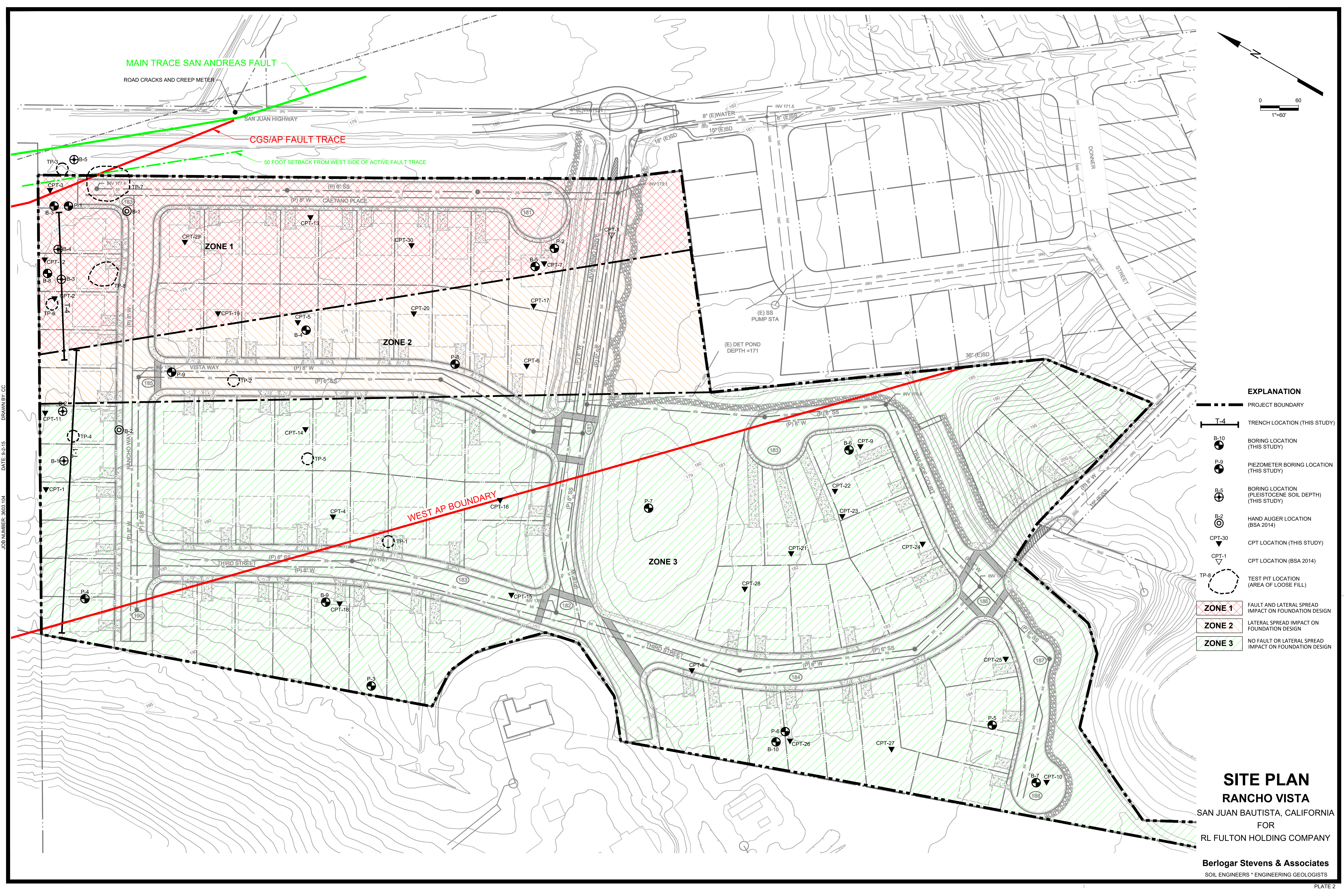
FIGURE 1 – VICINITY MAP

FIGURE 2 – SITE PLAN

JOB NUMBER: 3603.104 DATE: 7-21-15 BY: CC



VICINITY MAP
RANCHO VISTA
SAN JUAN BAUTISTA, CALIFORNIA
FOR
RL FULTON HOLDING COMPANY



JOB NUMBER: 3603.104
 DATE: 9-2-15
 DRAWN BY: CC

EXPLANATION

- PROJECT BOUNDARY
- T-4 TRENCH LOCATION (THIS STUDY)
- B-10 BORING LOCATION (THIS STUDY)
- P-9 PIEZOMETER BORING LOCATION (THIS STUDY)
- B-5 BORING LOCATION (PLEISTOCENE SOIL DEPTH) (THIS STUDY)
- B-2 HAND AUGER LOCATION (BSA 2014)
- CPT-30 CPT LOCATION (THIS STUDY)
- CPT-1 CPT LOCATION (BSA 2014)
- TP-8 TEST PIT LOCATION (AREA OF LOOSE FILL)
- ZONE 1** FAULT AND LATERAL SPREAD IMPACT ON FOUNDATION DESIGN
- ZONE 2** LATERAL SPREAD IMPACT ON FOUNDATION DESIGN
- ZONE 3** NO FAULT OR LATERAL SPREAD IMPACT ON FOUNDATION DESIGN

**SITE PLAN
RANCHO VISTA**

SAN JUAN BAUTISTA, CALIFORNIA
FOR
RL FULTON HOLDING COMPANY

Berloger Stevens & Associates
SOIL ENGINEERS * ENGINEERING GEOLOGISTS





APPENDIX A

FIELD EXPLORATIONS BY OTHERS

BORING LOG B-1


Job No.: 3603.100	Client: RL Fulton Holding Comany	Elevation: 177.5 feet
Job Name: Rancho Vista	Drill Method: Hand Auger	Date Drilled: 2-28-14


SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
 Bulk Sample		

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Type	USCS Classification	DESCRIPTION AND REMARKS
			0		CH	SILTY CLAY, medium to dark gray-brown, moist, medium stiff to stiff, trace fine-to medium-grained sand
			1			
			2		CH/CL	PI = 30 90% passing #200 sieve SILTY CLAY, light gray-brown, moist, stiff, trace fine-grained sand
			3			
			4		CL	SILTY CLAY, light gray-brown, moist, stiff
			5			Boring terminated at 5 feet No groundwater encountered
			6			
			7			
			8			
			9			
			10			

BORING LOG B-2



Job No.: 3603.100	Client: RL Fulton Holding Comany	Elevation: 178.7 feet
Job Name: Rancho Vista	Drill Method: Hand Auger	Date Drilled: 2-28-14






SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
 Bulk Sample		

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Type	USCS Classification	DESCRIPTION AND REMARKS
			0		CL/CH	SANDY CLAY, medium to dark gray-brown, moist, medium stiff to stiff, trace fine-to medium-grained sand
			1			
			2			
			3		SC	CLAYEY SAND, light to medium gray-brown, moist, medium dense, fine-grained sand, trace silt
			4		CL	SANDY CLAY, light gray-brown, moist, stiff, fine-grained sand
			4-1/2		CL	SANDY CLAY, light gray-brown, saturated, stiff, fine-to medium-grained sand, caliche and limonite stains
			5			Boring terminated at 5 feet Groundwater encountered at 4-1/2 feet
			6			
			7			
			8			
			9			
			10			

BORING LOG B-3



Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 176.7 feet
Job Name: Rancho Vista	Drill Method: Hollow-stem Auger	Date Drilled: 6-17-15






SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
 2.5-inch I.D. Split Barrel	140	30
 Bulk Sample		

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
30	91.8	24	0		CL	SILTY CLAY, gray-brown, dry to moist, stiff	176.7
			-		CL	SILTY CLAY, light to medium gray-brown, moist, stiff	-
			-		CL	SILTY CLAY, light gray-brown, moist to wet, very stiff, light gray-brown mottling	-
-	-	18	6-1/2		ML	SANDY SILT, light gray-brown, saturated, stiff, fine-to medium-grained sand 69% Passing #200 sieve	171.7
			-				below 6-1/2 feet, saturated
			10				166.7
			15			Boring terminated at 14-1/2 feet Groundwater encountered at 6-1/2 feet, rose to 5 feet	161.7
			20				156.7

BORING LOG B-4



Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 178.7 feet
Job Name: Rancho Vista	Drill Method: Hollow-stem Auger	Date Drilled: 6-17-15








SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
 2.5-inch I.D. Split Barrel	140	30
 Bulk Sample		

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		CL	SILTY CLAY, gray-brown, dry to moist, stiff to very stiff, trace fine-grained sand	178.7
			-				-
			-				-
			-				-
			-				-
			-				-
			-				-
			5		CL	SILTY CLAY, light to medium gray-brown, moist, stiff	173.7
			-				-
			-			below 6-1/2 feet, saturated	-
			-				-
			-				-
			10				168.7
			-				-
			-				-
			-				-
29.1	94.1	23	-		ML	SANDY SILT, light gray-brown, saturated, stiff to very stiff, fine-grained sand 67% Passing #200 sieve	-
			-				-
			15			Boring terminated at 14-1/2 feet Groundwater encountered at 6-1/2 feet	163.7
			-				-
			-				-
			-				-
			-				-
			20				158.7

BORING LOG B-5



Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 180 feet
Job Name: Rancho Vista	Drill Method: Hollow-stem Auger	Date Drilled: 6-17-15








SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
 2.5-inch I.D. Split Barrel	140	30
 Bulk Sample		

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)	
22.2	96.3	19	0		CL	SILTY CLAY, gray-brown, dry to moist, stiff, trace fine-grained sand	180	
			-					-
			-					-
			-					-
-	-	13	5		SM	SILTY SAND, light to medium gray-brown, saturated, medium dense, fine-to coarse-grained sand	175	
			-		CL	SILTY CLAY, light gray-brown, saturated, stiff	-	
-	-	11	-				-	
			-				-	
			-				-	
			-				-	
33.6	88.1	11	10		SM	SILTY SAND, light to medium gray-brown, saturated, loose, fine-grained sand	170	
			-		CL	SANDY CLAY, light gray-brown, saturated, medium stiff to stiff, fine-grained sand, trace clay	-	
			-			90% Passing #200 sieve PI=13 LL=36	-	
-	-	-	15		CL	SANDY CLAY, light to medium gray-brown, saturated, medium stiff, fine-grained sand	165	
			-		CL/CH	SANDY CLAY, dark gray-brown, saturated, medium stiff to stiff	-	
			-			Boring terminated at 17-1/2 feet Groundwater encountered at 7 feet	-	
			-				-	
			20				160	

BORING LOG B-6

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 182.5 feet
Job Name: Rancho Vista	Drill Method: Hollow-stem Auger	Date Drilled: 6-17-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
 2.5-inch I.D. Split Barrel	140	30
 Bulk Sample		

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		CL	SANDY CLAY, gray-brown, dry to moist, stiff, fine-grained sand, some silt	182.5
			-				-
			-				-
			-		CL	SILTY CLAY, gray-brown, moist, very stiff	-
			-				-
			5		CL	SILTY CLAY, light gray-brown, moist to wet, very stiff, dark gray-brown mottling	177.5
35.3	83.9	26	5		ML	CLAYEY SILT, light gray-brown, saturated, stiff	-
			-				-
			-		CL	SILTY CLAY, light to medium gray-brown, saturated, stiff	-
			10				172.5
			-				-
18.2	112.1	12	-		CL	SANDY CLAY, light gray-brown, saturated, medium stiff, fine-to coarse-grained sand 62% Passing #200 sieve PI=13 LL=26	-
			-				-
			15		CL	SILTY CLAY, light gray-brown, saturated, stiff, limonite stains	167.5
			-				-
			-				-
			20				162.5
-	-	67					

BORING LOG B-6



Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 182.5 feet
Job Name: Rancho Vista	Drill Method: Hollow-stem Auger	Date Drilled: 6-17-15






SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
■ 2.5-inch I.D. Split Barrel	140	30
▨ Bulk Sample		

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
-	-	67	20	■	CL	SILTY CLAY, light gray-brown, saturated, stiff, limonite stains	162.5
			-	■	CL	SANDY CLAY, light orange-brown, saturated, hard, fine-to coarse-grained sand, trace fine gravel	-
			-			Boring terminated at 21-1/2 feet Groundwater encountered at 6-1/2 feet, rose to 5-1/2 feet	-
			-				-
			-				-
			25				157.5
			-				-
			-				-
			-				-
			30				152.5
			-				-
			-				-
			-				-
			35				147.5
			-				-
			-				-
			-				-
			40				142.5

BORING LOG B-7



Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 184.5 feet
Job Name: Rancho Vista	Drill Method: Hollow-stem Auger	Date Drilled: 6-17-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
 2.5-inch I.D. Split Barrel	140	30
 Bulk Sample		

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)		
23.1	101.4	7	0		CL	SANDY CLAY/SILT, gray-brown, dry to moist, stiff, trace fine-to medium-grained sand 73% Passing #200 sieve PI=13 LL=33	184.5		
			-					-	
			-					-	
			-					-	
			-					-	
			-					-	
			5					below 6 feet, saturated	179.5
			-					-	
			-					-	
			-					-	
-	-	17	10		CL	SANDY CLAY, medium to dark gray-brown, saturated, medium stiff, fine-to medium-grained sand 52% Passing #200 sieve, PI=12 LL=28	174.5		
			-		CL	SILTY CLAY, mottled light gray and gray-brown, saturated, medium stiff	-		
			-		SM	SILTY SAND, light gray, saturated, medium dense to loose, fine-to medium-grained sand	-		
			-				-		
			-				-		
-			15		CL	SILTY CLAY, dark gray-brown, saturated, stiff, trace to some fine-grained sand	169.5		
-			-			-			
-			-			-			
-			-			-			
-			-			-			
-			20			164.5			

BORING LOG B-7



Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 184.5 feet
Job Name: Rancho Vista	Drill Method: Hollow-stem Auger	Date Drilled: 6-17-15






SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
 2.5-inch I.D. Split Barrel	140	30
 Bulk Sample		

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
-	-	17	20		CL	SILTY CLAY, dark gray-brown, saturated, stiff, trace to some fine-grained sand	164.5
-	-	17	-		CL	SILTY CLAY, brown-gray, saturated, stiff, trace fine-grained sand	-
-	-	17	-				-
-	-	17	-				-
-	-	17	-				-
-	-	17	-				-
-	-	17	25			Boring terminated at 23-1/2 feet Groundwater encountered at 6 feet, rose to 5-1/2 feet	159.5
-	-	17	-				-
-	-	17	-				-
-	-	17	-				-
-	-	17	-				-
-	-	17	-				-
-	-	17	30				154.5
-	-	17	-				-
-	-	17	-				-
-	-	17	-				-
-	-	17	-				-
-	-	17	-				-
-	-	17	-				-
-	-	17	35				149.5
-	-	17	-				-
-	-	17	-				-
-	-	17	-				-
-	-	17	-				-
-	-	17	-				-
-	-	17	-				-
-	-	17	40				144.5

BORING LOG B-8



Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 177 feet
Job Name: Rancho Vista	Drill Method: Hollow-stem Auger	Date Drilled: 6-17-15



SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
 2.5-inch I.D. Split Barrel	140	30
 Bulk Sample		

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
-	-	23	0		CL	SILTY CLAY, gray-brown, dry to moist, stiff	177
			-			87% Passing #200 sieve PI=29 LL=46	-
			-		CL	SILTY CLAY, light to medium gray-brown, moist, stiff	-
			-				-
			5			below 6 feet, saturated	172
			-				-
			-				-
			10				167
			-		SM	SILTY SAND, light gray-brown, saturated, medium dense, fine-grained sand, limonite stains 47% Passing #200 sieve	-
			-				-
			15				162
			-		ML	CLAYEY SILT, light gray-brown, saturated, stiff, trace fine-grained sand	-
			-				-
			-				-
			20				157

BORING LOG B-8

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 177 feet
Job Name: Rancho Vista	Drill Method: Hollow-stem Auger	Date Drilled: 6-17-15






SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
 2.5-inch I.D. Split Barrel	140	30
 Bulk Sample		

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
-	-	43	20		ML	CLAYEY SILT, light gray-brown, saturated, stiff, trace fine-grained sand	157
			-				-
			-				-
			-				-
			25		SM	SILTY SAND, light gray-brown, saturated, medium dense, fine-grained sand	152
			-				-
			-		CL	SILTY CLAY, light brown-gray, saturated, very stiff, black mottling, limonite stains	-
			-				-
			30			Boring terminated at 28-1/2 feet Groundwater encountered at 6 feet, rose to 5-1/2 feet	147
			-				-
			-				-
			-				-
			35				142
			-				-
			-				-
			-				-
			40				137

BORING LOG B-9

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 184 feet
Job Name: Rancho Vista	Drill Method: Hollow-stem Auger	Date Drilled: 6-17-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
2.5-inch I.D. Split Barrel	140	30
Bulk Sample		

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		CL	SANDY CLAY, gray-brown, dry to moist, stiff, fine-to medium-grained sand, some silt 64% Passing #200 sieve PI=12 LL=28	184
			-		CL	SANDY CLAY, light to medium gray-brown, moist, stiff, fine-to medium-grained sand, trace to some silt	-
			-				-
			5				179
			-				-
			-				-
			-				-
			10				174
			-		CH	SILTY CLAY, light gray-brown, saturated, very stiff, trace fine-grained sand, limonite stains 94% Passing #200 sieve PI=40 LL=53	-
			-				-
			-				-
			15				169
			-				-
			-				-
			20		SM	SILTY SAND, light gray-brown, saturated, medium dense to loose, fine-to coarse-grained sand, limonite stains	164

BORING LOG B-9

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 184 feet
Job Name: Rancho Vista	Drill Method: Hollow-stem Auger	Date Drilled: 6-17-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
2.5-inch I.D. Split Barrel	140	30
Bulk Sample		

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
16.7	110.5	82	20		CL	SILTY CLAY, light gray-brown, saturated, very stiff, trace fine-grained sand, limonite stains	164
			-		SM	SILTY SAND, light gray-brown, saturated, medium dense to loose, fine-to coarse-grained sand, limonite stains	-
			-		ML	SILT (SILTSTONE?), light gray-brown, saturated, very dense, trace fine-grained sand, heavy limonite stains	-
			-			Boring terminated at 22-1/2 feet Groundwater encountered at 7 feet, rose to 6 feet	-
			-				-
			25				159
			-				-
			-				-
			-				-
			-				-
			30				154
			-				-
			-				-
			-				-
			35				149
			-				-
			-				-
			-				-
			40				144

UNIFIED SOIL CLASSIFICATION SYSTEM











BY: CC

DATE: 6-19-15

MAJOR DIVISIONS			CLASSIFICATION SYMBOL	TYPICAL NAMES
COARSE GRAINED SOILS MORE THAN HALF OF THE MATERIAL IS LARGER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS WITH LITTLE TO NO FINES	GW	WELL GRADED GRAVELS, GRAVEL/SAND MIXTURES
			GP	POORLY GRADED GRAVELS, GRAVEL/SAND MIXTURES
		GRAVEL WITH OVER 12% FINES	GM	SILTY GRAVELS, POORLY GRADED GRAVEL/SAND/SILT MIXTURES
			GC	CLAYEY GRAVELS, POORLY GRADED GRAVEL/SAND/CLAY MIXTURES
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS WITH LITTLE TO NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS
			SP	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS, POORLY GRADED SAND/SILT MIXTURES
			SC	CLAYEY SANDS, POORLY GRADED SAND/CLAY MIXTURES
FINE GRAINED SOILS MORE THAN HALF OF THE MATERIAL IS SMALLER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY	
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
		OL	ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS	
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SILTS

KEY TO BORING LOG SYMBOLS

JOB NUMBER: 3603.104

Depth in Feet	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per foot	Unified Soil Classification System	
					Bulk Sample
					2.5-inch I.D. Split Barrel Sample
					2.8-inch I.D. Shelby Tube Sample
					No Sample recovered
					Standard Penetration Test interval
					Well-defined stratum change
					Gradual stratum change
					Interpreted stratum change
					Water level encountered while drilling boring
					Stabilized water level in boring after drilling

Note: Soils described as dry, moist, and wet are estimated to be dry of optimum, near optimum, and more wet than optimum moisture content, respectively. Saturated soils are estimated to be within areas of free groundwater.

BORING LOG P-1

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 177 feet
Job Name: Rancho Vista	Drill Method: Rotary Wash	Date Drilled: 7-13-15


SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		CL	SILTY CLAY, medium to dark gray-brown, dry to moist, stiff, trace fine-to medium-grained sand, occasional cobbles	177
			-				-
			-				-
			-				-
			-		CL	SILTY CLAY, light to medium gray-brown, moist, stiff	-
			5				172
			-			below 6 feet, saturated	-
			-				-
			-		SM	SILTY SAND, gray-brown, saturated, medium dense, fine-to medium-grained sand	-
			10		CL	SILTY CLAY, light to medium gray-brown, saturated, stiff	167
			-				-
			-				-
			-				-
			-				-
			15		SM	SILTY SAND, light gray-brown, saturated, medium dense, fine-grained sand	162
			-				-
			-		CL	SILTY CLAY, medium to dark gray-brown, saturated, stiff to very stiff	-
			-				-
			20				157

BORING LOG P-1

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 177 feet
Job Name: Rancho Vista	Drill Method: Rotary Wash	Date Drilled: 7-13-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			20		CL	SILTY CLAY, medium to dark gray-brown, saturated, stiff to very stiff	157
			-				-
			-			below 22 feet, trace fine-to medium-grained sand	-
			-				-
			25				152
			-				-
			-		SC	CLAYEY SAND, light to medium gray-brown, saturated, medium dense, fine-to medium-grained sand, some silt,	-
			-			below 28-1/2 feet, fine-to coarse-grained sand	-
			-				-
			30		CL	SILTY CLAY, gray-brown, saturated, stiff, trace fine-to medium-grained sand	147
			-			Boring terminated at 30 feet	-
			-			Groundwater obscured by rotary wash drill method	-
			-			 Transducer installed at depth shown on log	-
			-				-
			35				142
			-				-
			-				-
			-				-
			40				137

BORING LOG P-2

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 181 feet
Job Name: Rancho Vista	Drill Method: Rotary Wash	Date Drilled: 7-13-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		CL	SILTY CLAY, medium to dark gray-brown, dry to moist, stiff, trace fine-to medium-grained sand, trace fine gravel	181
			-				-
			-				-
			-				-
			-		CL	SILTY CLAY, medium to light gray-brown, moist, stiff, trace fine-grained sand	-
			5				176
			-				-
			-		SM	SILTY SAND, light gray-brown, wet to saturated, medium dense, fine-grained sand	-
			-		CL	SILTY CLAY, gray-brown, saturated, stiff, trace fine-grained sand	-
			-				-
			10				171
			-				-
			-				-
			-				-
			-				-
			15				166
			-			below 15-1/2 feet, trace to some fine-to medium-grained sand	-
			-				-
			-		CL	SILTY CLAY, medium to dark gray-brown, saturated, stiff to very stiff	-
			-				-
			20				161

BORING LOG P-2

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 181 feet
Job Name: Rancho Vista	Drill Method: Rotary Wash	Date Drilled: 7-13-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			20		CL	SILTY CLAY, medium to dark gray-brown, saturated, stiff to very stiff	161
			-				-
			-				-
			-				-
			-				-
			25		CL	SILTY CLAY, light to medium gray-brown, saturated, stiff, trace fine-to medium-grained sand	156
			-				-
			-				-
			-				-
			-		CL	SILTY CLAY, gray-brown, saturated, stiff	-
			30			Boring terminated at 30 feet Groundwater obscured by rotary wash drill method	151
			-				-
			-			Transducer installed at depth shown on log	-
			-				-
			-				-
			35				146
			-				-
			-				-
			-				-
			40				141

BORING LOG P-3

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 186.5 feet
Job Name: Rancho Vista	Drill Method: Rotary Wash	Date Drilled: 7-16-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		CL	SILTY CLAY, light to medium gray-brown, dry to moist, stiff, some fine-to coarse-grained sand, trace fine-to coarse gravel, occasional cobbles	186.5
			-				.
			-				.
			-				.
			-				.
			5				181.5
			-				.
			-		CL	SILTY CLAY, light gray-brown, moist, stiff to very stiff	.
			-				.
			10		SP	CLAYEY SAND, light gray-brown, moist to wet, fine-to coarse-grained sand, fine-to coarse gravel	176.5
			-		CL	SILTY CLAY, light gray-brown, saturated, very stiff, trace fine-to coarse-grained sand	.
			-				.
			-				.
			15				171.5
			-				.
			-				.
			-				.
			-				.
			20				166.5

BORING LOG P-3

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 186.5 feet
Job Name: Rancho Vista	Drill Method: Rotary Wash	Date Drilled: 7-16-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			20		CL	SILTY CLAY, light gray-brown, saturated, very stiff, trace fine-to coarse-grained sand	166.5
			-				-
			-		CL	SILTY CLAY, light gray-brown, saturated, stiff, some fine-to medium-grained sand, limonite stains	-
			-				-
			25				161.5
			-				-
			-		CL	SILTY CLAY, light brown-gray, saturated, very stiff	-
			30				156.5
			-			below 31 feet, trace to some fine-to medium-grained sand	-
			-				-
			-			below 34-1/2 feet, some medium-to coarse-grained sand, some fine gravel	-
			35				151.5
			-				-
			-		ML	CLAYEY SILT, light gray, saturated, stiff, trace fine-to coarse-grained sand	-
			-				-
			40		SP	GRAVELLY SAND, gray, saturated, dense, medium-to coarse-grained sand, fine gravel	146.5

BORING LOG P-3

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 186.5 feet
Job Name: Rancho Vista	Drill Method: Rotary Wash	Date Drilled: 7-16-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			40		ML	CLAYEY SILT, light gray, saturated, stiff, trace fine-to coarse-grained sand	146.5
			-		SP	GRAVELLY SAND, gray, saturated, dense, medium-to coarse-grained sand, fine gravel	-
			-				-
			-				-
			-				-
			45				141.5
			-			CLAYSTONE, medium to dark gray, weak to friable	-
			-				-
			-				-
			-				-
			50			Boring terminated at 50 feet Groundwater obscured by rotary wash drill method	136.5
			-			█ Transducer installed at depth shown on log	-
			-				-
			-				-
			-				-
			55				131.5
			-				-
			-				-
			-				-
			-				-
			60				126.5

BORING LOG P-4

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 187 feet
Job Name: Rancho Vista	Drill Method: Rotary Wash	Date Drilled: 7-16-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		CL	SILTY CLAY, gray-brown, dry to moist, stiff, trace fine-to medium-grained sand	187
			-				-
			-				-
			-				-
			-		CL	SILTY CLAY, light gray-brown, moist, stiff, trace fine-to coarse-grained sand, trace fine gravel, limonite stains	-
			5				182
			-				-
			-				-
			-		CL	SILTY CLAY, light to medium gray-brown, moist, very stiff	-
			10				177
			-				-
			-				-
			-				-
			-				-
			15				172
			-				-
			-				-
			-				-
			-				-
			20			below 18 feet, very stiff to hard, trace fine-grained sand	167

BORING LOG P-4

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 187 feet
Job Name: Rancho Vista	Drill Method: Rotary Wash	Date Drilled: 7-16-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			20		CL	SILTY CLAY, light to medium gray-brown, moist, very stiff to hard, trace fine-grained sand	167
			-				-
			-				-
			-				-
			-				-
			25				162
			-		CL	SILTY CLAY, light gray-brown, saturated, very stiff, trace to some fine-to coarse-grained sand, limonite stains	-
			-				-
			-				-
			30			Boring terminated at 30 feet Groundwater obscured by rotary wash drill method	157
			-			█ Transducer installed at depth shown on log	-
			-				-
			-				-
			35				152
			-				-
			-				-
			-				-
			40				147

BORING LOG P-5

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 184 feet
Job Name: Rancho Vista	Drill Method: Rotary Wash	Date Drilled: 7-20-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		CL	SILTY CLAY, gray-brown, dry to moist, stiff, some fine-to medium-grained sand	184
			-				-
			-				-
			-		CL	SANDY CLAY, gray-brown, dry to moist, stiff, fine-to medium-grained sand, some silt	-
			-				-
			5				179
			-				-
			-		CL	SILTY CLAY, medium to dark gray-brown, moist to wet, stiff, trace fine-grained sand	-
			-		CL	SANDY CLAY, medium to dark gray-brown, saturated, stiff, fine-to medium-grained sand, some silt	-
			10				174
			-				-
			-		SC	CLAYEY SAND, gray-brown, saturated, medium dense, fine-to medium-grained sand	-
			-				-
			15				169
			-				-
			-				-
			-				-
			-		CL	SILTY CLAY, gray-black, saturated, medium stiff to stiff, trace fine-grained sand	-
			20				164

BORING LOG P-5

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 184 feet
Job Name: Rancho Vista	Drill Method: Rotary Wash	Date Drilled: 7-20-15


SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			20		CL	SILTY CLAY, gray-black, saturated, medium stiff to stiff, trace fine-grained sand	164
			-				-
			-				-
			-				-
			-				-
			25		CL	SILTY CLAY, light to medium gray-brown, saturated, stiff, trace fine-to medium-grained sand	159
			-				-
			-				-
			-				-
			30		CL	SANDY CLAY, light to medium gray-brown, saturated, stiff, fine-to medium-grained sand	154
			-				-
			-		SM	SILTY SAND, light gray-brown, saturated, medium dense, fine-to medium-grained sand	-
			-				-
			-				-
			35				149
			-			below 36 feet, trace clay	-
			-				-
			-			below 39 feet, trace to some fine gravel	-
			40		SM	SILTY SAND, light gray-brown, saturated, dense, fine-to medium-grained sand, trace to some fine gravel, trace clay	144

BORING LOG P-5

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 184 feet
Job Name: Rancho Vista	Drill Method: Rotary Wash	Date Drilled: 7-20-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			40		SM	SILTY SAND, light gray-brown, saturated, dense, fine-to medium-grained sand, trace to some fine gravel, trace clay	144
			-				-
			-				-
			-			SANDY CLAYSTONE, gray, friable, fine-grained sand	-
			-				-
			45				139
			-				-
			-			Boring terminated at 46-1/2 feet Groundwater obscured by rotary wash drill method	-
			-			 Transducer installed at depth shown on log	-
			-				-
			50				134
			-				-
			-				-
			-				-
			-				-
			55				129
			-				-
			-				-
			-				-
			60				124

BORING LOG P-6

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 183 feet
Job Name: Rancho Vista	Drill Method: Rotary Wash	Date Drilled: 7-20-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		CL	SILTY CLAY, gray-brown, dry to moist, stiff, trace fine-to medium-grained sand	183
			-				-
			-				-
			-				-
			-				-
			5		SM	SILTY SAND, light to medium gray-brown, moist, medium dense, fine-to medium-grained sand, trace fine gravel	178
			-				-
			-				-
			-		CL	SILTY CLAY, gray-brown, saturated, stiff, trace fine-to medium-grained sand	-
			-				-
			10				173
			-				-
			-				-
			-				-
			-				-
			15				168
			-				-
			-				-
			-		SC	CLAYEY SAND, light to medium gray-brown, saturated, medium dense, fine-to medium-grained sand, trace silt	-
			20				163

BORING LOG P-6

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 183 feet
Job Name: Rancho Vista	Drill Method: Rotary Wash	Date Drilled: 7-20-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			20		SC	CLAYEY SAND, light to medium gray-brown, saturated, medium dense, fine-to medium-grained sand, trace silt	163
			-		CL	SILTY CLAY, gray-brown, saturated, stiff to very stiff, trace fine-to medium-grained sand	-
			-				-
			-				-
			-				-
			25				158
			-				-
			-				-
			-				-
			-				-
			30				153
			-				-
			-				-
			-				-
			-				-
			35				148
			-				-
			-				-
			-		SM	SILTY SAND, light gray-brown, saturated, medium dense, fine-to medium-grained sand, trace clay	-
			-				-
			40				143

BORING LOG P-6

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 183 feet
Job Name: Rancho Vista	Drill Method: Rotary Wash	Date Drilled: 7-20-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			40		SM	SILTY SAND, light gray-brown, saturated, medium dense, fine-to medium-grained sand, trace clay	143
			-				-
			-				-
			-				-
			45			SILTSTONE, light gray-brown, friable	138
			-				-
			-			Boring terminated at 46 feet Groundwater obscured by rotary wash drill method	-
			-			█ Transducer installed at depth shown on log	-
			-				-
			50				133
			-				-
			-				-
			-				-
			55				128
			-				-
			-				-
			-				-
			60				123

BORING LOG P-7

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 179 feet
Job Name: Rancho Vista	Drill Method: Rotary Wash	Date Drilled: 8-21-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		CL	SILTY CLAY, medium to dark gray-brown, moist, medium stiff, fine-to medium-grained sand	179
			-				-
			-				-
			-				-
			-				-
			5				174
			-		CL	SILTY CLAY, light to medium gray-brown, saturated, medium stiff, fine-to medium-grained sand	-
			-				-
			-				-
			10		CL	SILTY CLAY, medium gray-brown, saturated, medium stiff, fine-to medium-grained sand	169
			-				-
			-		CL	SANDY CLAY, gray-brown, saturated, medium stiff, fine-to medium-grained sand	-
			-				-
			15		CL	CLAYEY SAND, gray-brown, saturated, medium stiff to soft, fine-to medium-grained sand	164
			-				-
			-		CL	SANDY CLAY, brown-gray, saturated, stiff, fine-to medium-grained sand	-
			-				-
			-				-
			20				159

BORING LOG P-7

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 179 feet
Job Name: Rancho Vista	Drill Method: Rotary Wash	Date Drilled: 8-21-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			20		CL	SANDY CLAY, brown-gray, stiff, saturated, fine-to medium-grained sand	159
			-				-
			-				-
			-				-
			-				-
			25				154
			-				-
			-		SC	CLAYEY SAND, gray-brown, saturated, dense, fine-to medium-grained sand	-
			-				-
			30			Boring terminated at 30 feet Groundwater obscured by rotary wash drill method Transducer installed at depth shown on log	149
			-				-
			-				-
			-				-
			-				-
			35				144
			-				-
			-				-
			-				-
			40				139

BORING LOG P-8

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 180 feet
Job Name: Rancho Vista	Drill Method: Rotary Wash	Date Drilled: 8-21-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		CL	SILTY CLAY, medium to dark gray-brown, dry to moist, stiff, trace fine-to medium-grained sand, fine-to coarse gravel	180
			-				-
			-				-
			-				-
			-				-
			5		CL	SILTY CLAY, light to medium gray-brown, moist, stiff, trace fine-grained sand	175
			-				-
			-				-
			-				-
			-				-
			10				170
			-				-
			-				-
			-		SC	CLAYEY SAND, light to medium gray-brown, saturated, fine-to medium-grained sand	-
			-				-
			15				165
			-				-
			-		CL	SILTY CLAY, gray-brown, saturated, stiff, trace fine-to medium-grained sand	-
			-				-
			-				-
			20				160

BORING LOG P-8

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 180 feet
Job Name: Rancho Vista	Drill Method: Rotary Wash	Date Drilled: 8-21-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			20		CL	SILTY CLAY, gray-brown, saturated, stiff, trace fine-to medium-grained sand	160
			-				-
			-				-
			-				-
			-				-
			25		SM	SILTY SAND, gray-brown, saturated, medium dense, fine-to medium-grained sand, trace clay	155
			-				-
			-				-
			-				-
			-				-
			30		CL	SILTY CLAY, light to medium gray-brown, saturated, stiff	150
			-			Boring terminated at 30 feet	-
			-			Groundwater obscured by rotary wash drill method	-
			-			Transducer installed at depth shown on log	-
			-				-
			-				-
			-				-
			35				145
			-				-
			-				-
			-				-
			-				-
			40				140

BORING LOG P-9

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 178 feet
Job Name: Rancho Vista	Drill Method: Rotary Wash	Date Drilled: 8-21-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		CL	SILTY CLAY, medium to dark gray-brown, dry to moist, stiff, trace fine-to medium-grained sand, trace fine-to coarse gravel	178
			-				-
			-				-
			-		CL	SILTY CLAY, light gray-brown, moist, stiff	-
			-				-
			5		SC	CLAYEY SAND, light to medium gray-brown, moist to wet, medium dense	173
			-				-
			-		CL	SILTY CLAY, light to medium brown-gray, wet to saturated, stiff, limonite stains	-
			-				-
			10				168
			-				-
			-		SC	CLAYEY SAND, light to medium gray-brown, saturated, fine-to medium-grained sand	-
			15				163
			-		CL	SILTY CLAY, gray-brown, saturated, stiff, trace fine-to medium-grained sand	-
			-				-
			-				-
			20				158

BORING LOG P-9

Job No.: 3603.104	Client: RL Fulton Holding Company	Elevation: 178 feet
Job Name: Rancho Vista	Drill Method: Rotary Wash	Date Drilled: 8-21-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			20		CL	SILTY CLAY, gray-brown, saturated, stiff, trace fine-to medium-grained sand	158
			-				-
			-				-
			-		SM/SP	SAND/SILTY SAND, gray-brown, saturated, medium dense, fine-to coarse-grained sand	-
			-				-
			25				153
			-				-
			-				-
			-				-
			-		CL	SILTY CLAY, gray-brown, saturated, stiff to very stiff	-
			30				148
			-			Boring terminated at 30 feet Groundwater obscured by rotary wash drill method	-
			-			Transducer installed at depth shown on log	-
			-				-
			-				-
			35				143
			-				-
			-				-
			-				-
			-				-
			40				138

UNIFIED SOIL CLASSIFICATION SYSTEM











BY: CC

DATE: 6-19-15

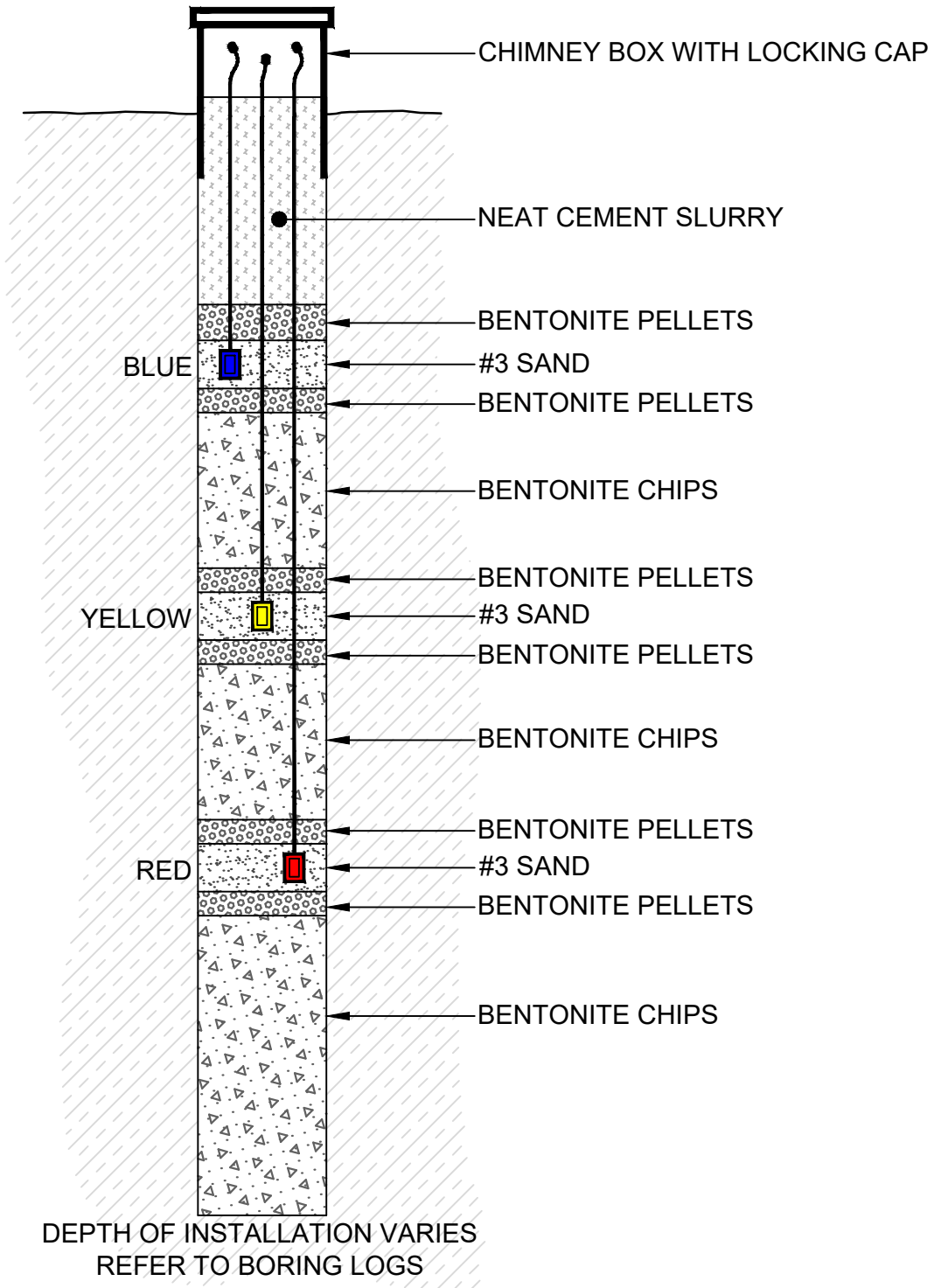
MAJOR DIVISIONS			CLASSIFICATION SYMBOL	TYPICAL NAMES
COARSE GRAINED SOILS MORE THAN HALF OF THE MATERIAL IS LARGER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS WITH LITTLE TO NO FINES	GW	WELL GRADED GRAVELS, GRAVEL/SAND MIXTURES
			GP	POORLY GRADED GRAVELS, GRAVEL/SAND MIXTURES
		GRAVEL WITH OVER 12% FINES	GM	SILTY GRAVELS, POORLY GRADED GRAVEL/SAND/SILT MIXTURES
			GC	CLAYEY GRAVELS, POORLY GRADED GRAVEL/SAND/CLAY MIXTURES
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS WITH LITTLE TO NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS
			SP	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS, POORLY GRADED SAND/SILT MIXTURES
			SC	CLAYEY SANDS, POORLY GRADED SAND/CLAY MIXTURES
FINE GRAINED SOILS MORE THAN HALF OF THE MATERIAL IS SMALLER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SILTS

KEY TO BORING LOG SYMBOLS

JOB NUMBER: 3603.104

Depth in Feet	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per foot	Unified Soil Classification System	
					Bulk Sample
					2.5-inch I.D. Split Barrel Sample
					2.8-inch I.D. Shelby Tube Sample
					No Sample recovered
					Standard Penetration Test interval
					Well-defined stratum change
					Gradual stratum change
					Interpreted stratum change
					Water level encountered while drilling boring
					Stabilized water level in boring after drilling

Note: Soils described as dry, moist, and wet are estimated to be dry of optimum, near optimum, and more wet than optimum moisture content, respectively. Saturated soils are estimated to be within areas of free groundwater.




TYPICAL PNEUMATIC PIEZOMETER DETAIL

BORING LOG B-1

Job No.: 3603.103	Client: RL Fulton Holding Company	Elevation: 179 feet
Job Name: Rancho Vista	Drill Method: Hollow-stem Auger	Date Drilled: 3-16-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		CL	SILTY CLAY, dark gray to black, moist, medium stiff to stiff	179
			-				
			-				
			-				
			5		CL	SILTY CLAY, medium to dark brown, slightly moist, stiff to very stiff	174
			-				
			-				
			-				
			10		CL	SILTY CLAY, mottled yellow and light gray, stiff to very stiff	169
			-				
			-				
			15			Boring terminated at 11-1/2 feet Groundwater encountered at 4-1/2 feet	164
			-				
			-				
			20				159

BORING LOG B-2

Job No.: 3603.103	Client: RL Fulton Holding Company	Elevation: 178 feet
Job Name: Rancho Vista	Drill Method: Hollow-stem Auger	Date Drilled: 3-16-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		CL	SILTY CLAY, black, medium stiff	178
			-				-
			-				-
			-		CL	SILTY CLAY, medium to dark brown	-
			-				-
			-				-
			-				-
			-				-
			-				-
			5				173
			-				-
			-				-
			-				-
			-				-
			-				-
			10		CL	SILTY CLAY, dark gray-blue, saturated, stiff to very stiff	168
			-				-
			-				-
			-				-
			-				-
			-				-
			-				-
			15				163
			-				-
			-				-
			-				-
			-		SC	CLAYEY SAND, orange-yellow	-
			-				-
			20			Boring terminated at 20 feet, groundwater encountered at 4-1/2 feet	158

BORING LOG B-3

Job No.: 3603.103	Client: RL Fulton Holding Company	Elevation: 177 feet
Job Name: Rancho Vista	Drill Method: Hollow-stem Auger	Date Drilled: 3-16-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		CL	SILTY CLAY, dark gray to black, moist, medium stiff to stiff	177
			-				-
			-				-
			-		CL	SILTY CLAY, gray-brown, dry to moist	-
			-				-
			5				172
			-				-
			-		CL	SILTY CLAY, dark gray, moist	-
			-				-
			10				167
			-				-
			-				-
			-		SP	SAND fine-grained, dark gray, saturated, medium dense	-
			15				162
			-				-
			-				-
			-		CL	SILTY CLAY, dark gray, moist	-
			20				157

BORING LOG B-3

Job No.: 3603.103	Client: RL Fulton Holding Company	Elevation: 177 feet
Job Name: Rancho Vista	Drill Method: Hollow-stem Auger	Date Drilled: 3-16-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			20		CL	SILTY CLAY, dark gray, moist	157
			-				-
			-				-
			-				-
			-				-
			25		SP	SAND fine-grained, dark gray, saturated, medium dense	152
			-				-
			-				-
			-				-
			-				-
			30		CL	CLAY with minor SAND fine-grained, dark gray, moist, stiff	147
			-				-
			-				-
			-				-
			35		CL	CLAY with SAND medium-grained, very dark gray/black, very stiff, very small lenses (1/8 inch thick vertical bands of medium to dark gray sand)	142
			-				-
			-				-
			-				-
			40		SP	SAND fine-to medium-grained, dark orange and gray, medium dense	137

BORING LOG B-3

Job No.: 3603.103	Client: RL Fulton Holding Company	Elevation: 177 feet
Job Name: Rancho Vista	Drill Method: Hollow-stem Auger	Date Drilled: 3-16-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			40		SP	SAND fine-to medium-grained, dark orange and gray, medium dense	137
			-				-
			-				-
			-				-
			-				-
			45		SC	CLAYEY SAND, orange-yellow, dense to very dense, fine-to coarse-grained sand	132
			-				-
			-				-
			-				-
			50				127
			-				-
			-				-
			-				-
			-				-
			55				122
			-				-
			-				-
			-				-
			-				-
			60				117
						Boring terminated at 46-1/2 feet Groundwater encountered at 4-1/2 feet	

BORING LOG B-4

Job No.: 3603.103	Client: RL Fulton Holding Company	Elevation: 177 feet
Job Name: Rancho Vista	Drill Method: Hollow-stem Auger	Date Drilled: 3-16-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0			Straight drilling. Not logged above 35 feet in depth	177
			-				-
			-				-
			-				-
			-				-
			▽				-
			5				172
			-				-
			-				-
			-				-
			-				-
			10				167
			-				-
			-				-
			-				-
			-				-
			15				162
			-				-
			-				-
			-				-
			20				157

BORING LOG B-4

Job No.: 3603.103	Client: RL Fulton Holding Company	Elevation: 177 feet
Job Name: Rancho Vista	Drill Method: Hollow-stem Auger	Date Drilled: 3-16-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			20			Straight drilling. Not logged above 35 feet in depth	157
			-				-
			-				-
			-				-
			-				-
			25				152
			-				-
			-				-
			-				-
			30				147
			-			-	
			-			-	
			-			-	
			35		CL	CLAY with minor SAND fine-grained, dark gray, stiff to very stiff	142
			-			below 37 feet, harder drilling	-
			-				-
			-				-
			-				-
			40				137

BORING LOG B-4

Job No.: 3603.103	Client: RL Fulton Holding Company	Elevation: 177 feet
Job Name: Rancho Vista	Drill Method: Hollow-stem Auger	Date Drilled: 3-16-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			40		CL	CLAY with minor SAND fine-grained, dark gray, stiff to very stiff	137
			-				-
			-				-
			-				-
			-				-
			45		CL	SANDY CLAY with SAND medium-grained, dark gray-brown, hard	132
			-				-
			-				-
			-				-
			-				-
			50			Boring terminated at 51-1/2 feet Groundwater encountered at 4-1/2 feet	127
			-				-
			-				-
			-				-
			-				-
			55			Boring terminated at 51-1/2 feet Groundwater encountered at 4-1/2 feet	122
			-				-
			-				-
			-				-
			-				-
			60			Boring terminated at 51-1/2 feet Groundwater encountered at 4-1/2 feet	117
			-				-

BORING LOG B-5

Job No.: 3603.103	Client: RL Fulton Holding Company	Elevation: 177 feet
Job Name: Rancho Vista	Drill Method: Hollow-stem Auger	Date Drilled: 3-16-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0			Straight drilling. Not logged above 44 feet in depth	177
			-				-
			-				-
			-				-
			-				-
			5				172
			-				-
			-				-
			-				-
			-				-
			10				167
			-				-
			-				-
			-				-
			-				-
			15				162
			-				-
			-				-
			-				-
			20				157

BORING LOG B-5

Job No.: 3603.103	Client: RL Fulton Holding Company	Elevation: 177 feet
Job Name: Rancho Vista	Drill Method: Hollow-stem Auger	Date Drilled: 3-16-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			20			Straight drilling. Not logged above 44 feet in depth	157
			-				-
			-				-
			-				-
			-				-
			25				152
			-				-
			-				-
			-				-
			-				-
			30				147
			-				-
			-				-
			-				-
			-				-
			35				142
			-				-
			-				-
			-				-
			40				137

BORING LOG B-5

Job No.: 3603.103	Client: RL Fulton Holding Company	Elevation: 177 feet
Job Name: Rancho Vista	Drill Method: Hollow-stem Auger	Date Drilled: 3-16-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)

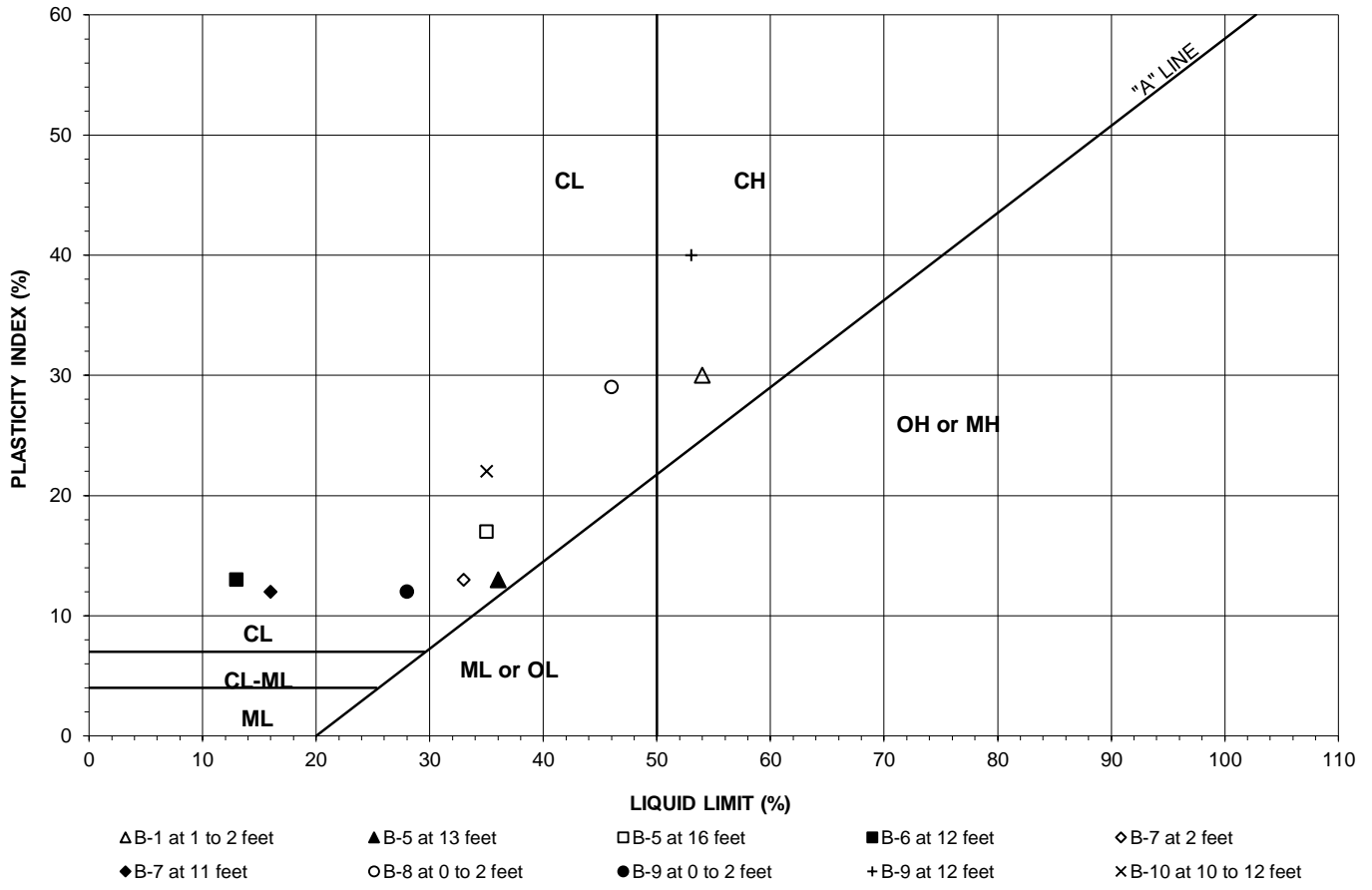
Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			40			Straight drilling. Not logged above 44 feet in depth	137
			-				-
			-				-
			-				-
			-				-
			45		CL	SANDY CLAY with SAND medium-grained, stringers of gray and orange-gray	132
			-				-
			-			Boring terminated at 46-1/2 feet No groundwater encountered	-
			-				-
			-				-
			50				127
			-				-
			-				-
			-				-
			55				122
			-				-
			-				-
			-				-
			60				117



APPENDIX B

LABORATORY TESTING BY OTHERS

JOB NUMBER: 3603.104 DATE: 8-13-15 BY: CC



LOCATION	LIQUID LIMIT	PLASTICITY INDEX	USCS CLASSIFICATION
B-1 at 1 to 2 feet	54	30	CH
B-5 at 13 feet	36	13	CL
B-5 at 16 feet	35	17	CL
B-6 at 12 feet	13	13	CL
B-7 at 2 feet	33	13	CL
B-7 at 11 feet	16	12	CL
B-8 at 0 to 2 feet	46	29	CL
B-9 at 0 to 2 feet	28	12	CL
B-9 at 12 feet	53	40	CH
B-10 at 10 to 12 feet	35	22	CL

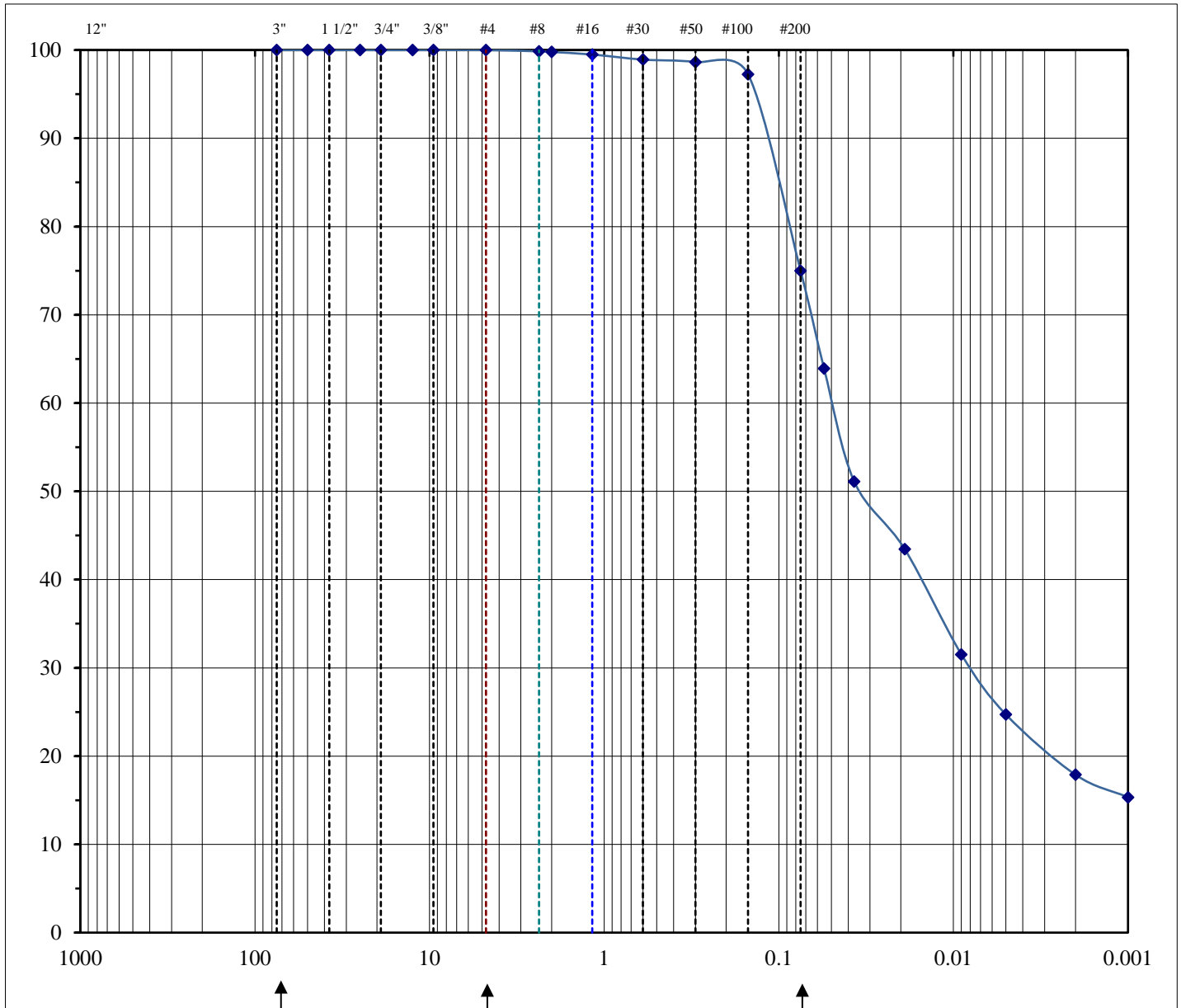
ATTERBERG LIMITS TEST

Gradation Test Data ASTM D 422

Project Name: Rancho Vista, San Juan Bautista	Project No: 3603.104
Comments:	Date: 6/26/2015
Invoice Number: 14347	

Tested By: gs

Reported By: G. Suckow



COBBLES	GRAVEL		SAND			SILT/CLAY
	coarse	fine	coarse	medium	fine	

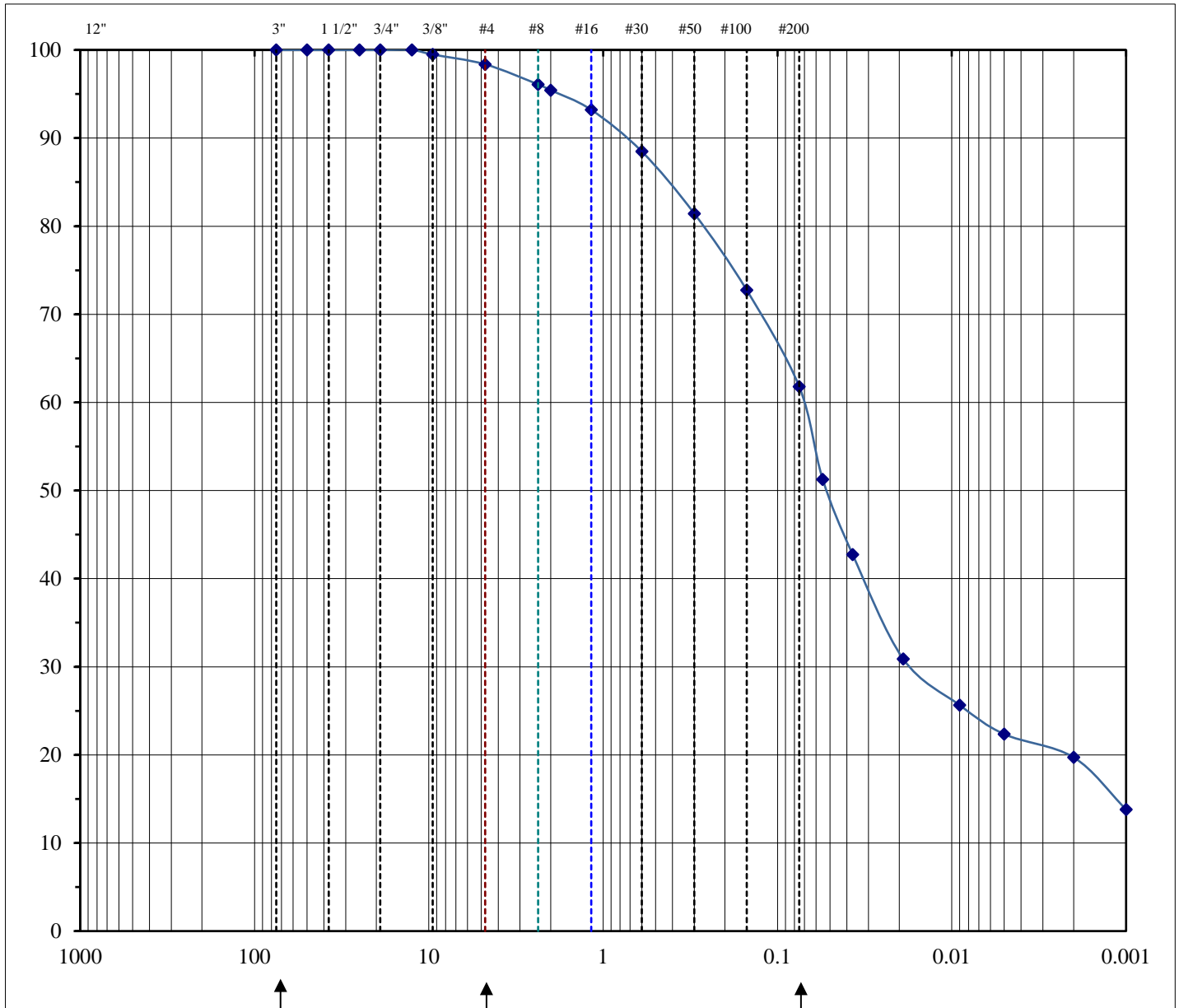
Symbol	Sample ID	Description	ASTM D4318 Plasticity Index:
	B5 at 16ft	CL Silty Clay with Sand Olive Gray (CH Dark Gray scalped)	17

Gradation Test Data ASTM D 422

Project Name: Rancho Vista, San Juan Bautista	Project No: 3603.104
Comments:	Date: 6/26/2015
Invoice Number: 14347	

Tested By: gs

Reported By: G. Suckow



COBBLES	GRAVEL		SAND			SILT/CLAY
	coarse	fine	coarse	medium	fine	

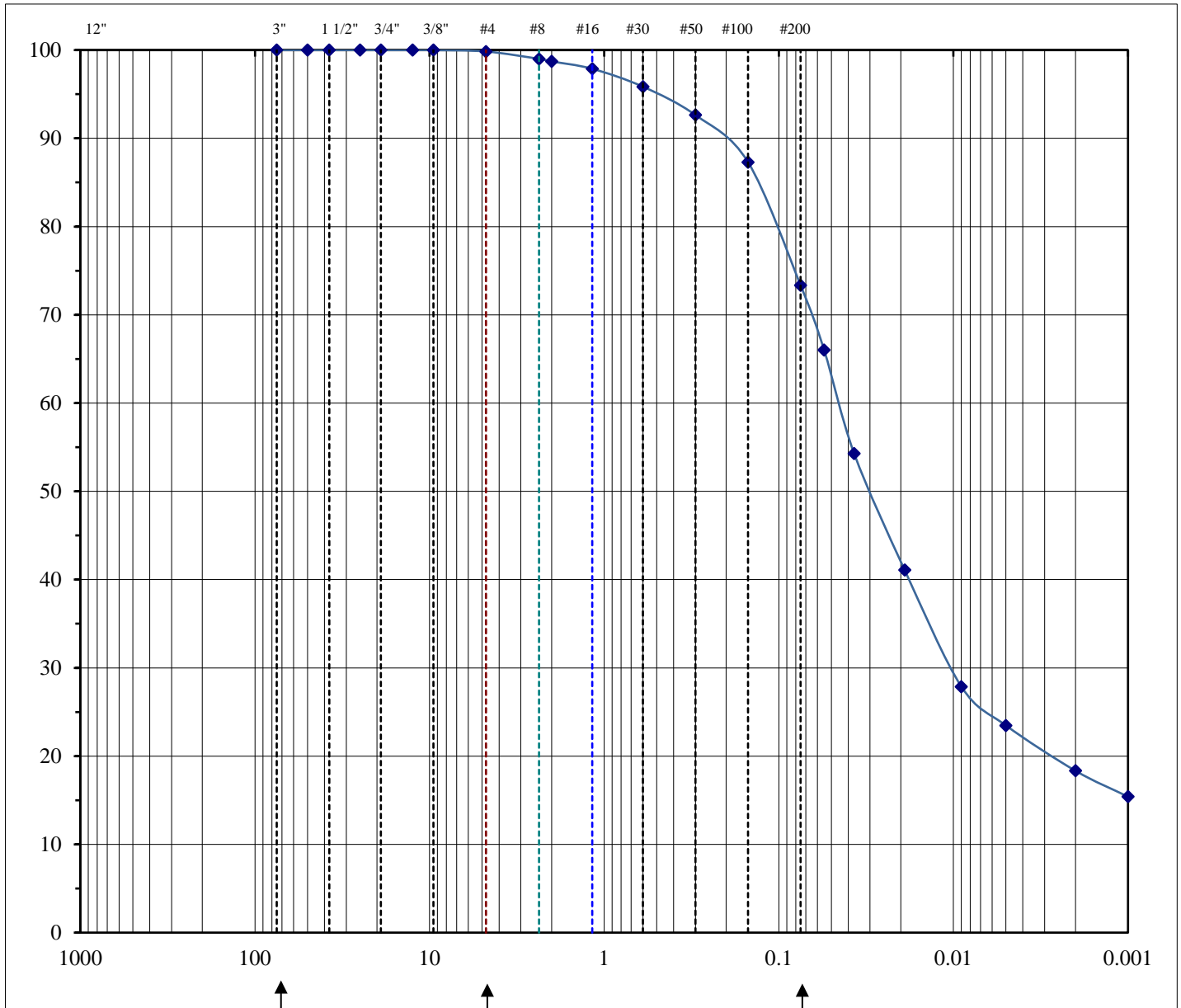
Symbol	Sample ID	Description	ASTM D4318 Plasticity Index:
	B6 at 12ft	CL Sandy Clay Red Brown	13

Gradation Test Data ASTM D 422

Project Name: Rancho Vista, San Juan Bautista	Project No: 3603.104
Comments:	Date: 6/26/2015
Invoice Number: 14347	

Tested By: gs

Reported By: G. Suckow



COBBLES	GRAVEL		SAND			SILT/CLAY
	coarse	fine	coarse	medium	fine	

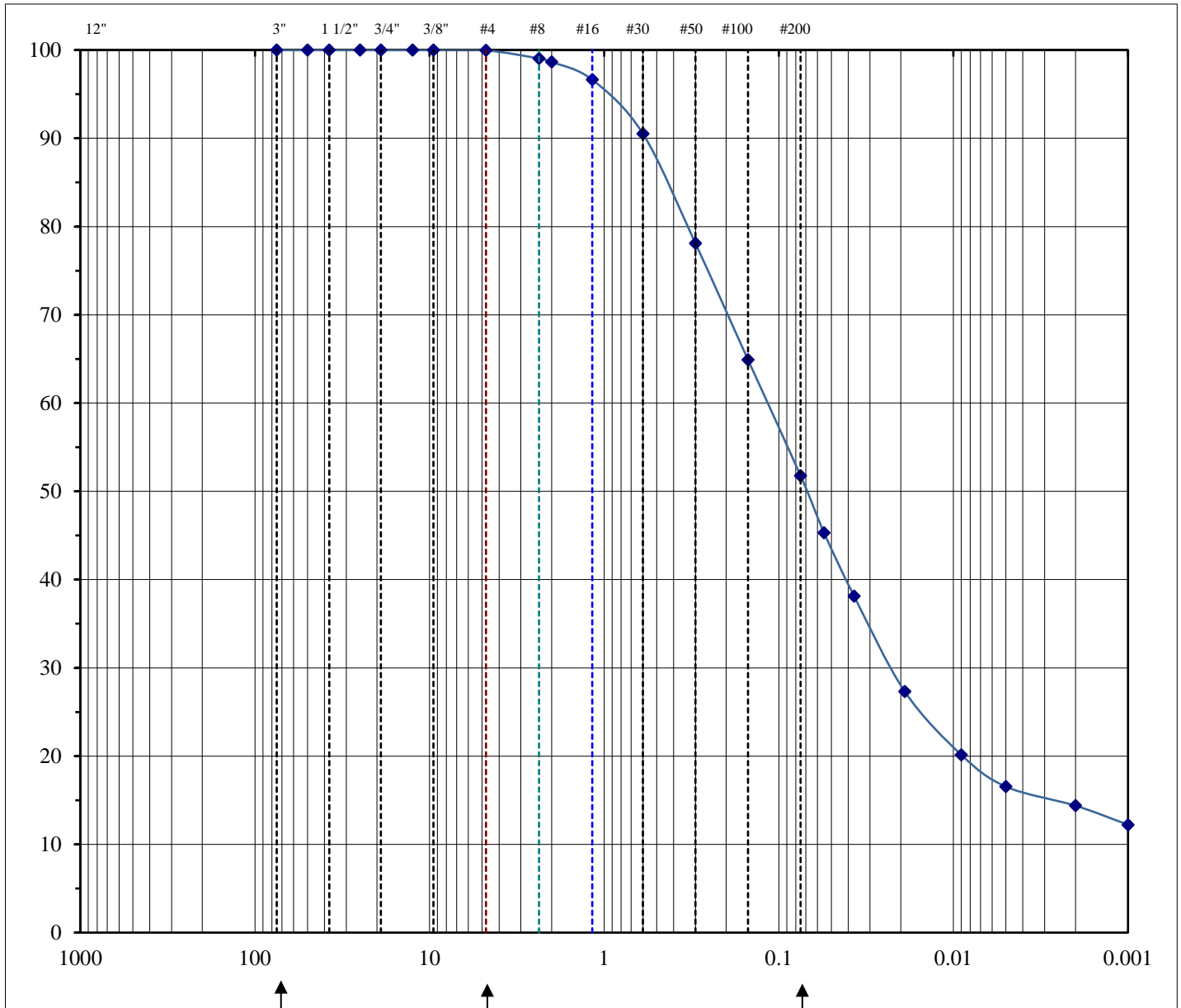
Symbol	Sample ID	Description	ASTM D4318 Plasticity Index:
	B7 at 2ft	CL Silty Clay with Sand Dark Gray Brown	13

Gradation Test Data ASTM D 422

Project Name: Rancho Vista, San Juan Bautista	Project No: 3603.104
Comments:	Date: 6/26/2015
Invoice Number: 14347	

Tested By: gs

Reported By: G. Suckow



COBBLES	GRAVEL		SAND			SILT/CLAY
	coarse	fine	coarse	medium	fine	

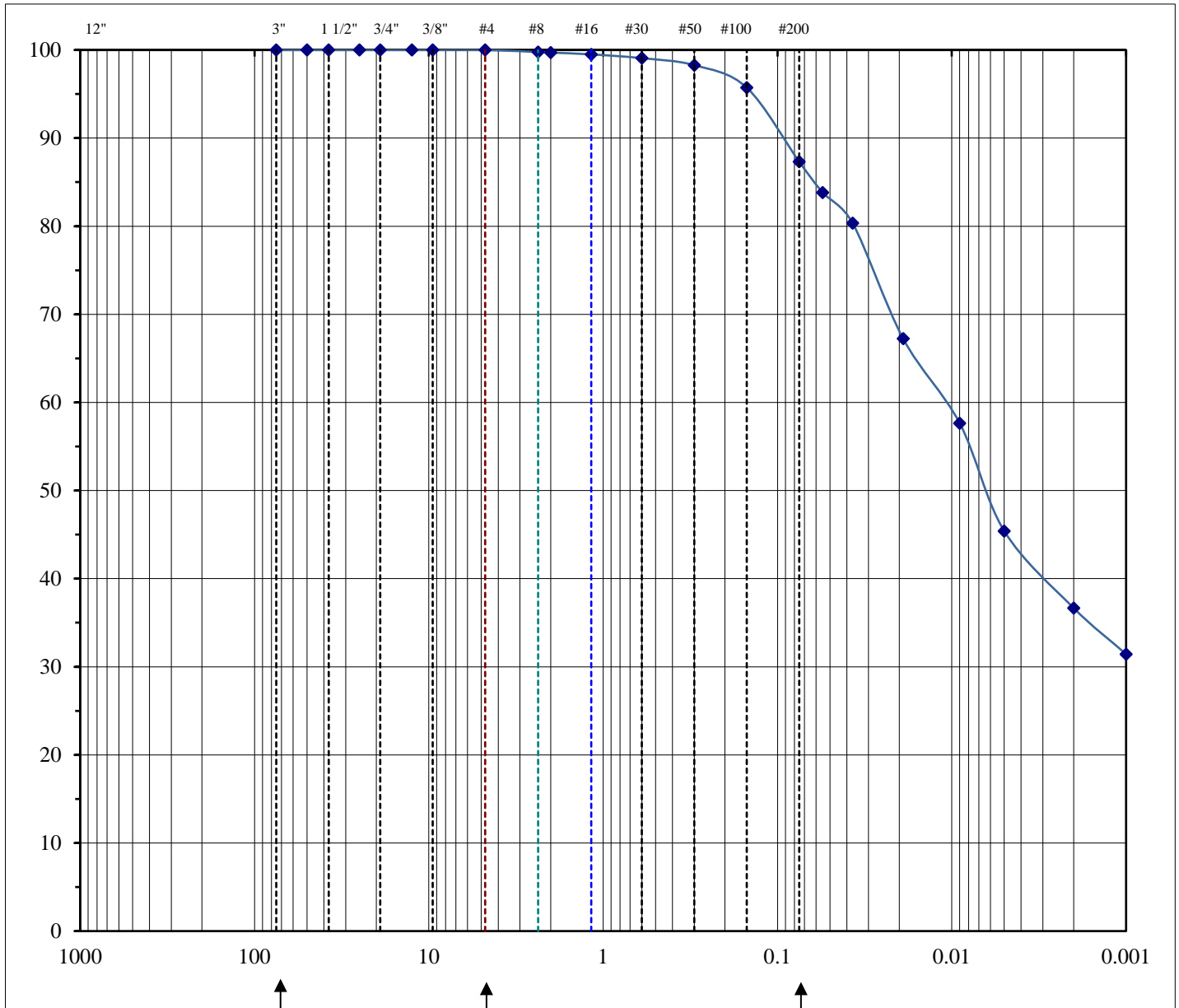
Symbol	Sample ID	Description	ASTM D4318 Plasticity Index:
	B7 at 11ft	CL Sandy Clay Dark Gray	12

Gradation Test Data ASTM D 422

Project Name: Rancho Vista, San Juan Bautista	Project No: 3603.104
Comments:	Date: 6/26/2015
Invoice Number: 14347	

Tested By: gs

Reported By: G. Suckow



COBBLES	GRAVEL		SAND			SILT/CLAY
	coarse	fine	coarse	medium	fine	

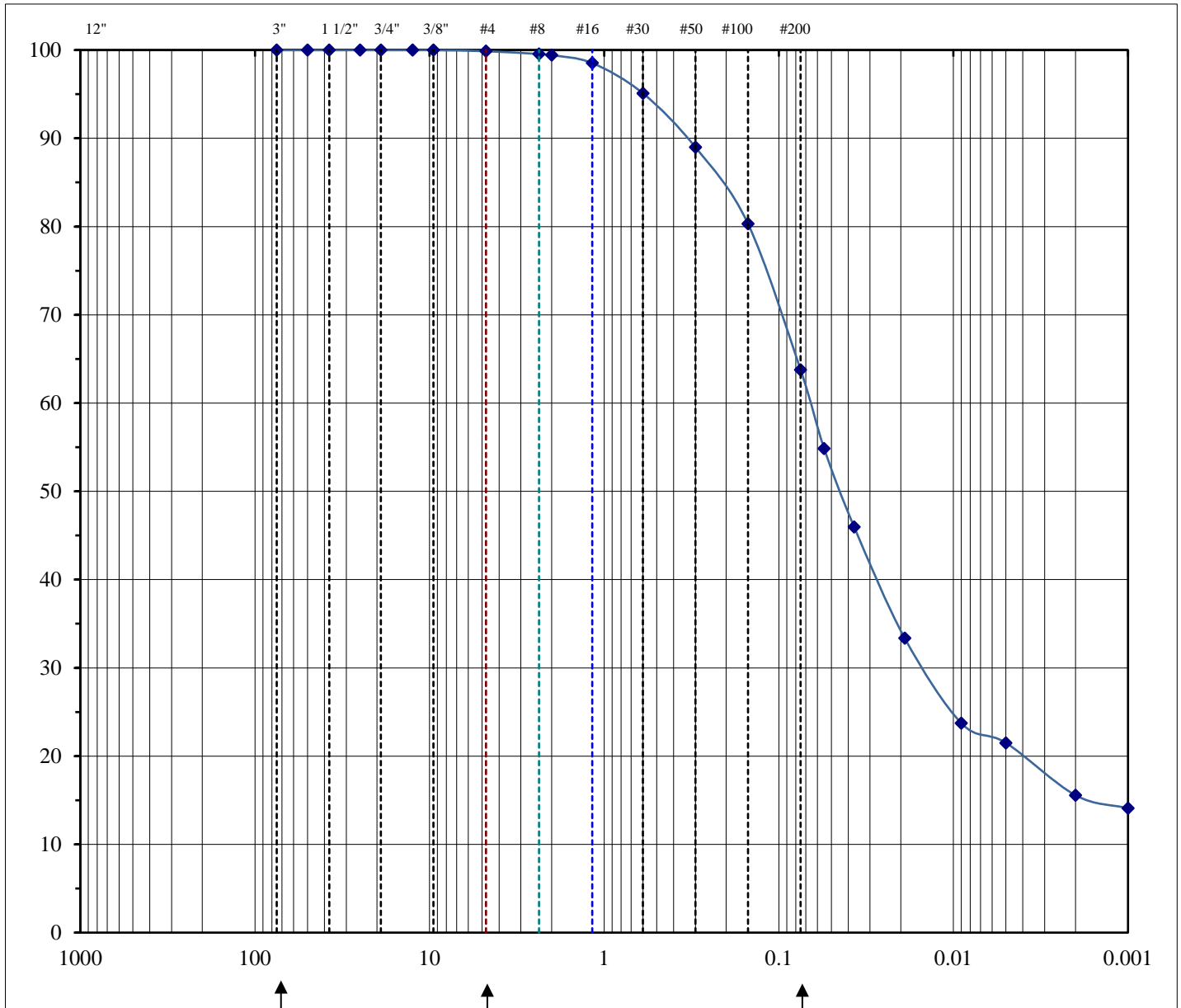
Symbol	Sample ID	Description	ASTM D4318 Plasticity Index:
	B8 at 0-2ft	CL Silty Clay Gray Brown	29

Gradation Test Data ASTM D 422

Project Name: Rancho Vista, San Juan Bautista	Project No: 3603.104
Comments:	Date: 6/26/2015
Invoice Number: 14347	

Tested By: gs

Reported By: G. Suckow



COBBLES	GRAVEL		SAND			SILT/CLAY
	coarse	fine	coarse	medium	fine	

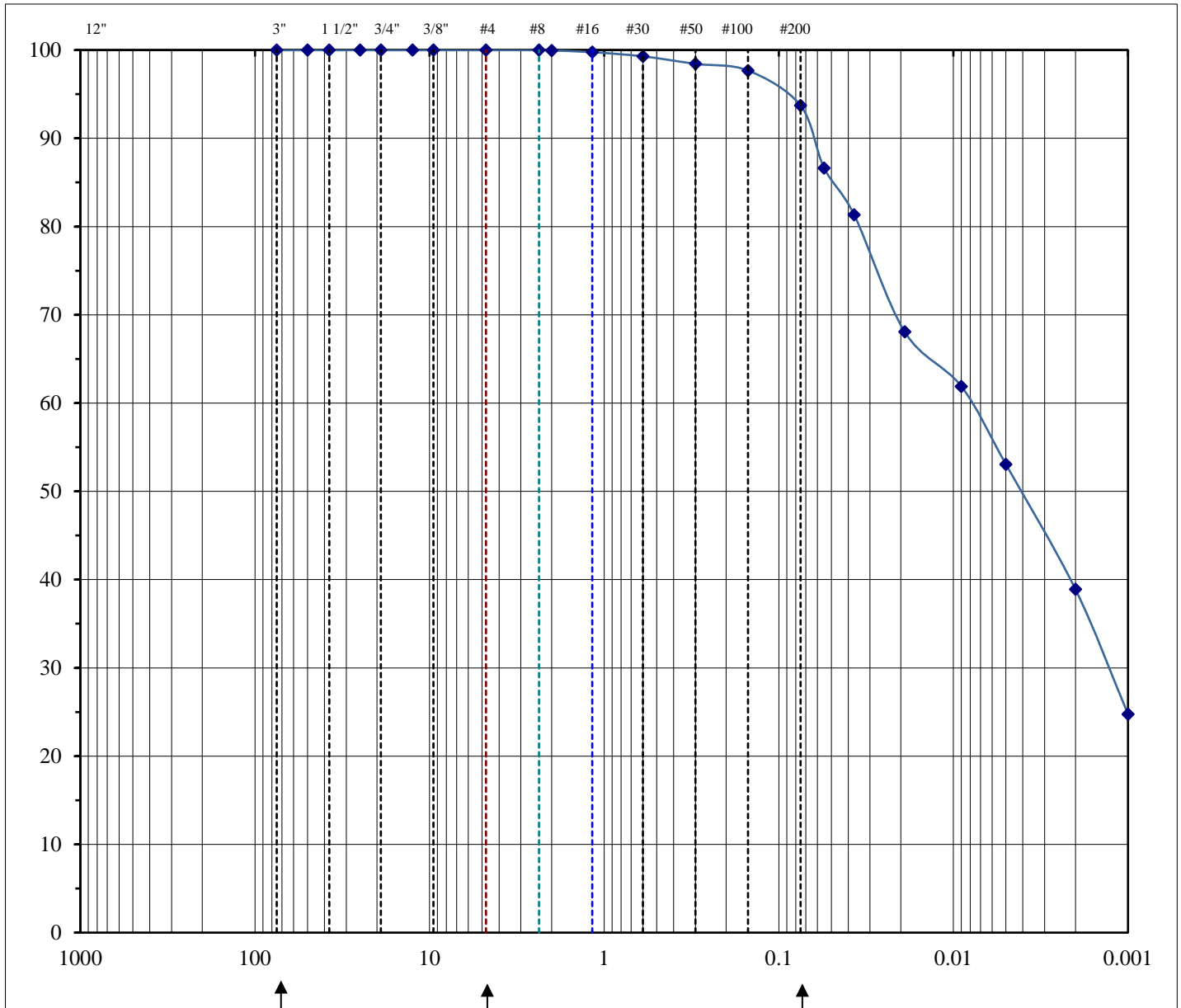
Symbol	Sample ID	Description	ASTM D4318 Plasticity Index:
	B9 at 0-2ft	CL Sandy Clay Dark Gray Brown	12

Gradation Test Data ASTM D 422

Project Name: Rancho Vista, San Juan Bautista	Project No: 3603.104
Comments:	Date: 6/26/2015
Invoice Number: 14347	

Tested By: gs

Reported By: G. Suckow



COBBLES	GRAVEL		SAND			SILT/CLAY
	coarse	fine	coarse	medium	fine	

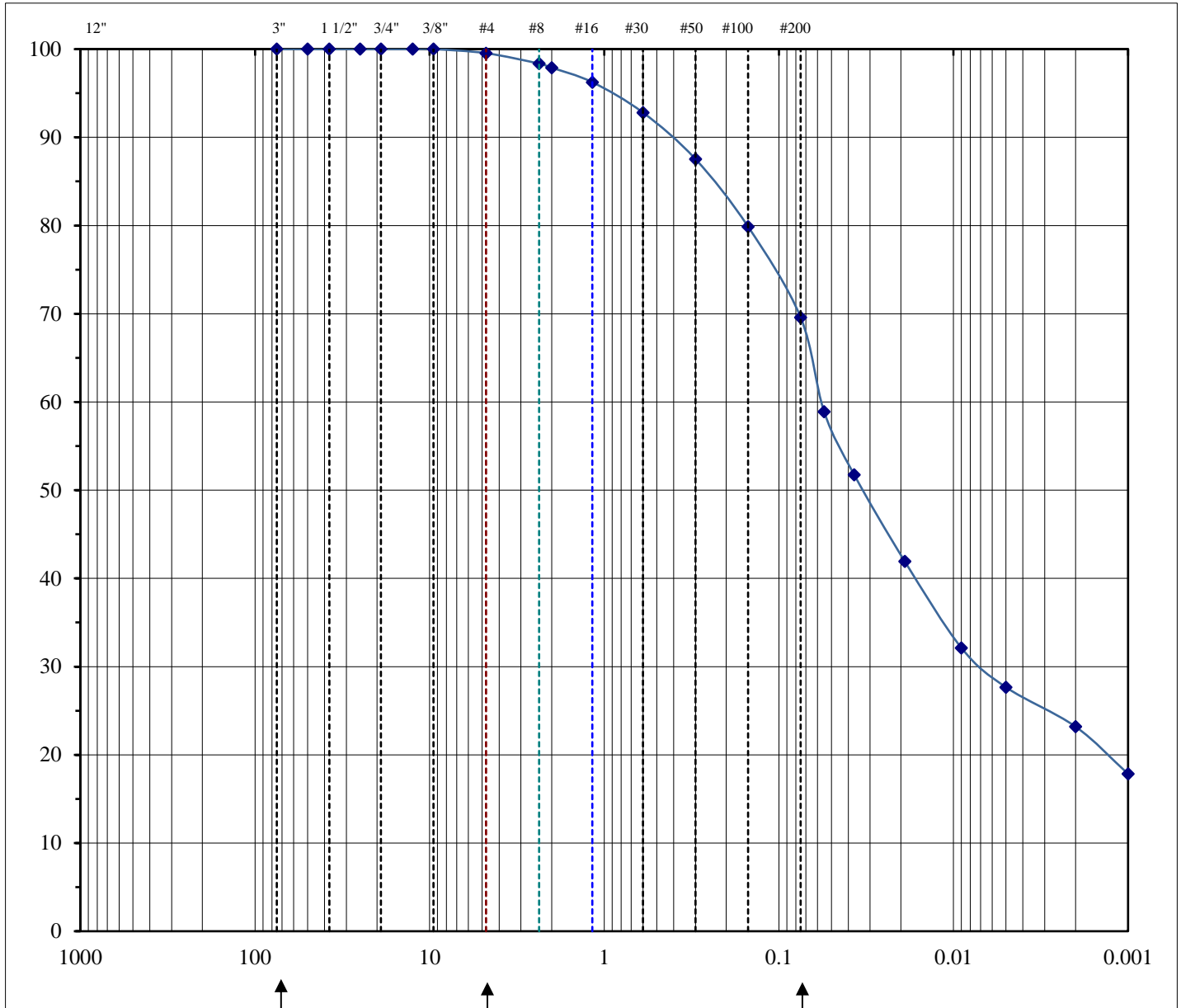
Symbol	Sample ID	Description	ASTM D4318 Plasticity Index:
	B9 at 12ft	CH Silty Clay Light Gray Brown	40

Gradation Test Data ASTM D 422

Project Name: Rancho Vista, San Juan Bautista	Project No: 3603.104
Comments:	Date: 6/26/2015
Invoice Number: 14347	

Tested By: gs

Reported By: G. Suckow



COBBLES	GRAVEL		SAND			SILT/CLAY
	coarse	fine	coarse	medium	fine	

Symbol	Sample ID	Description	ASTM D4318 Plasticity Index:
	B10 at 10-12ft	CL Sandy Clay Plastic Dark Gray Brown	22

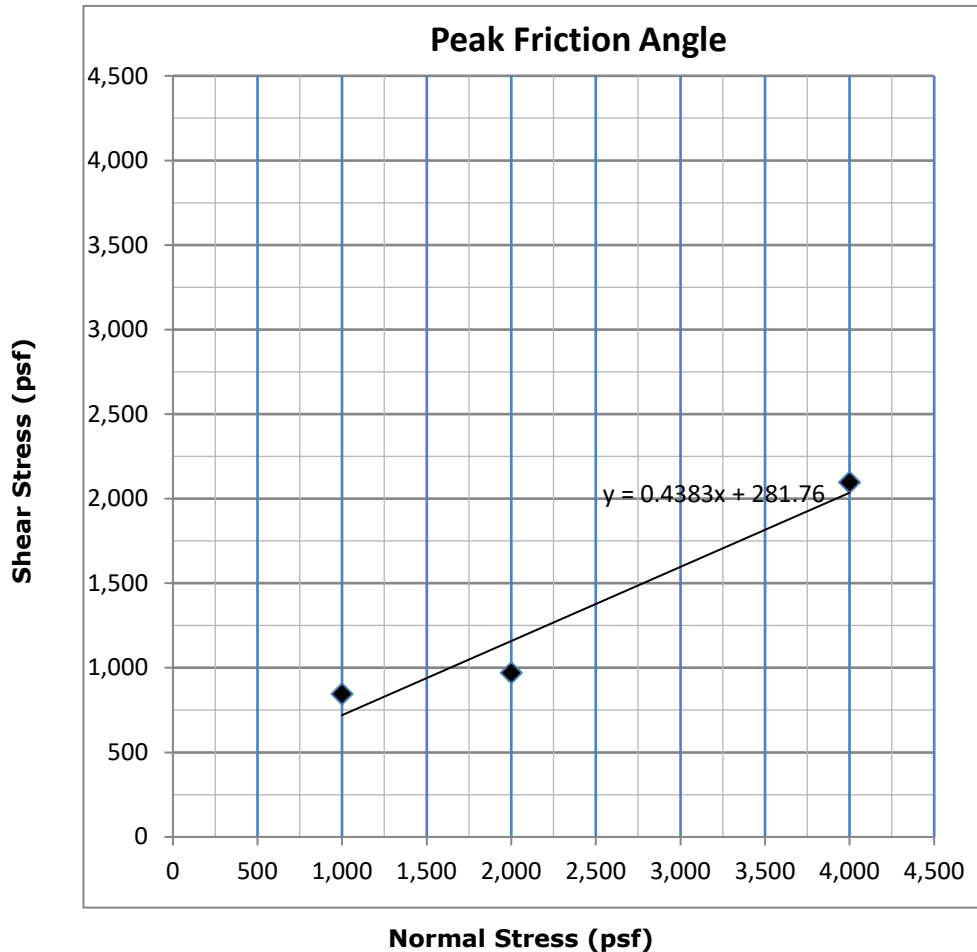
Direct Shear Worksheet ASTM D-3080

Project Name: Rancho Vista, San Juan Bautista		Project Number: 3603.104	
Sample ID: B8 at 12ft		Date Tested: 07/01/15	
Material Description: Silty Sand / Sandy Silt Light Brown Gray		Invoice Number: 14347	
Sample Type: insitu	Test Type: cu	Shear Rate, inches/min.: 0.00100	
Maximum Dry Density, pcf: 0.0		Minimum Required Compaction, %: 0.0	
Optimum Moisture Content, %: 0.0		Minimum Compacted Moisture Content, %: 0.0	

Summary of Results

Normal Stress, psf:	1,000	2,000	4,000	
Peak Shear Stress, psf:	845	971	2,098	
Initial Dry Density, pcf:	91.4	90.9	88.2	
Initial Moisture Content, %:	26.7	26.7	26.7	
Final Moisture Content, %:	26.8	26.8	26.2	
Peak Cohesion, (C'), psf:	282		Peak Friction Angle, (Φ'_{peak}), Degrees:	23.7

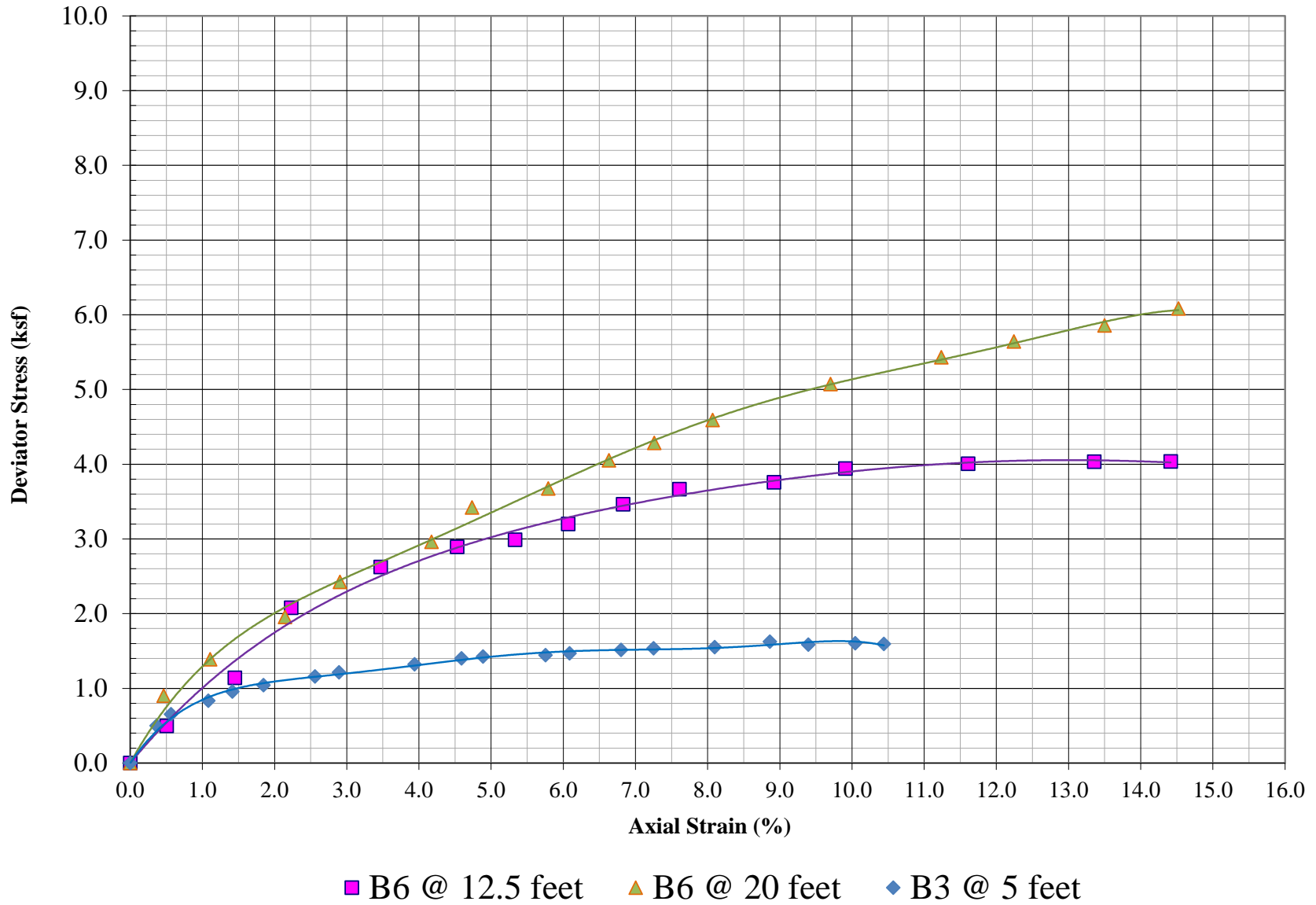
Graph of Shear Stress vs Normal Stress



Berlogar Stevens & Associates Pleasanton, CA

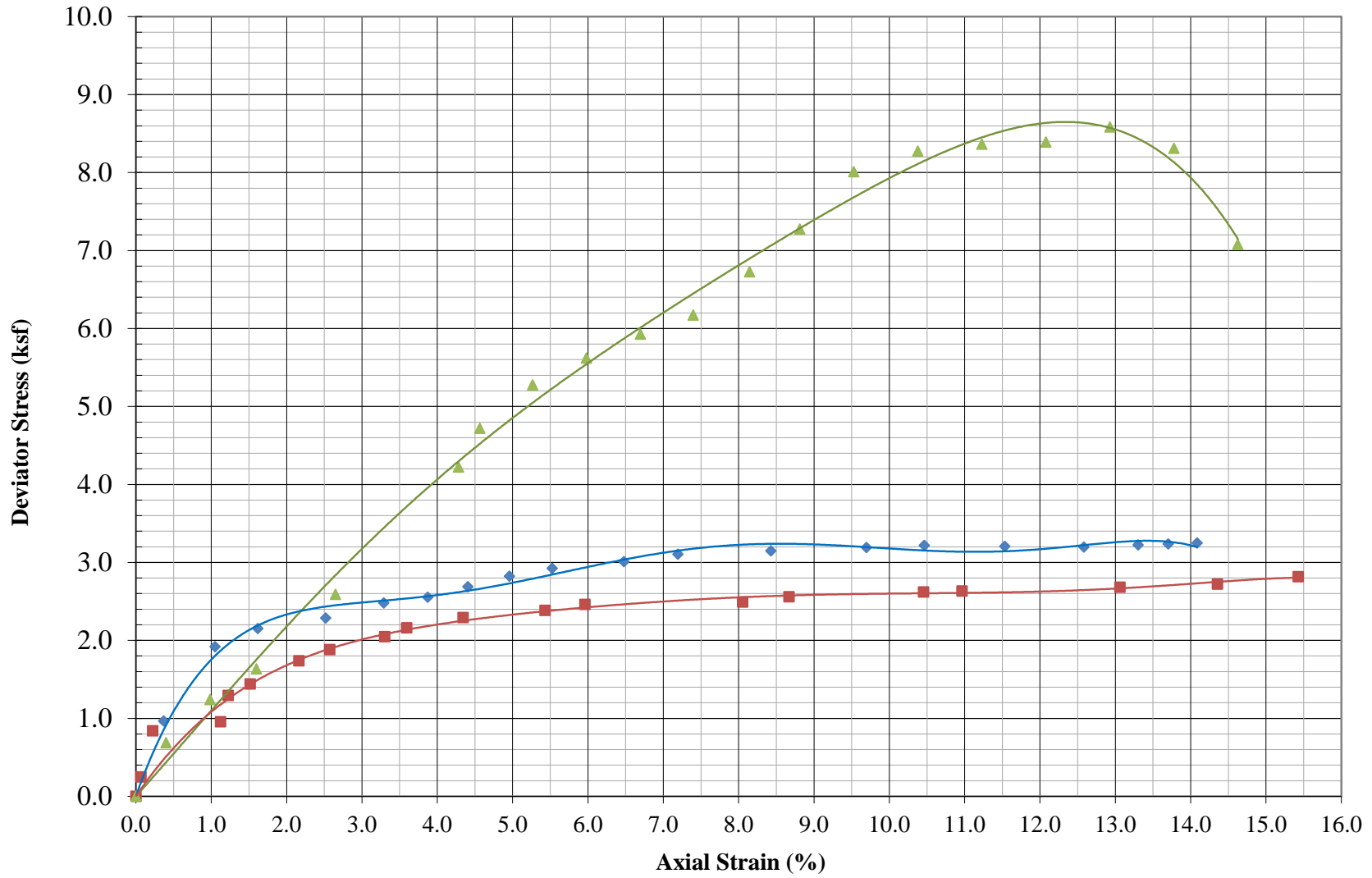
TXCU D-4767 TEST

Project Name: Rancho Vista, San Juan Bautista, CA
Project No.: 3603.104



TXCU D-4767 TEST

Project Name: Rancho Vista, San Juan Bautista, CA
Project No.: 3603.104



◆ B7 @ 16 feet ■ B8 @ 27 feet ▲ B9 @ 11.5 feet

Consolidated-Undrained Triaxial Compression Strength ASTM D-4767

Project Name: Rancho Vista, San Juan Bautista, CA			Project Number: 3603.104		
Sample ID: B3 at 5ft -300psf			Date: 07/06/15		
Sample Description: Sandy Clay Red Brown			Invoice Number: 14347		
Test Type: Consolidated Unsaturated Undrained			Deflection Rate, in/min: 0.2000		
Cell Pressure, psi: 2.1		Back Pressure, psi: 0.0		Effective Consolidation Pressure, ksf: 0.300	
Initial Dry Density, pcf: 94.6			Consolidated Dry Density, pcf: 94.1		
Initial Moisture Content, %: 17.6			Consolidated Moisture Content, %: 31.6		

Test Data

Load, lbs	Pore Pressure, psi	Axial Strain, inches	Deviator Stress, ksf	Axial Strain, %	Δ Pore Pressure, psf	σ_1 , ksf	σ_3' ksf	σ_1' / σ_3'
0	0.0	0.000	0.000	0.0	0.000	0.300	0.300	1.0
16	0.2	0.022	0.498	0.4	0.029	0.797	0.271	2.8
21	0.3	0.034	0.652	0.6	0.043	0.952	0.256	3.5
27	0.2	0.065	0.834	1.1	0.029	1.134	0.271	4.1
31	0.6	0.085	0.955	1.4	0.086	1.254	0.213	5.5
34	0.8	0.111	1.042	1.8	0.115	1.342	0.184	6.7
38	0.9	0.154	1.156	2.6	0.130	1.456	0.170	7.8
40	1.0	0.174	1.213	2.9	0.144	1.513	0.156	8.8
44	1.0	0.237	1.320	3.9	0.144	1.620	0.156	9.5
47	1.0	0.276	1.401	4.6	0.144	1.700	0.156	10.0
48	1.2	0.294	1.426	4.9	0.173	1.725	0.127	12.3
49	1.2	0.346	1.442	5.8	0.173	1.742	0.127	12.4
50	1.2	0.366	1.467	6.1	0.173	1.766	0.127	12.6
52	1.2	0.409	1.514	6.8	0.173	1.813	0.127	12.9
53	1.3	0.436	1.535	7.2	0.187	1.835	0.112	14.7
54	1.4	0.487	1.550	8.1	0.202	1.850	0.098	16.8
57	1.5	0.533	1.623	8.9	0.216	1.922	0.084	20.4
56	1.5	0.565	1.585	9.4	0.216	1.884	0.084	20.0
57	1.4	0.604	1.602	10.0	0.202	1.901	0.098	17.4
57	1.4	0.628	1.594	10.4	0.202	1.894	0.098	17.3

Initial Data		Consolidated Data		Final Data		Sketch of Failure
Sample Mass, (g)	805.4	ΔH_C , in:	0.01	Tare ID:	832	
Diameter, inches:	2.42	ΔH_{Sat} , in:	0.00	Wet Sample + Tare Mass,(g)	912.9	
Height, inches:	6.00	ΔV_C , cm ³ :	0.0	Dry Sample + Tare Mass, (g)	696.6	
Initial Area. ft ² :	0.032	Area _c , ft ² :	0.032	Tare Mass, (g)	11.5	
Initial Vol. ft ³ :	0.016	Vol _c , ft ³ :	0.016	init γ_{wet} pcf:	111.2	

Tested By:

Reported By:

Berlogar Stevens & Associates

Consolidated-Undrained Triaxial Compression Strength ASTM D-4767

Project Name: Rancho Vista, San Juan Bautista, CA		Project Number: 3603.104	
Sample ID: B6 at 12-1/2ft 500psf		Date: 07/06/15	
Sample Description: Sandy Clay Red Brown		Invoice Number: 14347	
Test Type: Consolidated Unsaturated Undrained		Deflection Rate, in/min: 0.2000	
Cell Pressure, psi: 3.5	Back Pressure, psi: 0.0	Effective Consolidation Pressure, ksf: 0.500	
Initial Dry Density, pcf: 106.1		Consolidated Dry Density, pcf: 105.6	
Initial Moisture Content, %: 18.3		Consolidated Moisture Content, %: 17.7	

Test Data

Load, lbs	Pore Pressure, psi	Axial Strain, inches	Deviator Stress, ksf	Axial Strain, %	Δ Pore Pressure, psf	σ ₁ ' ksf	σ ₃ ' ksf	σ ₁ ' / σ ₃ '
0	0.0	0.000	0.000	0.0	0.000	0.500	0.500	1.0
16	0.3	0.022	0.497	0.5	0.043	0.997	0.456	2.1
37	0.4	0.063	1.139	1.4	0.058	1.639	0.442	3.6
68	0.4	0.097	2.077	2.2	0.058	2.576	0.442	5.7
87	0.5	0.151	2.623	3.5	0.072	3.123	0.428	7.1
97	0.6	0.197	2.893	4.5	0.086	3.392	0.413	8.0
101	0.6	0.232	2.986	5.3	0.086	3.486	0.413	8.2
109	0.7	0.264	3.198	6.1	0.101	3.698	0.399	9.0
119	0.7	0.297	3.463	6.8	0.101	3.963	0.399	9.7
127	0.8	0.331	3.665	7.6	0.115	4.165	0.384	10.5
132	0.8	0.388	3.755	8.9	0.115	4.255	0.384	10.8
140	0.8	0.431	3.940	9.9	0.115	4.439	0.384	11.2
145	0.8	0.505	4.003	11.6	0.115	4.503	0.384	11.4
149	0.8	0.581	4.032	13.4	0.115	4.532	0.384	11.5
151	0.8	0.627	4.037	14.4	0.115	4.536	0.384	11.5
154	0.7	0.691	4.046	15.9	0.101	4.546	0.399	11.1
158	0.7	0.754	4.080	17.3	0.101	4.579	0.399	11.2
160	0.7	0.797	4.082	18.3	0.101	4.582	0.399	11.2
162	0.7	0.821	4.105	18.9	0.101	4.605	0.399	11.3
161	0.7	0.844	4.053	19.4	0.101	4.553	0.399	11.2

Initial Data		Consolidated Data		Final Data		Sketch of Failure
Sample Mass, (g)	657.5	ΔH _C , in:	0.01	Tare ID:	818	
Diameter, inches:	2.42	ΔH _{Sat} , in:	0.00	wet Sample + Tare Mass, (g)	765.0	
Height, inches:	4.34	ΔV _C , cm ³ :	0.0	Dry Sample + Tare Mass, (g)	666.7	
Initial Area, ft ² :	0.032	Area _C , ft ² :	0.032	Tare Mass, (g)	111.0	
Initial Vol. ft ³ :	0.012	Vol _C , ft ³ :	0.012	init Y _{wetr} pcf:	125.5	

Tested By: gs

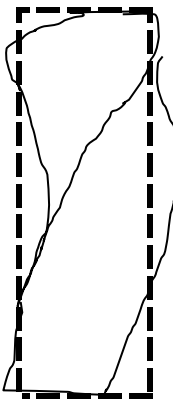
Reported By: G Suckow

Consolidated-Undrained Triaxial Compression Strength ASTM D-4767

Project Name: Rancho Vista, San Juan Bautista, CA		Project Number: 3603.104	
Sample ID: B6 at 20 ft 750psf		Date: 07/06/15	
Sample Description: Sandy Clay Red Brown		Invoice Number: 14347	
Test Type: Consolidated Unsaturated Undrained		Deflection Rate, in/min: 0.2000	
Cell Pressure, psi: 5.2	Back Pressure, psi: 0.0	Effective Consolidation Pressure, ksf: 0.750	
Initial Dry Density, pcf: 110.8		Consolidated Dry Density, pcf: 110.1	
Initial Moisture Content, %: 17.8		Consolidated Moisture Content, %: 17.6	

Test Data

Load, lbs	Pore Pressure, psi	Axial Strain, inches	Deviator Stress, ksf	Axial Strain, %	Δ Pore Pressure, psf	σ ₁ , ksf	σ ₃ ' ksf	σ ₁ ' / σ ₃ '
0	0.0	0.000	0.000	0.0	0.000	0.750	0.750	1.0
29	0.4	0.028	0.901	0.5	0.058	1.651	0.693	2.3
45	0.7	0.067	1.389	1.1	0.101	2.139	0.649	3.1
64	1.0	0.130	1.954	2.1	0.144	2.704	0.606	4.2
80	1.2	0.176	2.424	2.9	0.173	3.174	0.577	5.2
99	1.4	0.253	2.960	4.2	0.202	3.710	0.549	6.4
115	1.4	0.287	3.418	4.7	0.202	4.169	0.549	7.2
125	1.6	0.351	3.674	5.8	0.230	4.425	0.520	8.1
139	1.7	0.402	4.050	6.6	0.245	4.800	0.505	9.0
148	1.8	0.440	4.283	7.3	0.259	5.033	0.491	9.7
160	1.8	0.489	4.590	8.1	0.259	5.340	0.491	10.3
180	1.9	0.588	5.072	9.7	0.274	5.822	0.477	11.6
196	2.0	0.681	5.429	11.2	0.288	6.179	0.462	12.7
206	2.0	0.742	5.641	12.2	0.288	6.391	0.462	13.2
217	2.0	0.818	5.857	13.5	0.288	6.607	0.462	13.7
228	2.0	0.880	6.081	14.5	0.288	6.831	0.462	14.2
239	2.0	0.974	6.259	16.1	0.288	7.009	0.462	14.5
246	2.0	1.034	6.366	17.1	0.288	7.117	0.462	14.8
250	2.0	1.071	6.422	17.7	0.288	7.172	0.462	14.9
257	2.0	1.176	6.463	19.4	0.288	7.213	0.462	15.0

Initial Data		Consolidated Data		Final Data		Sketch of Failure 
Sample Mass, (g)	951.9	ΔH _C , in:	0.02	Tare ID:	835	
Diameter, inches:	2.42	ΔH _{Satv} , in:		wet Sample + Tare Mass,(g)	1061.0	
Height, inches:	6.04	ΔV _C , cm ³ :		Dry Sample + Tare Mass, (g)	918.7	
Initial Area, ft ² :	0.032	Area _C , ft ² :	0.032	Tare Mass, (g)	110.7	
Initial Vol. ft ³ :	0.016	Vol _C , ft ³ :	0.016	init Y _{wetr} pcf:	130.6	

Tested By:

Reported By:

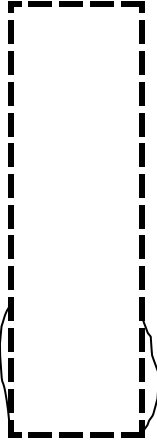
Berlogar Stevens & Associates

Consolidated-Undrained Triaxial Compression Strength ASTM D-4767

Project Name: Rancho Vista, San Juan Bautista, CA		Project Number: 3603.104	
Sample ID: B7 at 16 ft 650 psf		Date: 07/06/15	
Sample Description: Silty Clay Dark Gray		Invoice Number: 14347	
Test Type: Consolidated Unsaturated Undrained		Deflection Rate, in/min: 0.2000	
Cell Pressure, psi: 4.5	Back Pressure, psi: 0.0	Effective Consolidation Pressure, ksf: 0.650	
Initial Dry Density, pcf: 97.3		Consolidated Dry Density, pcf: 96.9	
Initial Moisture Content, %: 25.1		Consolidated Moisture Content, %: 24.8	

Test Data

Load, lbs	Pore Pressure, psi	Axial Strain, inches	Deviator Stress, ksf	Axial Strain, %	Δ Pore Pressure, psf	σ ₁ ' ksf	σ ₃ ' ksf	σ ₁ ' / σ ₃ '
0	0.0	0.000	0.000	0.0	0.000	0.650	0.650	1.0
31	0.1	0.022	0.965	0.4	0.014	1.615	0.636	2.5
62	0.3	0.063	1.917	1.1	0.043	2.567	0.607	4.2
70	0.3	0.097	2.152	1.6	0.043	2.802	0.607	4.5
75	0.3	0.151	2.284	2.5	0.043	2.934	0.607	4.8
82	0.3	0.197	2.478	3.3	0.043	3.128	0.607	5.1
85	0.4	0.232	2.553	3.9	0.058	3.203	0.592	5.3
90	0.5	0.264	2.688	4.4	0.072	3.338	0.578	5.7
95	0.5	0.297	2.821	5.0	0.072	3.471	0.578	5.9
99	0.6	0.331	2.922	5.5	0.086	3.572	0.564	6.2
103	0.6	0.388	3.010	6.5	0.086	3.660	0.564	6.3
107	0.6	0.431	3.103	7.2	0.086	3.753	0.564	6.5
110	0.7	0.505	3.147	8.4	0.101	3.797	0.549	6.7
113	0.7	0.581	3.188	9.7	0.101	3.838	0.549	6.8
115	0.7	0.627	3.217	10.5	0.101	3.867	0.549	6.9
116	0.8	0.691	3.206	11.5	0.115	3.856	0.535	7.0
117	0.8	0.754	3.196	12.6	0.115	3.846	0.535	7.0
119	0.8	0.797	3.224	13.3	0.115	3.874	0.535	7.0
120	0.8	0.821	3.236	13.7	0.115	3.886	0.535	7.0
121	0.9	0.844	3.248	14.1	0.130	3.898	0.520	7.2

Initial Data		Consolidated Data		Final Data		Sketch of Failure 
Sample Mass, (g)	878.5	ΔH _{Cr} , in:	0.01	Tare ID:	314	
Diameter, inches:	2.42	ΔH _{Sat} , in:	0.00	wet Sample + Tare Mass, (g)	1046.1	
Height, inches:	5.98	ΔV _{Cr} , cm ³ :	0.0	Dry Sample + Tare Mass, (g)	871.9	
Initial Area, ft ² :	0.032	Area _{cr} , ft ² :	0.032	Tare Mass, (g)	169.8	
Initial Vol. ft ³ :	0.016	Vol _{Cr} , ft ³ :	0.016	init Y _{wetr} pcf:	121.7	

Tested By: gs

Reported By: G Suckow

Consolidated-Undrained Triaxial Compression Strength ASTM D-4767

Project Name: Rancho Vista, San Juan Bautista, CA		Project Number: 3603.104	
Sample ID: B8 at 27 feet 950 psf		Date: 07/06/15	
Sample Description: Silty Sand Olive Gray with Silty Clay Olive Gray zone		Invoice Number: 14347	
Test Type: Consolidated Unsaturated Undrained		Deflection Rate, in/min: 0.2000	
Cell Pressure, psi: 2.1	Back Pressure, psi: 0.0	Effective Consolidation Pressure, ksf: 0.300	
Initial Dry Density, pcf: 91.9		Consolidated Dry Density, pcf: 90.9	
Initial Moisture Content, %: 31.4		Consolidated Moisture Content, %: 27.8	

Test Data

Load, lbs	Pore Pressure, psi	Axial Strain, inches	Deviator Stress, ksf	Axial Strain, %	Δ Pore Pressure, psf	σ_1 , ksf	σ_3' ksf	σ_1' / σ_3'
0	0.0	0.000	0.000	0.0	0.000	0.300	0.300	1.0
8	1.3	0.004	0.249	0.1	0.187	0.548	0.112	3.2
27	1.6	0.013	0.839	0.2	0.230	1.138	0.069	13.1
31	1.8	0.066	0.954	1.1	0.259	1.254	0.040	24.7
42	1.9	0.072	1.291	1.2	0.274	1.591	0.026	50.8
47	2.0	0.089	1.441	1.5	0.288	1.740	0.012	126.1
57	2.0	0.127	1.736	2.2	0.288	2.036	0.012	151.7
62	2.0	0.151	1.880	2.6	0.288	2.180	0.012	164.2
68	1.9	0.194	2.047	3.3	0.274	2.346	0.026	80.0
72	1.9	0.211	2.161	3.6	0.274	2.460	0.026	84.4
77	1.8	0.255	2.293	4.3	0.259	2.592	0.040	57.9
81	1.6	0.319	2.385	5.4	0.230	2.684	0.069	35.5
84	1.5	0.350	2.459	6.0	0.216	2.759	0.084	30.4
87	1.3	0.473	2.490	8.1	0.187	2.790	0.112	23.2
90	1.2	0.509	2.559	8.7	0.173	2.858	0.127	21.2
94	1.1	0.614	2.620	10.5	0.158	2.920	0.141	19.6
95	1.0	0.644	2.633	11.0	0.144	2.933	0.156	17.9
99	0.8	0.767	2.679	13.1	0.115	2.979	0.184	15.5
102	0.6	0.843	2.719	14.4	0.086	3.019	0.213	13.8
107	0.5	0.906	2.817	15.4	0.072	3.117	0.228	13.4

Initial Data		Consolidated Data		Final Data		<p align="center">Sketch of Failure</p>
Sample Mass, (g)	851.2	ΔH_{Cr} , in:	0.03	Tare ID:	16	
Diameter, inches:	2.42	ΔH_{Sat} , in:	0.00	Wet Sample + Tare Mass,(g)	1040.7	
Height, inches:	5.84	ΔV_{Cr} , cm ³ :	0.0	Dry Sample + Tare Mass, (g)	860.8	
Initial Area, ft ² :	0.032	Area _{cr} , ft ² :	0.032	Tare Mass, (g)	212.9	
Initial Vol. ft ³ :	0.016	Vol _{cr} , ft ³ :	0.016	init γ_{wet} pcf:	120.7	

Tested By: gs

Reported By: g suckow

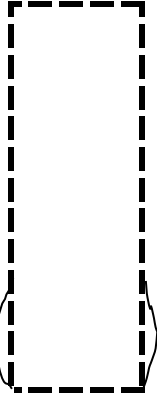
Berlogar Stevens & Associates

Consolidated-Undrained Triaxial Compression Strength ASTM D-4767

Project Name: Rancho Vista, San Juan Bautista, CA		Project Number: 3603.104	
Sample ID: B9 at 11-1/2 feet 500 psf		Date: 07/06/15	
Sample Description: Silty Clay Loght Olive Gray		Invoice Number: 14347	
Test Type: Consolidated Unsaturated Undrained		Deflection Rate, in/min: 0.2000	
Cell Pressure, psi: 3.5	Back Pressure, psi: 0.0	Effective Consolidation Pressure, ksf: 0.500	
Initial Dry Density, pcf: 99.0		Consolidated Dry Density, pcf: 98.8	
Initial Moisture Content, %: 24.7		Consolidated Moisture Content, %: 24.3	

Test Data

Load, lbs	Pore Pressure, psi	Axial Strain, inches	Deviator Stress, ksf	Axial Strain, %	Δ Pore Pressure, psf	σ_1 , ksf	σ_3' ksf	σ_1' / σ_3'
0	0.0	0.000	0.000	0.0	0.000	0.500	0.500	1.0
22	0.1	0.024	0.686	0.4	0.014	1.185	0.485	2.4
40	0.2	0.059	1.239	1.0	0.029	1.739	0.471	3.6
53	0.3	0.096	1.632	1.6	0.043	2.132	0.456	4.6
85	0.4	0.159	2.589	2.6	0.058	3.089	0.442	6.9
141	0.5	0.257	4.223	4.3	0.072	4.723	0.428	10.9
158	0.6	0.274	4.718	4.6	0.086	5.218	0.413	12.4
178	0.7	0.316	5.277	5.3	0.107	5.776	0.393	14.4
191	0.8	0.359	5.619	6.0	0.115	6.119	0.384	15.6
203	0.8	0.402	5.927	6.7	0.115	6.426	0.384	16.4
213	0.9	0.444	6.172	7.4	0.130	6.672	0.370	17.7
234	0.9	0.489	6.726	8.1	0.130	7.225	0.370	19.2
255	1.0	0.529	7.276	8.8	0.144	7.776	0.356	21.5
283	1.0	0.572	8.012	9.5	0.144	8.511	0.356	23.5
295	1.0	0.623	8.273	10.4	0.144	8.773	0.356	24.3
301	1.0	0.674	8.361	11.2	0.144	8.861	0.356	24.5
305	1.0	0.725	8.391	12.1	0.144	8.891	0.356	24.6
315	1.0	0.776	8.583	12.9	0.144	9.082	0.356	25.1
308	1.0	0.827	8.310	13.8	0.144	8.810	0.356	24.4
265	1.0	0.878	7.079	14.6	0.144	7.579	0.356	20.9

Initial Data		Consolidated Data		Final Data		Sketch of Failure 
Sample Mass, (g)	893.4	ΔH_C , in:	0.00	Tare ID:	20	
Diameter, inches:	2.42	ΔH_{Satr} , in:		wet Sample + Tare Mass, (g)	1104.3	
Height, inches:	6.00	ΔV_C , cm ³ :		Dry Sample + Tare Mass, (g)	929.8	
Initial Area, ft ² :	0.032	Area _c , ft ² :	0.032	Tare Mass, (g)	213.1	
Initial Vol. ft ³ :	0.016	Vol _C , ft ³ :	0.016	init γ_{wet} pcf:	123.3	

Tested By:

Reported By:

Berlogar Stevens & Associates

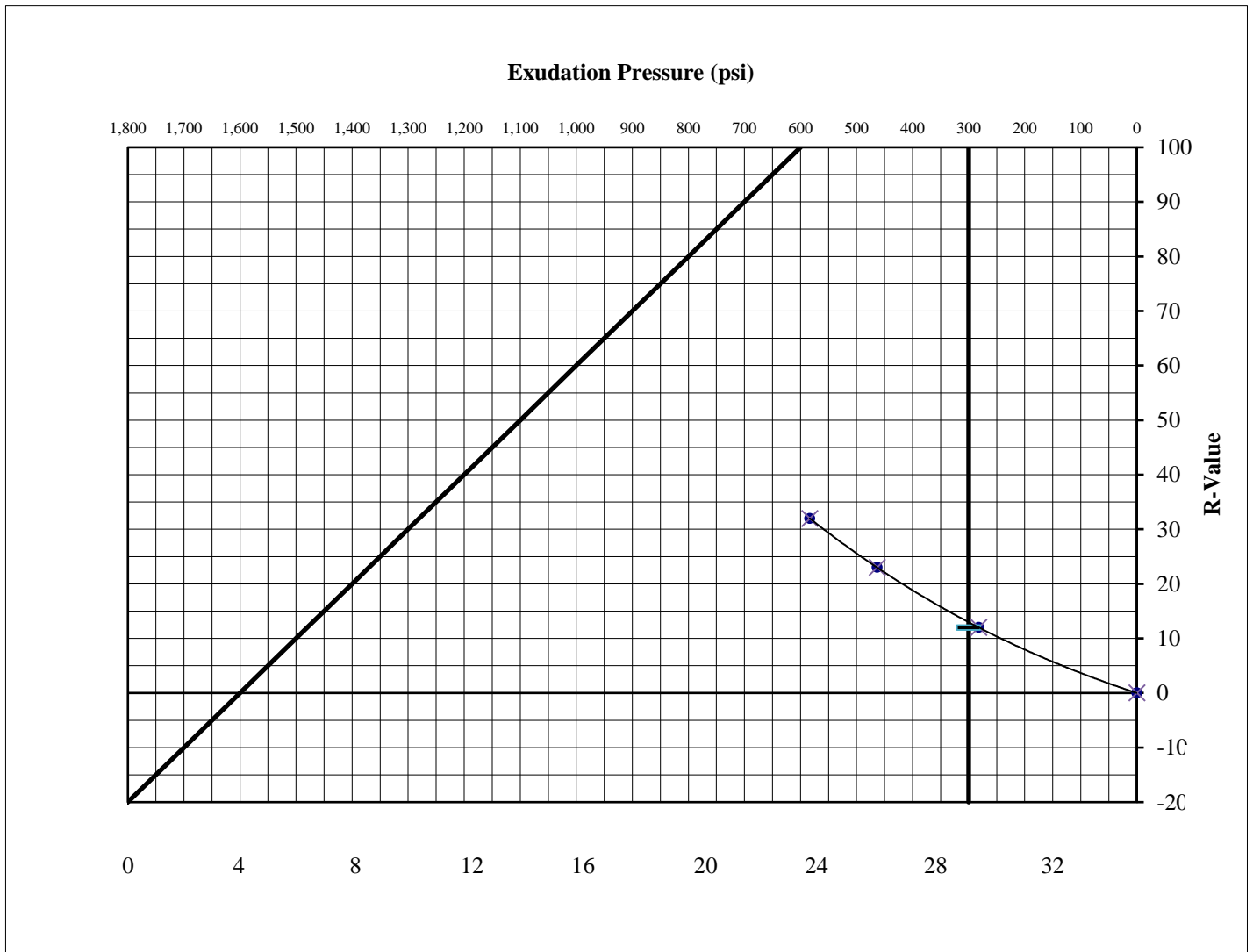
Resistance Value (R) Value Test

ASTM D2844 and CalTrans CTM 301

Project Name: Rancho Vista, San Juan Bautista	Project Number: 3603.104
Sample ID: B6 at 0-3ft	Date Tested: 07/08/15
Area Sample Represents:	Invoice Number: 14347
Material Description: Silty Clay with Sand Dark Brown Organic	Reported By: G Suckow
Comments:	

Specimen Data

Specimen	A	B	C	D
Exudation Pressure, psi	282	463	584	0
Resistance Value (R) :	12	23	32	0
% Moisture at Test:	17.6	16.1	14.6	
Dry Density at Test, pcf:	108.8	109.7	114.0	
Expansion Dial, (0.0001"):	4	16	56	0
Expansion Pressure, psf:	17.7	70.9	248.1	
Expansion Pressure at 300 psi:	23.0 psf			
R-Value at 300 psi Exudation Pressure: 12	Specification:			



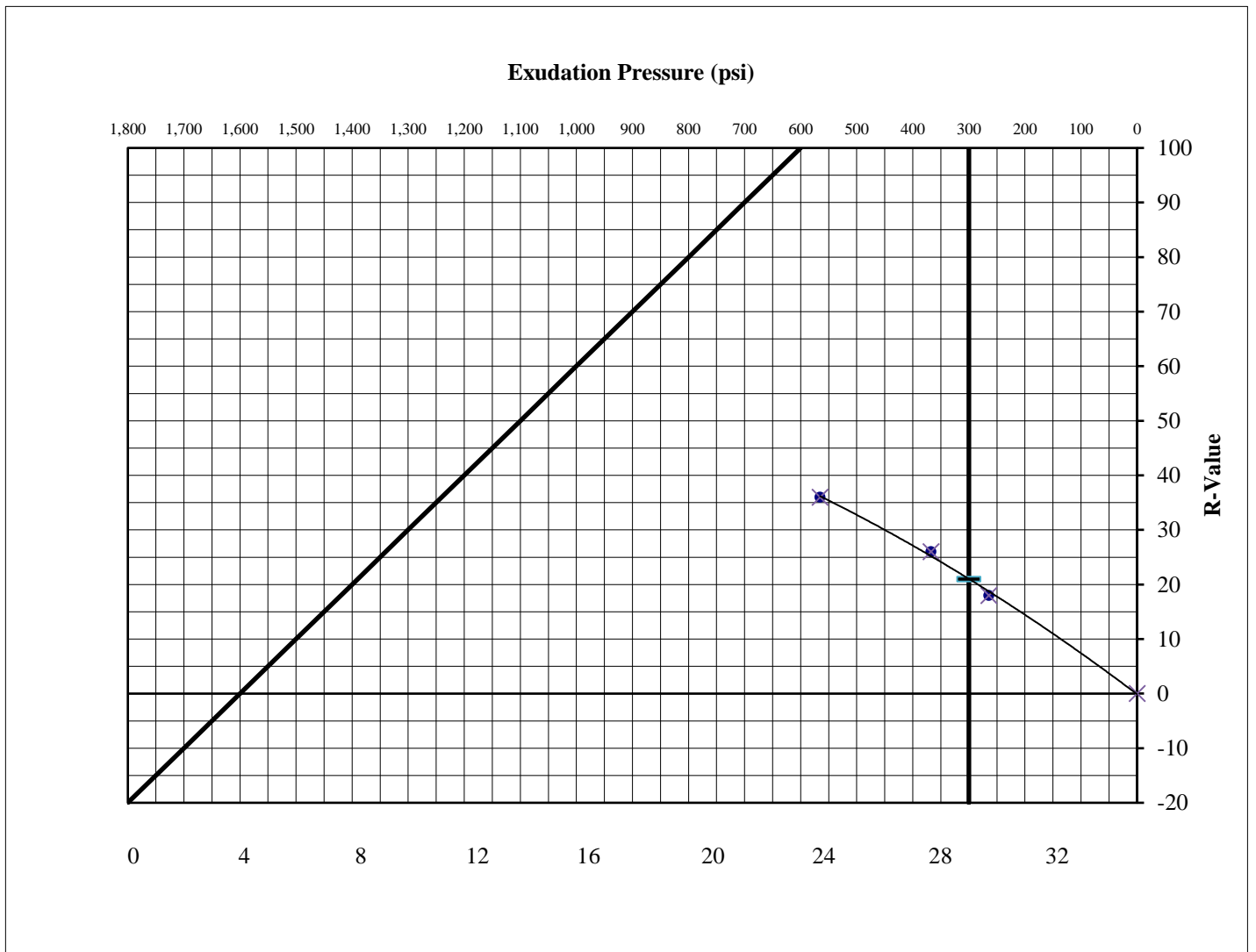
Resistance Value (R) Value Test

ASTM D2844 and CalTrans CTM 301

Project Name: Rancho Vista, San Juan Bautista	Project Number: 3603.104
Sample ID: B10 at 0-3ft	Date Tested: 07/07/15
Area Sample Represents:	Invoice Number: 14347
Material Description: Silty Clay with Sand Dark Gray Brown	Reported By: G Suckow
Comments:	

Specimen Data

Specimen	A	B	C	D
Exudation Pressure, psi	264	368	565	0
Resistance Value (R) :	18	26	36	0
% Moisture at Test:	17.6	16.7	15.8	
Dry Density at Test, pcf:	107.2	108.5	107.8	
Expansion Dial, (0.0001"):	3	12	27	0
Expansion Pressure, psf:	13.3	53.2	119.6	
Expansion Pressure at 300 psi:	27.1 psf			
R-Value at 300 psi Exudation Pressure: 21		Specification:		



Berlogar Stevens & Associates

ASTM Laboratory Tests Summary Sheets

Project Name: Rancho Vista, San Juan Bautista, CA	Project Number: 3603.104
Client: R.L. Fulton Holding Company, LLC	Date Reported: 04/20/16
Attention: Mr. Bob Fulton	Date Received: 04/14/16
Sample ID: Granite Rock Company, Highway 129 Project Site - TP1 at 3.5 feet	Invoice Number: 14724
Material Description: Silty Clay with Claystone, Very Weak to Friable, Brown and Dark Gray Mix	Reported By: G Suckow

Sieve Analysis ASTM C136 CTM 202

Resistance Value (R-Value) ASTM D2844 CTM 301

Sieve Size		Percent Passing	Specifications				
US	mm			A	B	C	D
3"	75.0			Exudation Pressure, psi:			
2-1/2"	63.5			Corrected R-Value:			
2"	50.0			Moisture Content at Test, %:			
1-1/2"	37.5			Dry Density, pcf:			
1"	25.0			Expansion Pressure, psf:			
3/4"	19.0			R-Value at 300 psi:		Specification:	
1/2"	12.5			Expansion Pressure at 300 psi:		psf	
3/8"	9.5	100		Plasticity Index ASTM D4318			
1/4"	6.3			Liquid Limit:	40	Specification	
#4	4.75	100		Plastic Limit:	22	Specification	
#8	2.36	100		Plasticity Index:	18	Specification	
#10	2.00			-40 Soil Classification:	CL Lean Clay		
#16	1.18	100		Coarse and Fine Aggregate Quality Tests			
#30	0.600	99				Specifications	
#40	0.425			Cleanliness Value, CTM 227:			
#50	0.300	99		Sand Equivalency, ASTM D2419:			
#100	0.150	98		Coarse Durability Index, ASTM3744:			
#200	0.075	68.6		Fine Durability Index, ASTM3744:			
Dry Density Moisture Content Relationship				Sodium Soundness ASTM C88, % Loss:			
				LA Abrasion ASTM C131 500 Revs. % Loss:			
Test Method	Optimum Moisture Content, %:	Maximum Dry Density, Pcf:	LA Abrasion ASTM C131 100 Revs. % Loss:				
			LA Abrasion ASTM C131 Grading Used:				
			ASTM D-4829 Expansion Index(EI) _{50%} :				
D1557B			Expansion Potential:				
Relative Compaction of Untreated Soils CTM 216							
Moisture Content, %	Maximum Wet Density, g/cc:						

Comments:

Berlogar Stevens & Associates

ASTM Laboratory Tests Summary Sheets

Project Name: Rancho Vista, San Juan Bautista, CA	Project Number: 3603.104
Client: R.L. Fulton Holding Company, LLC	Date Reported: 04/20/16
Attention: Mr. Bob Fulton	Date Received: 04/14/16
Sample ID: Granite Rock Company, Highway 129 Project Site - TP1 at 7 feet	Invoice Number: 14724
Material Description: Silty Clay with Claystone, Very Weak to Friable, Light Brown	Reported By: G Suckow

Sieve Analysis ASTM C136 CTM 202

Resistance Value (R-Value) ASTM D2844 CTM 301

Sieve Size		Percent Passing	Specifications				
US	mm			A	B	C	D
3"	75.0			Exudation Pressure, psi:			
2-1/2"	63.5			Corrected R-Value:			
2"	50.0			Moisture Content at Test, %:			
1-1/2"	37.5			Dry Density, pcf:			
1"	25.0			Expansion Pressure, psf:			
3/4"	19.0	100		R-Value at 300 psi:		Specification:	
1/2"	12.5	100		Expansion Pressure at 300 psi:		psf	
3/8"	9.5	99		Plasticity Index ASTM D4318			
1/4"	6.3			Liquid Limit:	39	Specification	
#4	4.75	98		Plastic Limit:	23	Specification	
#8	2.36	97		Plasticity Index:	16	Specification	
#10	2.00			-40 Soil Classification:	CL Lean Clay		
#16	1.18	97		Coarse and Fine Aggregate Quality Tests			
#30	0.600	96				Specifications	
#40	0.425			Cleanliness Value, CTM 227:			
#50	0.300	96		Sand Equivalency, ASTM D2419:			
#100	0.150	95		Coarse Durability Index, ASTM3744:			
#200	0.075	69.2		Fine Durability Index, ASTM3744:			
Dry Density Moisture Content Relationship				Sodium Soundness ASTM C88, % Loss:			
				LA Abrasion ASTM C131 500 Revs. % Loss:			
Test Method	Optimum Moisture Content, %:	Maximum Dry Density, Pcf:	LA Abrasion ASTM C131 100 Revs. % Loss:				
			LA Abrasion ASTM C131 Grading Used:				
			ASTM D-4829 Expansion Index(EI) _{50%} :				
			Expansion Potential:				
Relative Compaction of Untreated Soils CTM 216							
Moisture Content, %	Maximum Wet Density, g/cc:						

Comments:

Berlogar Stevens & Associates

ASTM Laboratory Tests Summary Sheets

Project Name: Rancho Vista, San Juan Bautista, CA	Project Number: 3603.104
Client: R.L. Fulton Holding Company, LLC	Date Reported: 04/20/16
Attention: Mr. Bob Fulton	Date Received: 04/14/16
Sample ID: Granite Rock Company, Highway 129 Project Site - TP2 sidehill	Invoice Number: 14724
Material Description: Silty Sand with Siltstone, Very Weak, Light Brown	Reported By: G Suckow

Sieve Analysis ASTM C136 CTM 202

Resistance Value (R-Value) ASTM D2844 CTM 301

Sieve Size		Percent Passing	Specifications				
US	mm			A	B	C	D
3"	75.0			Exudation Pressure, psi:			
2-1/2"	63.5			Corrected R-Value:			
2"	50.0	100		Moisture Content at Test, %:			
1-1/2"	37.5	93		Dry Density, pcf:			
1"	25.0	82		Expansion Pressure, psf:			
3/4"	19.0	76		R-Value at 300 psi:		Specification:	
1/2"	12.5	70		Expansion Pressure at 300 psi: psf			
3/8"	9.5	66		Plasticity Index ASTM D4318			
1/4"	6.3			Liquid Limit:	35	Specification	
#4	4.75	58		Plastic Limit:	29	Specification	
#8	2.36	58		Plasticity Index:	6	Specification	
#10	2.00			-40 Soil Classification:	ML Silt		
#16	1.18	58		Coarse and Fine Aggregate Quality Tests			
#30	0.600	57		Specifications			
#40	0.425			Cleanliness Value, CTM 227:			
#50	0.300	57		Sand Equivalency, ASTM D2419:			
#100	0.150	57		Coarse Durability Index, ASTM3744:			
#200	0.075	39.5		Fine Durability Index, ASTM3744:			
Dry Density Moisture Content Relationship				Sodium Soundness ASTM C88, % Loss:			
				LA Abrasion ASTM C131 500 Revs. % Loss:			
				LA Abrasion ASTM C131 100 Revs. % Loss:			
				LA Abrasion ASTM C131 Grading Used:			
				ASTM D-4829 Expansion Index(EI) _{50%} :			
Test Method				Expansion Potential:			
D1557B							
Relative Compaction of Untreated Soils CTM 216							
Moisture Content, %		Maximum Wet Density, g/cc:					

Comments:

Berlogar Stevens & Associates

ASTM Laboratory Tests Summary Sheets

Project Name: Rancho Vista, San Juan Bautista, CA	Project Number: 3603.104
Client: R.L. Fulton Holding Company, LLC	Date Reported: 04/20/16
Attention: Mr. Bob Fulton	Date Received: 04/14/16
Sample ID: Granite Rock Company, Highway 129 Project Site - TP3 at 7 feet	Invoice Number: 14724
Material Description: Clayey Sand/Silty Sand with Claystone/Siltstone fragments, Very Weak, Light Brown	Reported By: G Suckow

Sieve Analysis ASTM C136 CTM 202

Resistance Value (R-Value) ASTM D2844 CTM 301

Sieve Size		Percent Passing	Specifications				
US	mm			A	B	C	D
3"	75.0			Exudation Pressure, psi:			
2-1/2"	63.5			Corrected R-Value:			
2"	50.0	100		Moisture Content at Test, %:			
1-1/2"	37.5	100		Dry Density, pcf:			
1"	25.0	97		Expansion Pressure, psf:			
3/4"	19.0	93		R-Value at 300 psi:		Specification:	
1/2"	12.5	83		Expansion Pressure at 300 psi:		psf	
3/8"	9.5	75		Plasticity Index ASTM D4318			
1/4"	6.3			Liquid Limit:	39	Specification	
#4	4.75	59		Plastic Limit:	25	Specification	
#8	2.36	59		Plasticity Index:	14	Specification	
#10	2.00			-40 Soil Classification:	CL/ML Lean Clay/Silt		
#16	1.18	59		Coarse and Fine Aggregate Quality Tests			
#30	0.600	59				Specifications	
#40	0.425			Cleanliness Value, CTM 227:			
#50	0.300	58		Sand Equivalency, ASTM D2419:			
#100	0.150	58		Coarse Durability Index, ASTM3744:			
#200	0.075	44.1		Fine Durability Index, ASTM3744:			
Dry Density Moisture Content Relationship				Sodium Soundness ASTM C88, % Loss:			
				LA Abrasion ASTM C131 500 Revs. % Loss:			
Test Method	Optimum Moisture Content, %:	Maximum Dry Density, Pcf:	LA Abrasion ASTM C131 100 Revs. % Loss:				
			LA Abrasion ASTM C131 Grading Used:				
			ASTM D-4829 Expansion Index(EI) _{50%} :				
D1557B			Expansion Potential:				
Relative Compaction of Untreated Soils CTM 216							
Moisture Content, %		Maximum Wet Density, g/cc:					

Comments:

Berlogar Stevens & Associates

ASTM Laboratory Tests Summary Sheets

Project Name: Rancho Vista, San Juan Bautista, CA	Project Number: 3603.104
Client: R.L. Fulton Holding Company, LLC	Date Reported:
Attention: Mr. Bob Fulton	Date Received: 04/14/16
Sample ID: Granite Rock Company, Highway 129 Project Site - TP4 center of hillside cut	Invoice Number: 14724
Material Description: sandy Clay with claystone fragments, Very Weak to Friable, Light Brown	Reported By: G Suckow

Sieve Analysis ASTM C136 CTM 202

Resistance Value (R-Value) ASTM D2844 CTM 301

Sieve Size		Percent Passing	Specifications				
US	mm			A	B	C	D
3"	75.0			Exudation Pressure, psi:			
2-1/2"	63.5			Corrected R-Value:			
2"	50.0			Moisture Content at Test, %:			
1-1/2"	37.5			Dry Density, pcf:			
1"	25.0			Expansion Pressure, psf:			
3/4"	19.0			R-Value at 300 psi:		Specification:	
1/2"	12.5			Expansion Pressure at 300 psi:		psf	
3/8"	9.5	100		Plasticity Index ASTM D4318			
1/4"	6.3			Liquid Limit:	36	Specification	
#4	4.75	100		Plastic Limit:	22	Specification	
#8	2.36	100		Plasticity Index:	14	Specification	
#10	2.00			-40 Soil Classification:	CL Lean Clay		
#16	1.18	99		Coarse and Fine Aggregate Quality Tests			
#30	0.600	98				Specifications	
#40	0.425			Cleanliness Value, CTM 227:			
#50	0.300	97		Sand Equivalency, ASTM D2419:			
#100	0.150	95		Coarse Durability Index, ASTM3744:			
#200	0.075	69.4		Fine Durability Index, ASTM3744:			
Dry Density Moisture Content Relationship				Sodium Soundness ASTM C88, % Loss:			
				LA Abrasion ASTM C131 500 Revs. % Loss:			
		Optimum Moisture Content, %:	Maximum Dry Density, Pcf:	LA Abrasion ASTM C131 100 Revs. % Loss:			
				LA Abrasion ASTM C131 Grading Used:			
Relative Compaction of Untreated Soils CTM 216				ASTM D-4829 Expansion Index(EI) _{50%} :			
				Expansion Potential:			
Moisture Content, %		Maximum Wet Density, g/cc:					

Comments:



APPENDIX C

Piezometer Data by Others

Rancho Vista, San Juan Bautista
BSA Job No: 3603.104

Piezometer No. P-1 Blue
Y=0.9789X - 0.2273

Installation depth (ft.) = 8.5
Surface Elevation (ft.) = 177.2 177.2

Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)
07/16/15	3.2	5.3	171.9
07/20/15	3.2	5.3	171.9
07/28/15	3.2	5.3	171.9
09/02/15	3.3	5.2	172.0
11/17/15	3.9	4.6	172.6
01/05/16	4.7	3.8	173.4
02/04/16	5.5	3.0	174.2
03/02/16	5.0	3.5	173.7
04/06/16	4.9	3.6	173.6
05/04/16			

Piezometer No. P-1 ORANGE
Y=0.978X - 0.6629

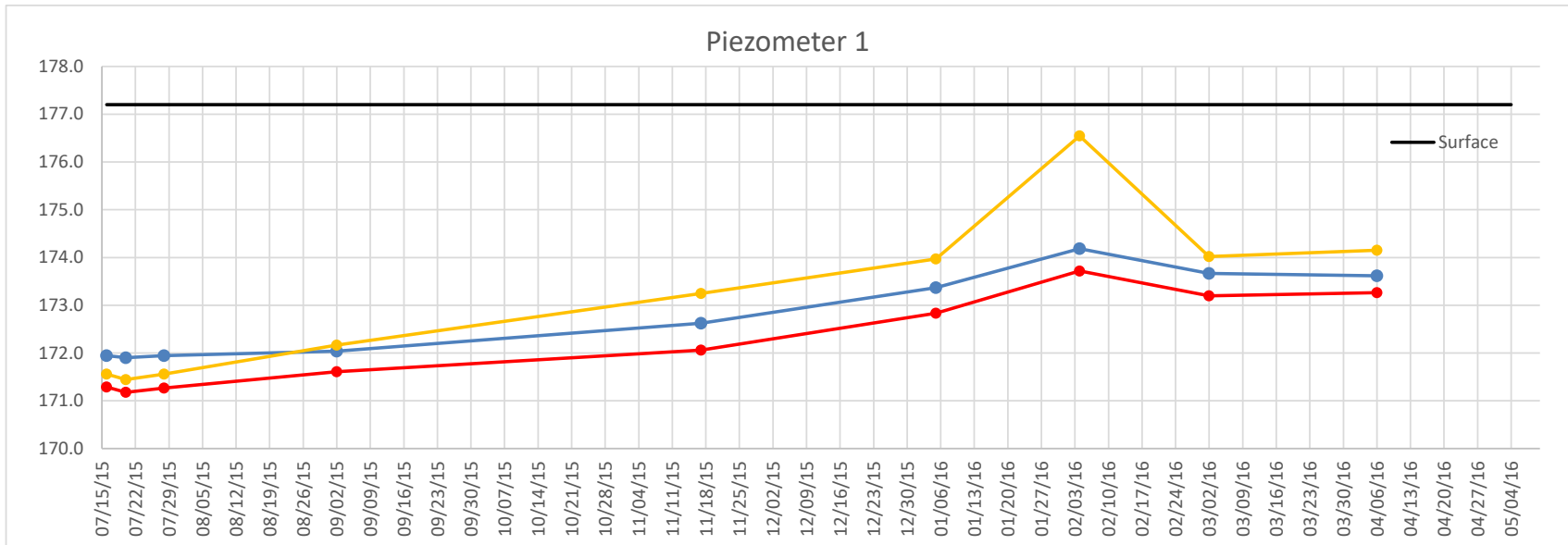
Installation depth (ft.) = 17.0
Surface Elevation (ft.) = 177.2

Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)
07/16/15	11.4	5.6	171.6
07/20/15	11.2	5.8	171.4
07/28/15	11.4	5.6	171.6
09/02/15	12.0	5.0	172.2
11/17/15	13.0	4.0	173.2
01/05/16	13.8	3.2	174.0
02/04/16	16.3	0.7	176.5
03/02/16	13.8	3.2	174.0
04/06/16	14.0	3.0	174.2

Piezometer No. P-1 Red
Y=0.9834x - 0.389

Installation depth (ft.) = 28.5
Surface Elevation (ft.) = 177.2

Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)
07/16/15	22.6	5.9	171.3
07/20/15	22.5	6.0	171.2
07/28/15	22.6	5.9	171.3
09/02/15	22.9	5.6	171.6
11/17/15	23.4	5.1	172.1
01/05/16	24.1	4.4	172.8
02/04/16	25.0	3.5	173.7
03/02/16	24.5	4.0	173.2
04/06/16	24.6	3.9	173.3



Rancho Vista, San Juan Bautista
BSA Job No: 3603.104

Piezometer No. P-2 Blue
Y=0.9832X - 0.5058

Installation depth (ft.) = 7.0
Surface Elevation (ft.) = 180.9

Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)
07/16/15	0.8	6.2	174.7
07/20/15	0.2	6.8	174.1
07/28/15	-0.4	7.4	173.5
09/02/15	-0.5	7.5	173.4
11/17/15	-0.1	7.1	173.8
01/05/16	0.8	6.2	174.7
02/04/16	2.5	4.5	176.4
03/02/16	1.8	5.2	175.7
04/06/16	1.9	5.1	175.8
05/04/16			

Piezometer No. P-2 Orange
Y=0.9845X - 0.385

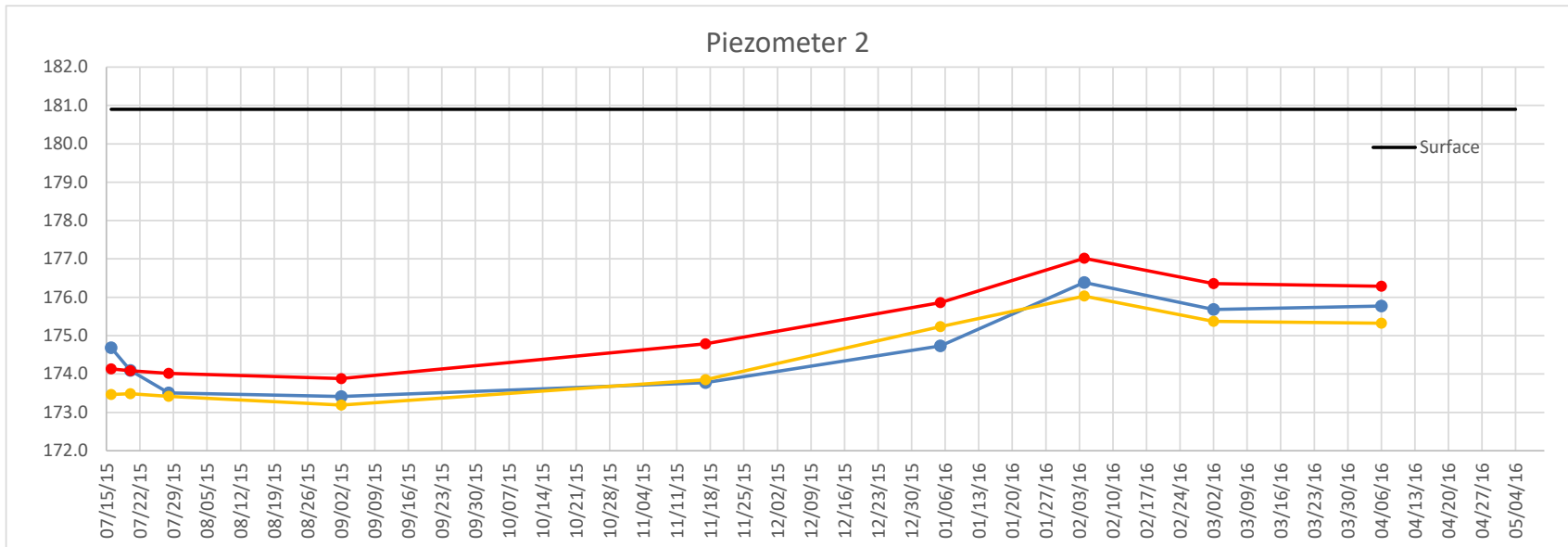
Installation depth (ft.) = 16.5
Surface Elevation (ft.) = 180.9

Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)
07/16/15	9.1	7.4	173.5
07/20/15	9.1	7.4	173.5
07/28/15	9.0	7.5	173.4
09/02/15	8.8	7.7	173.2
11/17/15	9.4	7.1	173.8
01/05/16	10.8	5.7	175.2
02/04/16	11.6	4.9	176.0
03/02/16	11.0	5.5	175.4
04/06/16	10.9	5.6	175.3

Piezometer No. P-2 Red
Y=0.9843X - 0.2599

Installation depth (ft.) = 24.5
Surface Elevation (ft.) = 180.9

Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)
07/16/15	17.7	5.9	174.1
07/20/15	17.7	5.9	174.1
07/28/15	17.6	6.0	174.0
09/02/15	17.5	6.1	173.9
11/17/15	18.4	6.1	174.8
01/05/16	19.5	5.0	175.9
02/04/16	20.6	3.9	177.0
03/02/16	20.0	4.5	176.4
04/06/16	19.9	4.6	176.3



Rancho Vista, San Juan Bautista
BSA Job No: 3603.104

Piezometer No. P-3 Blue
Y=0.983X - 0.2097

Installation depth (ft.) = 10.5
Surface Elevation (ft.) = 186.0 186.0

Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)
07/20/15	-0.3	10.8	175.2
07/28/15	-0.3	10.8	175.2
09/02/15	-0.4	10.9	175.1
11/17/15	-0.3	10.8	175.2
01/05/16	-0.3	10.8	175.2
02/04/16	3.9	6.6	179.4
03/02/16	3.3	7.2	178.8
04/06/16	4.2	6.3	179.7
07/27/16			

Piezometer No. P-3 Orange
Y=0.9864X - 0.8494

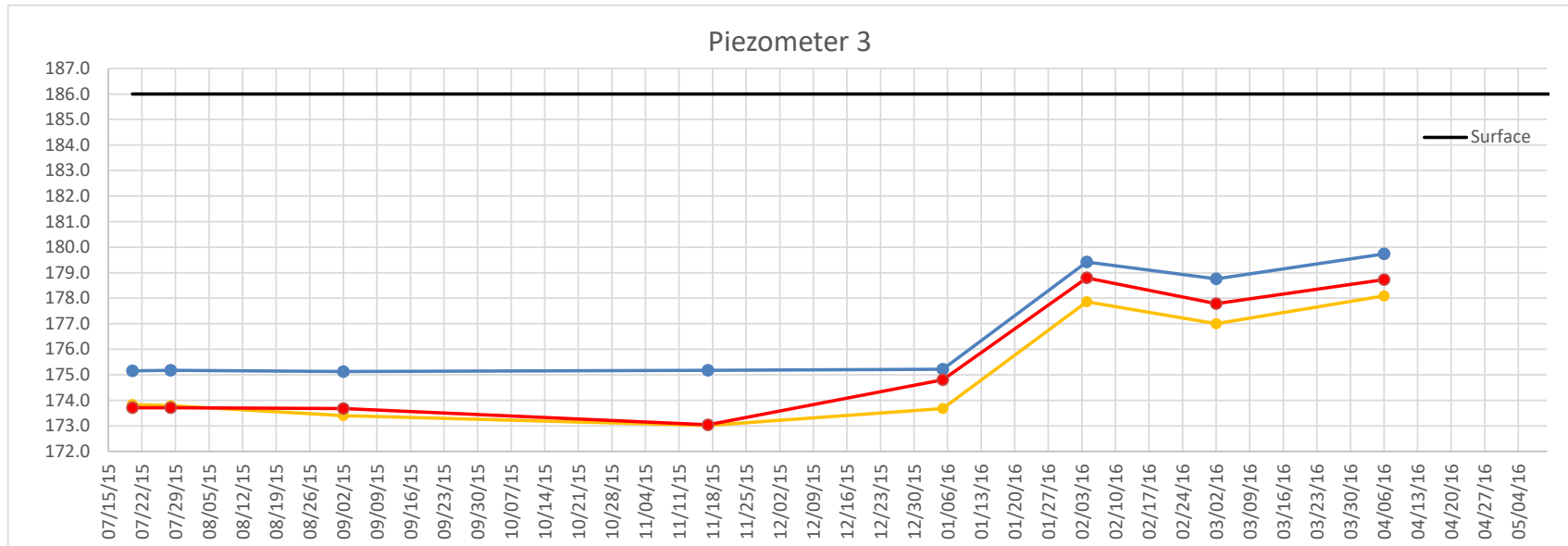
Installation depth (ft.) = 24.5
Surface Elevation (ft.) = 186.0

Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)
07/20/15	12.3	12.2	173.8
07/28/15	12.3	12.2	173.8
09/02/15	11.9	12.6	173.4
11/17/15	11.5	13.0	173.0
01/05/16	12.2	12.3	173.7
02/04/16	16.4	8.1	177.9
03/02/16	15.5	9.0	177.0
04/06/16	16.6	7.9	178.1

Piezometer No. P-3 Red
Y=0.989X - 0.7857

Installation depth (ft.) = 42.0
Surface Elevation (ft.) = 186.0

Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)
07/20/15	29.7	12.3	173.7
07/28/15	29.7	12.3	173.7
09/02/15	29.7	12.3	173.7
11/17/15	29.0	13.0	173.0
01/05/16	30.8	11.2	174.8
02/04/16	34.8	7.2	178.8
03/02/16	33.8	8.2	177.8
04/06/16	34.7	7.3	178.7



Rancho Vista, San Juan Bautista
BSA Job No: 3603.104

Piezometer No. P-4 Blue
Y=0.9892X - 0.4408

Installation depth (ft.) = 7.0
Surface Elevation (ft.) = 186.6 186.6

Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)
07/20/15	-0.6	7.6	179.0
07/28/15	-0.6	7.6	179.0
09/02/15	-0.7	7.7	178.9
11/17/15	-0.7	7.7	178.9
01/05/16	-0.8	7.8	178.8
02/04/16	-0.8	7.8	178.8
03/02/16	-0.7	7.7	178.9
04/06/16	-0.7	7.7	178.9
07/27/16			
07/27/16			

Piezometer No. P-4 Orange
Y=0.9787X - 0.2555

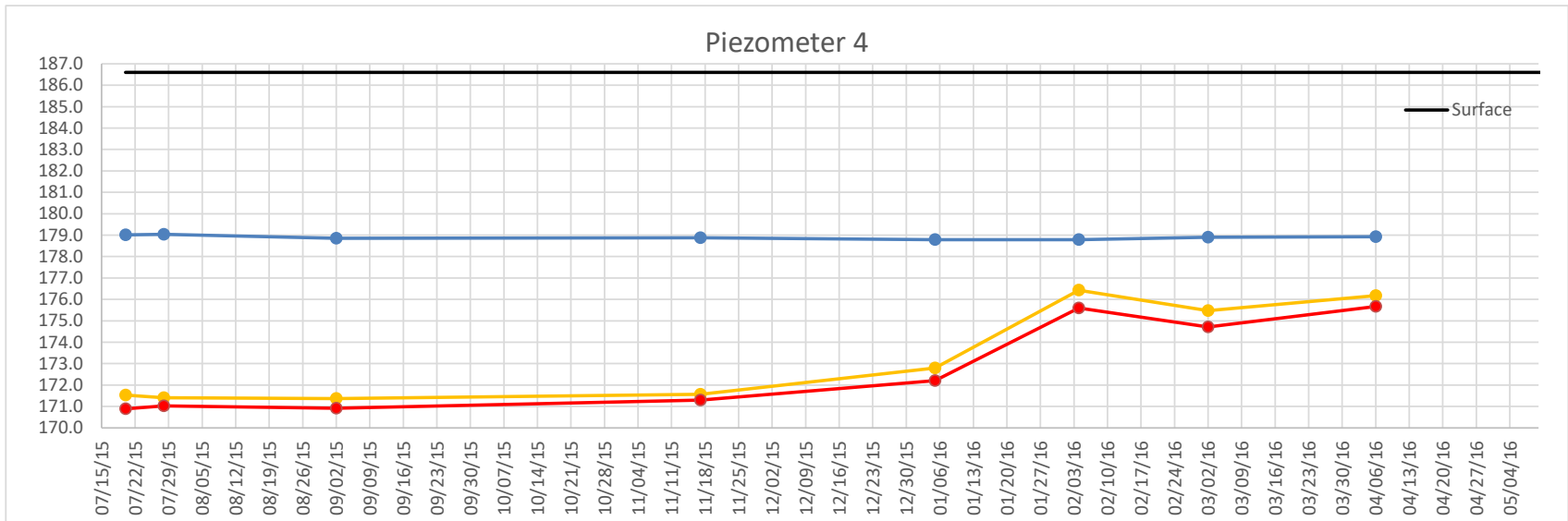
Installation depth (ft.) = 15.5
Surface Elevation (ft.) = 186.6

Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)
07/20/15	0.4	15.1	171.5
07/28/15	0.3	15.2	171.4
09/02/15	0.3	15.2	171.4
11/17/15	0.5	15.0	171.6
01/05/16	1.7	13.8	172.8
02/04/16	5.3	10.2	176.4
03/02/16	4.4	11.1	175.5
04/06/16	5.1	10.4	176.2

Piezometer No. P-4 Red
Y=0.986X - 0.5116

Installation depth (ft.) = 29.0
Surface Elevation (ft.) = 186.6

Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)
07/20/15	13.3	15.7	170.9
07/28/15	13.4	15.6	171.0
09/02/15	13.3	15.7	170.9
11/17/15	13.7	15.3	171.3
01/05/16	14.6	14.4	172.2
02/04/16	18.0	11.0	175.6
03/02/16	17.1	11.9	174.7
04/06/16	18.1	10.9	175.7



Rancho Vista, San Juan Bautista
BSA Job No: 3603.104

Piezometer No. P-5 Blue
Y=0.9851X - 0.0241

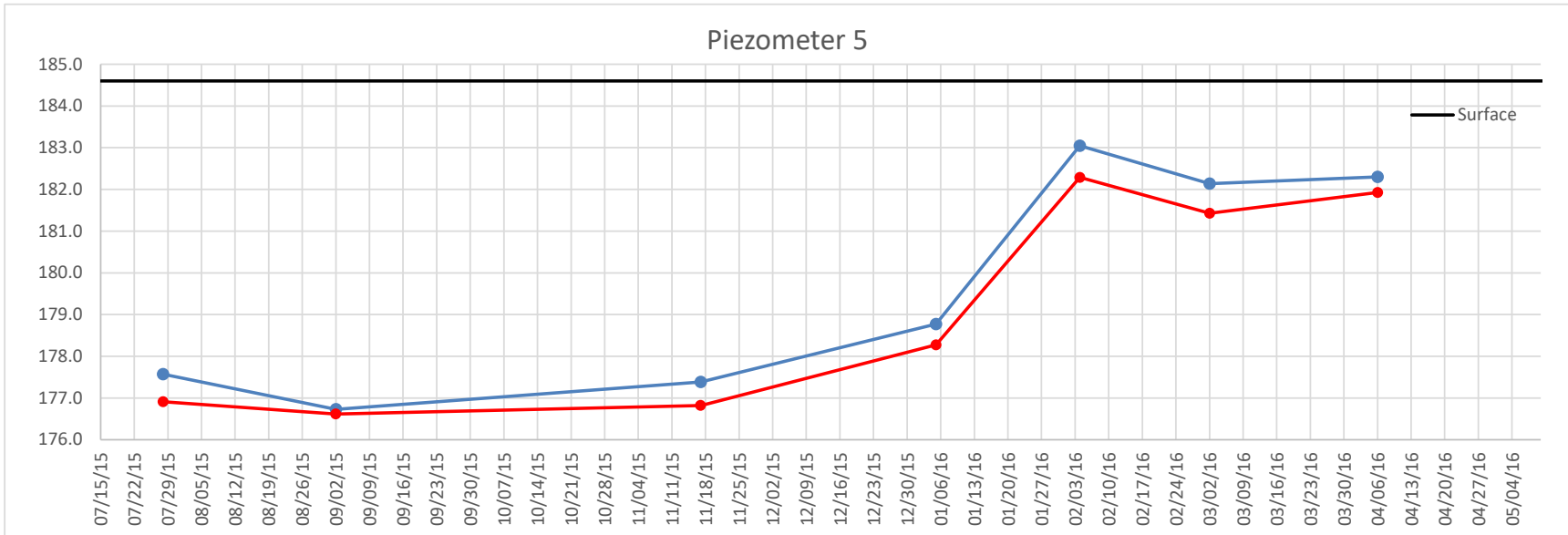
Installation Depth (ft.) = 15.0
Surface Elevation (ft.)= 184.6 184.6

Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)
07/15/15			
07/28/15	8.0	7.0	177.6
09/02/15	7.1	7.9	176.7
11/17/15	7.8	7.2	177.4
01/05/16	9.2	5.8	178.8
02/04/16	13.4	1.6	183.0
03/02/16	12.5	2.5	182.1
04/06/16	12.7	2.3	182.3
07/27/16			

Piezometer No. P-5 Red
Y=0.9834X - 0.2808

Installation Depth (ft.) = 35.0
Surface Elevation (ft.)= 184.6

Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)
07/28/15	27.3	7.7	176.9
09/02/15	27.0	8.0	176.6
11/17/15	27.2	7.8	176.8
01/05/16	28.7	6.3	178.3
02/04/16	32.7	2.3	182.3
03/02/16	31.8	3.2	181.4
04/06/16	32.3	2.7	181.9



Rancho Vista, San Juan Bautista
BSA Job No: 3603.104

Piezometer No. P-6 Blue
Y=0.9858X - 0.1358

Installation depth (ft.) = 6.5
Surface Elevation (ft.) = 183.3 183.3

Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)
07/15/15			
07/28/15	-0.2	6.7	176.6
09/02/15	-0.2	6.7	176.6
11/17/15	-0.2	6.7	176.6
01/05/16	-0.1	6.6	176.7
02/04/16	3.9	2.6	180.7
03/02/16	3.3	3.2	180.1
04/06/16	3.3	3.2	180.1
07/27/16			
07/27/16			

Piezometer No. P-6 Orange
Y=0.984X - 0.363

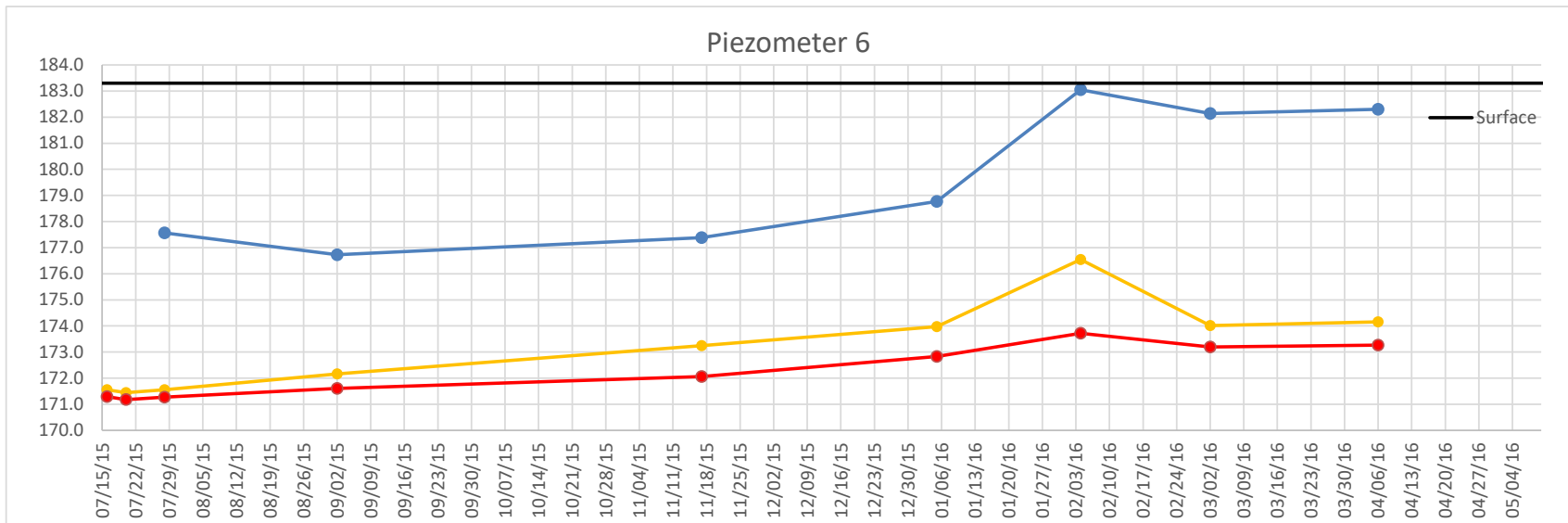
Installation depth (ft.) = 20.0
Surface Elevation (ft.) = 183.3

Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)
07/28/15	12.5	7.5	175.8
09/02/15	11.9	8.1	175.2
11/17/15	12.7	7.3	176.0
01/05/16	13.9	6.1	177.2
02/04/16	17.4	2.6	180.7
03/02/16	17.0	3.0	180.3
04/06/16	17.0	3.0	180.3

Piezometer No. P-6 Red
Y=0.9808X - 0.3553

Installation depth (ft.) = 40.0
Surface Elevation (ft.) = 183.3

Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)
07/28/15	32.0	8.0	175.3
09/02/15	32.3	7.7	175.6
11/17/15	32.9	7.1	176.2
01/05/16	34.2	5.8	177.5
02/04/16	37.6	2.4	180.9
03/02/16	37.0	3.0	180.3
04/06/16	37.2	2.8	180.5



Rancho Vista, San Juan Bautista
BSA Job No: 3603.104

Piezometer No. P-7 Blue
Y=0.9827X - 0.4542

Installation Depth (ft.) = 14.0
Surface Elevation (ft.)= 179.4 179.4

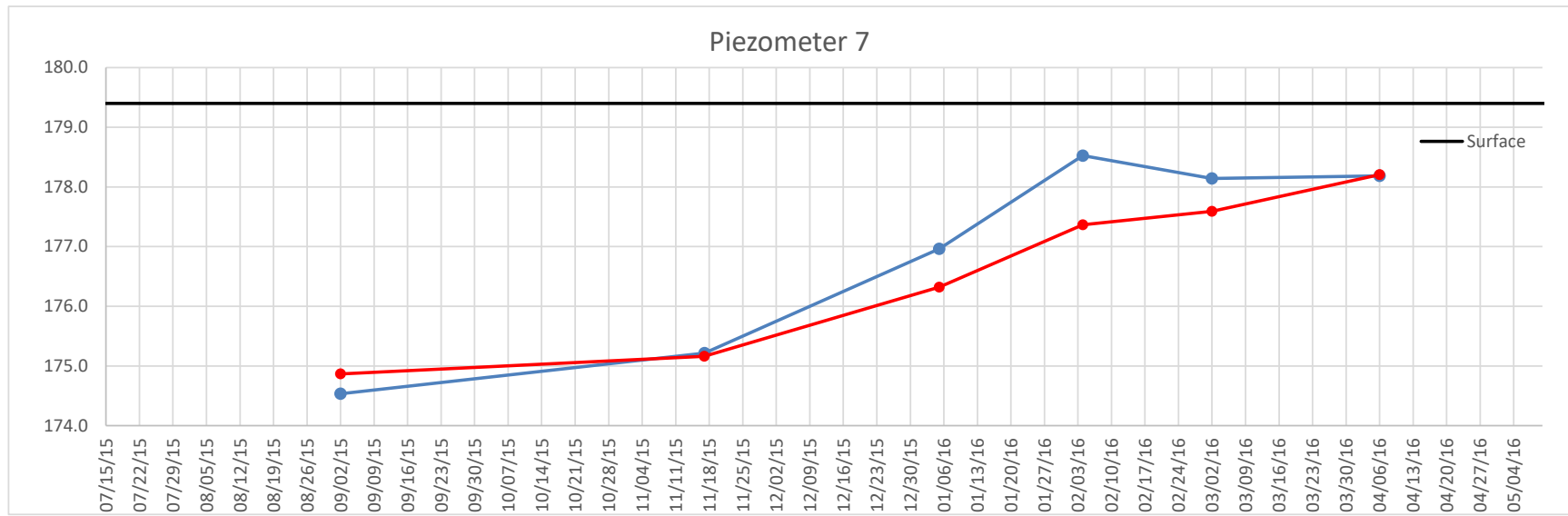
Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)
07/15/15			
09/02/15	9.1	4.9	174.5
11/17/15	9.8	4.2	175.2
01/05/16	11.6	2.4	177.0
02/04/16	13.1	0.9	178.5
03/02/16	12.7	1.3	178.1
04/06/16	12.8	1.2	178.2
07/27/16			
07/27/16			

Piezometer No. P-7 Red
Y=0.9845X - 0.4933

Installation Depth (ft.) = 28.5
Surface Elevation (ft.)= 179.4

Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)
09/02/15	24.0	4.5	174.9
11/17/15	24.3	4.2	175.2
01/05/16	25.4	3.1	176.3
02/04/16	26.5	2.0	177.4
03/02/16	26.7	1.8	177.6
04/06/16	27.3	1.2	178.2

Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)



Rancho Vista, San Juan Bautista
BSA Job No: 3603.104

Piezometer No. P-8 Blue
Y=0.9808X - 0.3651

Installation Depth (ft.) = 15.0
Surface Elevation (ft.)= 180.2 180.2

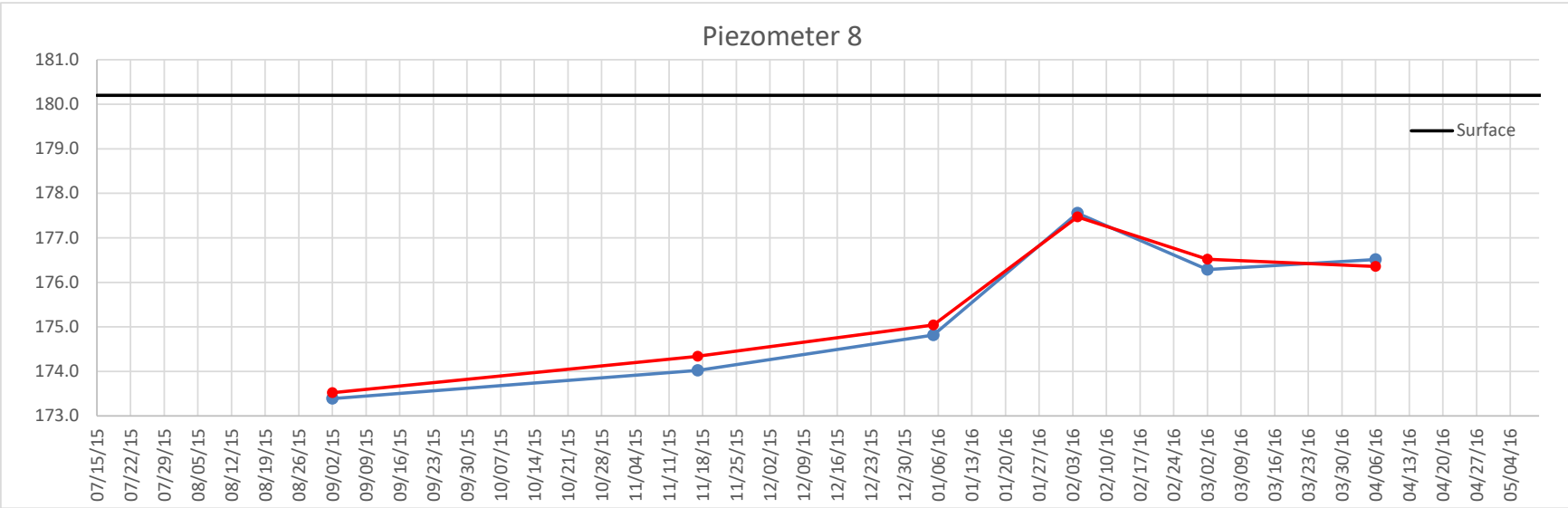
Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)
07/15/15			
09/02/15	8.2	6.8	173.4
11/17/15	8.8	6.2	174.0
01/05/16	9.6	5.4	174.8
02/04/16	12.4	2.6	177.6
03/02/16	11.1	3.9	176.3
04/06/16	11.3	3.7	176.5
07/27/16			
07/27/16			

Piezometer No. P-8 Red
Y=0.9832X - 0.26

Installation Depth (ft.) = 26.0
Surface Elevation (ft.)= 180.2

Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)
09/02/15	19.3	6.7	173.5
11/17/15	20.1	5.9	174.3
01/05/16	20.8	5.2	175.0
02/04/16	23.3	2.7	177.5
03/02/16	22.3	3.7	176.5
04/06/16	22.2	3.8	176.4

Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)



Rancho Vista, San Juan Bautista
BSA Job No: 3603.104

Piezometer No. P-9 Blue
Y=0.9958X + 0.021

Installation Depth (ft.) = 14.5
Surface Elevation (ft.)= 178.9

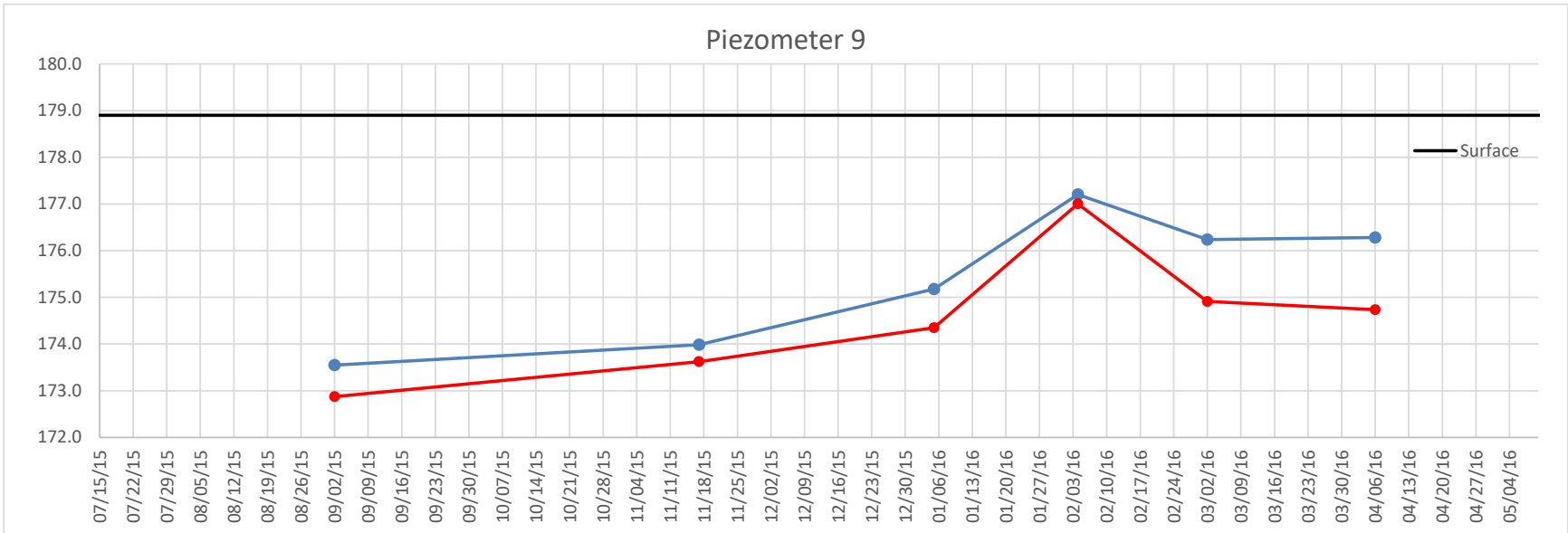
Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)
07/15/15			
09/02/15	9.1	5.4	173.5
11/17/15	9.6	4.9	174.0
01/05/16	10.8	3.7	175.2
02/04/16	12.8	1.7	177.2
03/02/16	11.8	2.7	176.2
04/06/16	11.9	2.6	176.3
07/27/16			

Piezometer No. P-9 Red
Y=0.983X - 0.1507

Installation Depth (ft.) = 28.0
Surface Elevation (ft.)= 178.9

Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)
09/02/15	22.0	6.0	172.9
11/17/15	22.7	5.3	173.6
01/05/16	23.4	4.6	174.3
02/04/16	26.1	1.9	177.0
03/02/16	24.0	4.0	174.9
04/06/16	23.8	4.2	174.7

Date	Piezometric Head (ft.)	Water Level Below Surface (ft.)	Groundwater Elevation (ft.)





APPENDIX D

LIQUEFACTION ANALYSIS

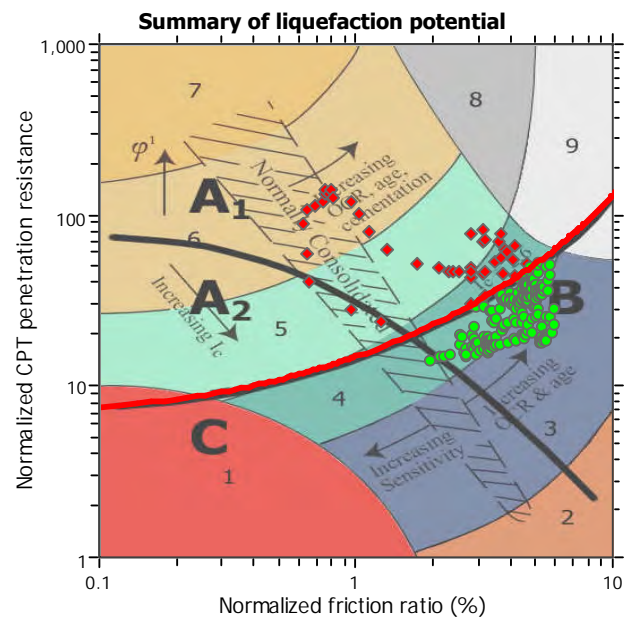
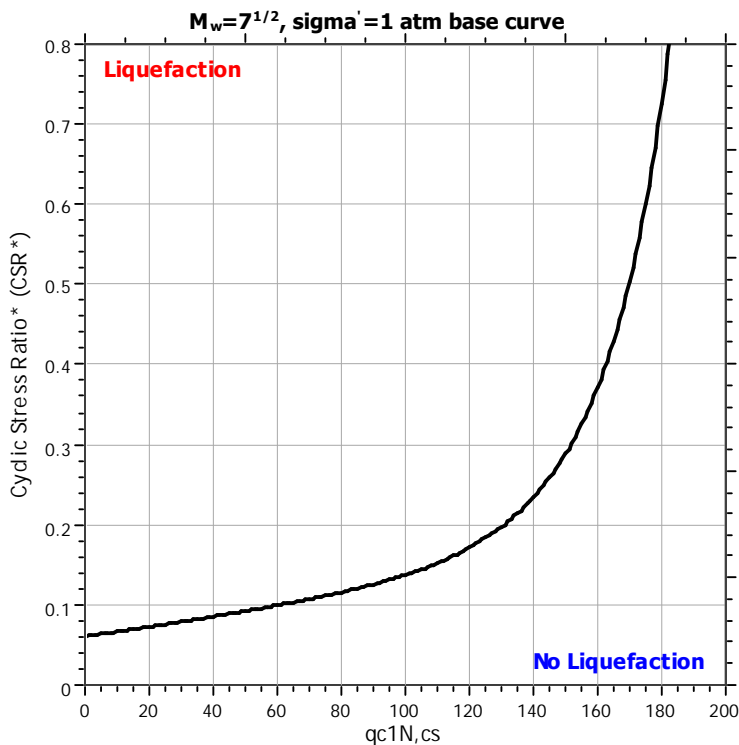
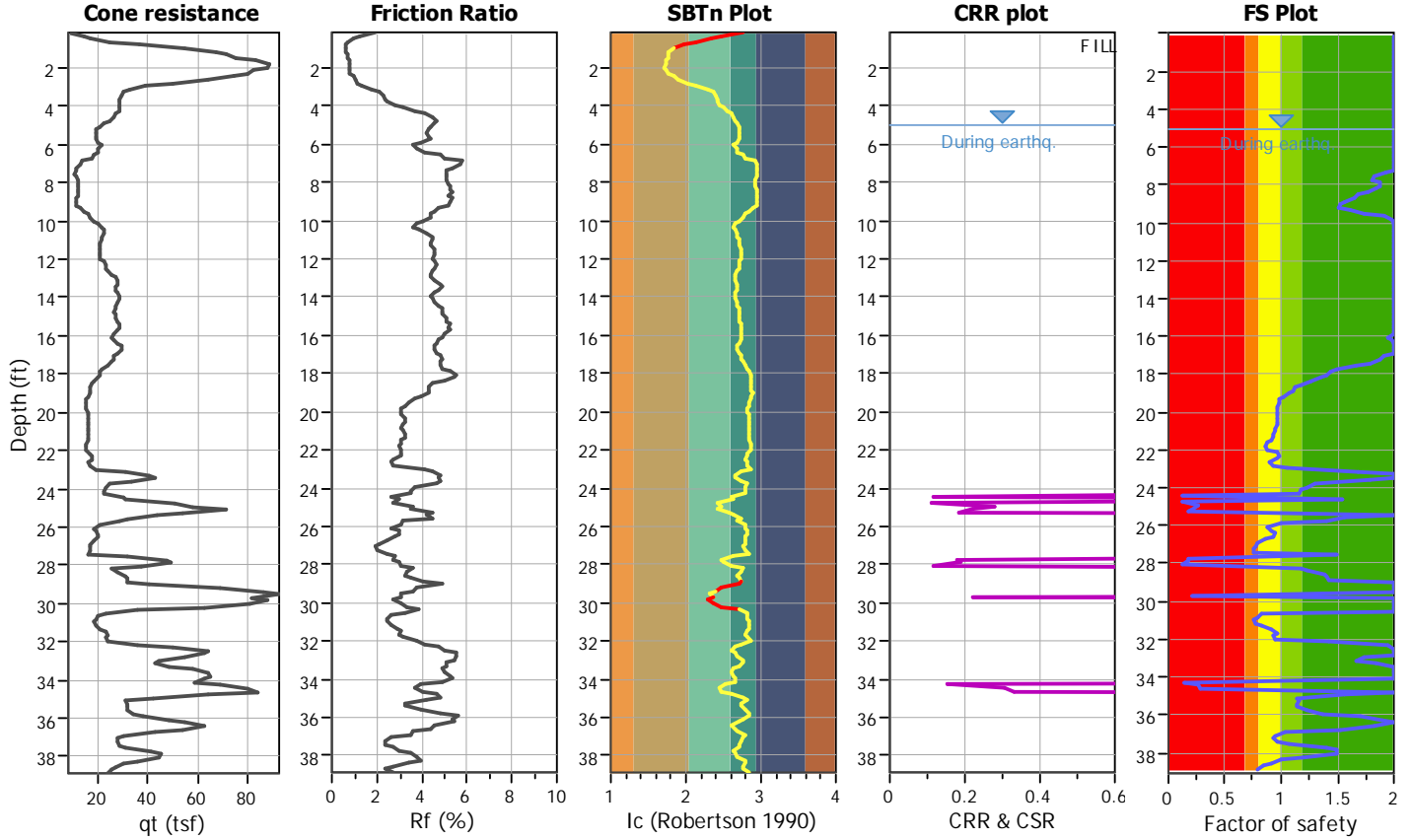
LIQUEFACTION ANALYSIS REPORT

Project title : Geotechnical Recommendation for
CPT file : CPT-1

Location : Rancho Vista

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	10.00 ft	Fill height:	5.00 ft	applied:	Sand & Clay
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	Yes
Earthquake magnitude M_w :	8.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	1.00	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based



Zone A₁ : Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

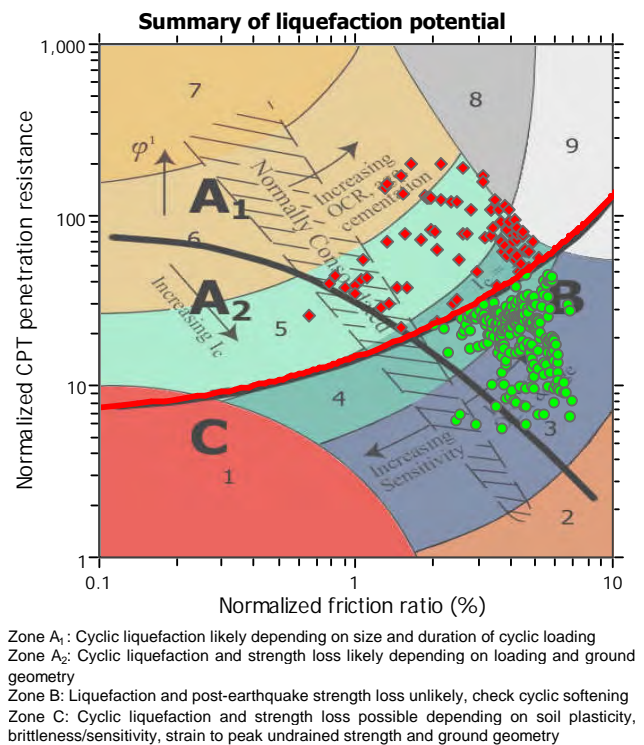
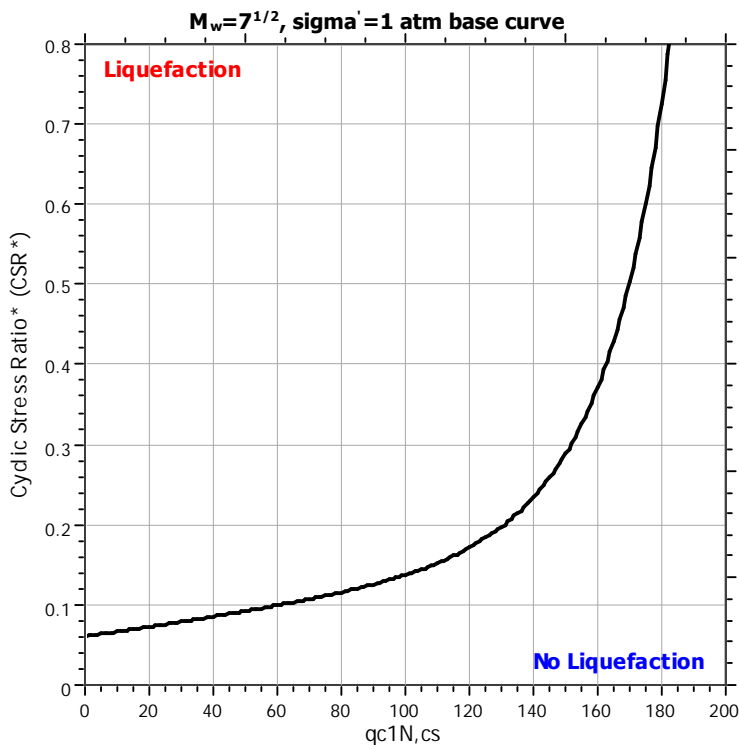
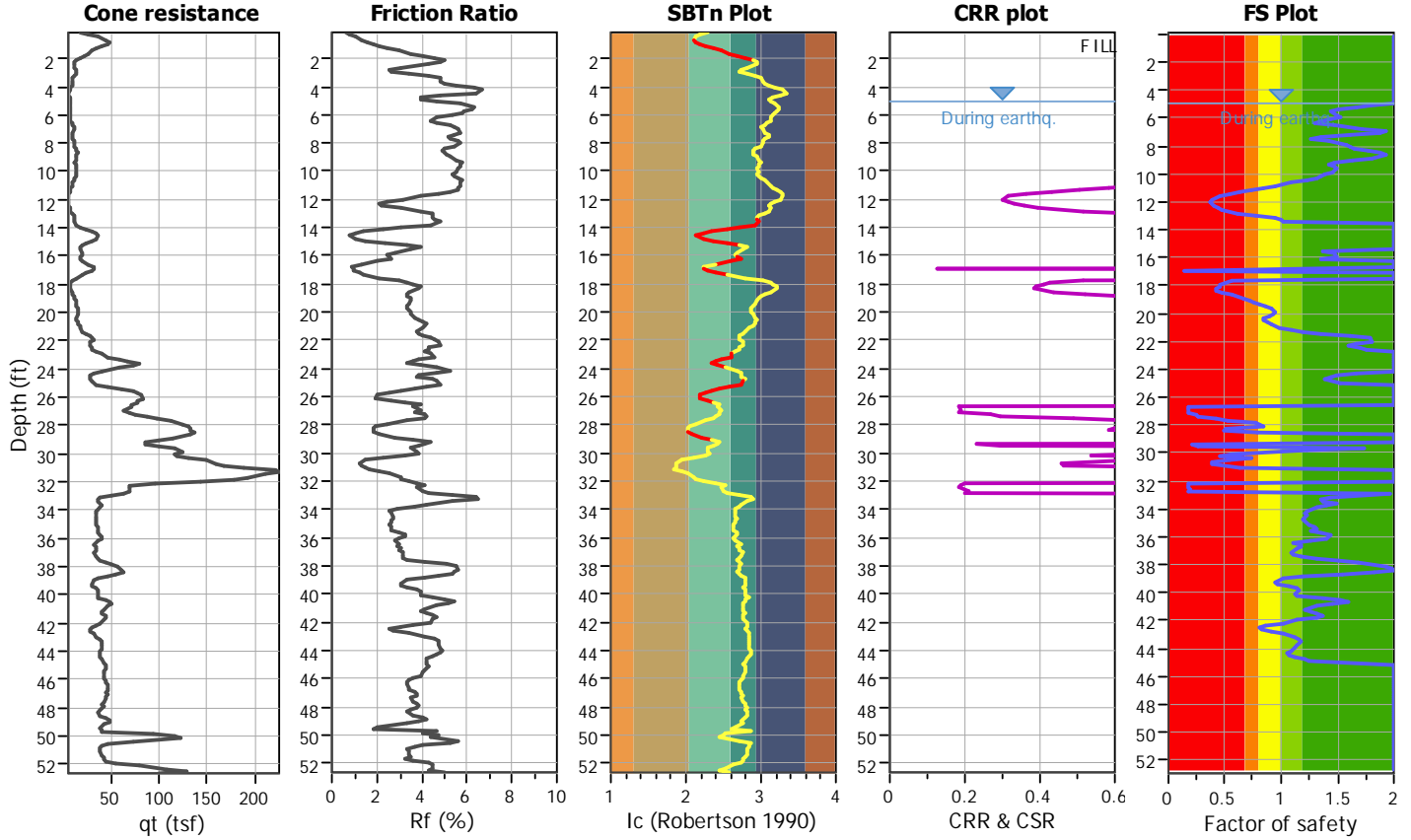
LIQUEFACTION ANALYSIS REPORT

Project title : Geotechnical Recommendation for
CPT file : CPT-2

Location : Rancho Vista

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	10.00 ft	Fill height:	5.00 ft	applied:	Sand & Clay
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	Yes
Earthquake magnitude M_w :	8.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	1.00	Unit weight calculation:	Based on SBT	K_g applied:	Yes	MSF method:	Method based



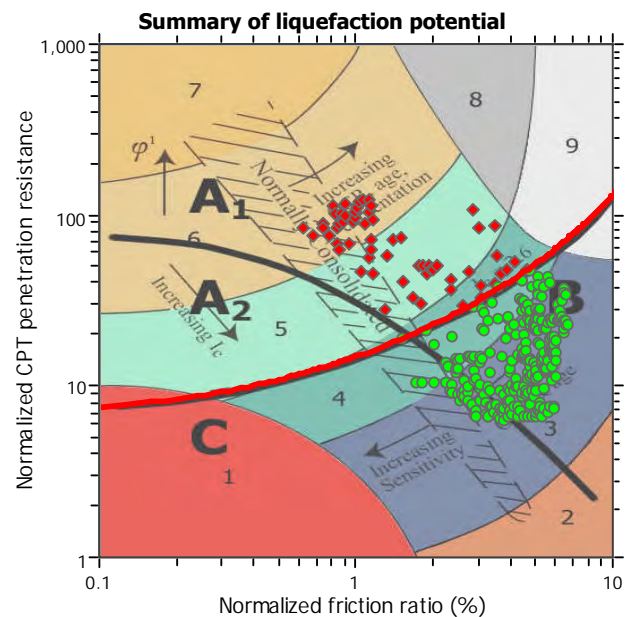
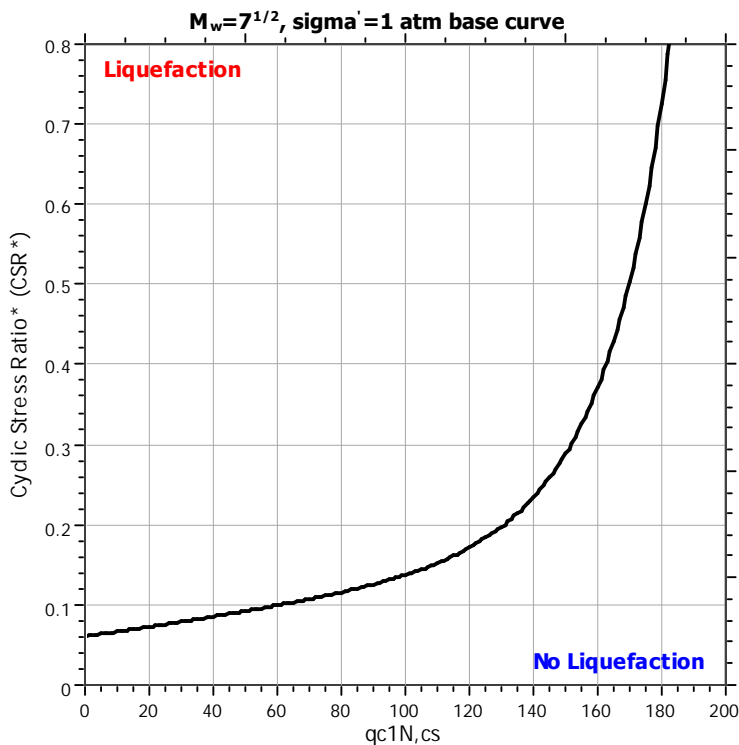
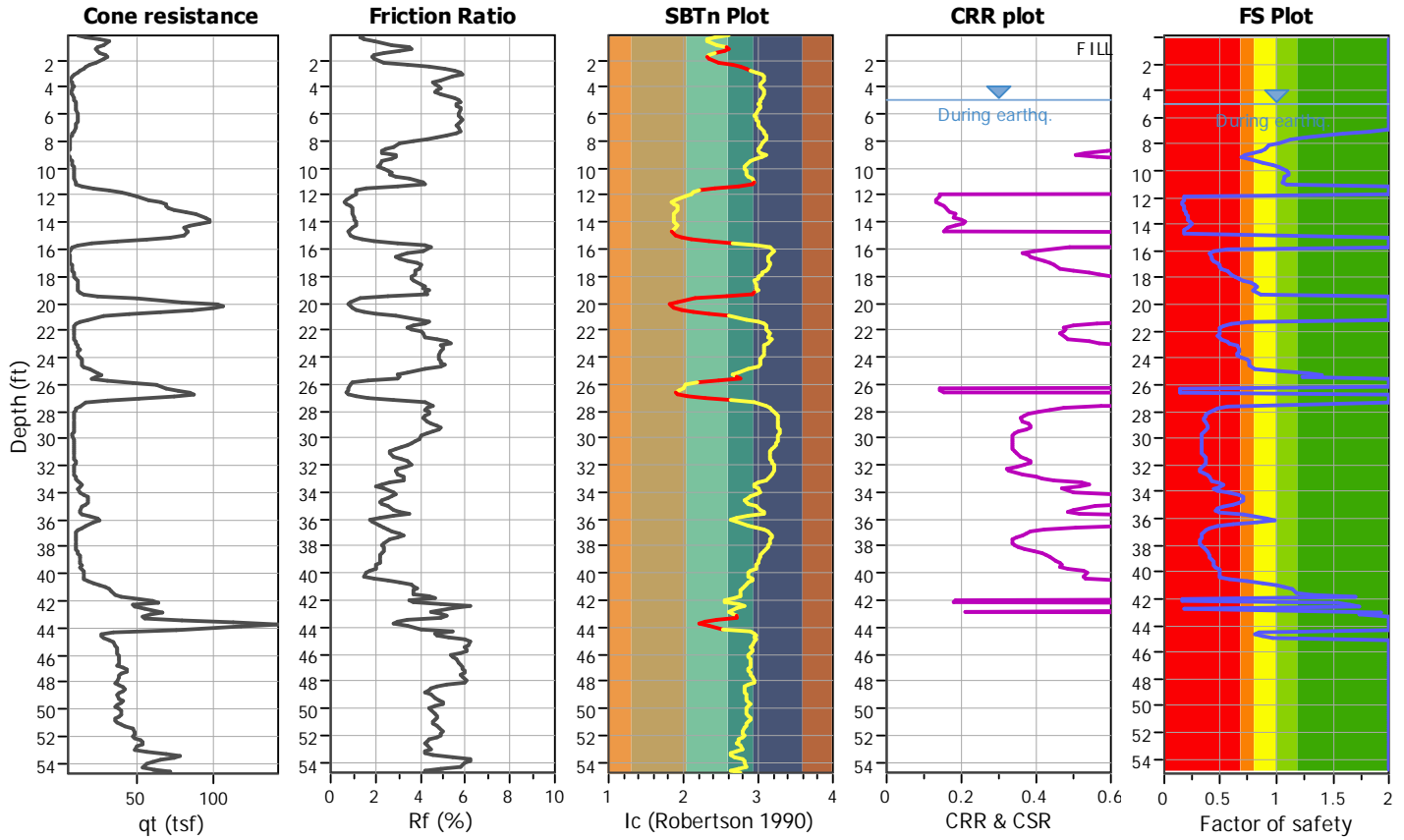
LIQUEFACTION ANALYSIS REPORT

Project title : Geotechnical Recommendation for
CPT file : CPT-3

Location : Rancho Vista

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	10.00 ft	Fill height:	5.00 ft	applied:	Sand & Clay
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	Yes
Earthquake magnitude M_w :	8.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	1.00	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:	Method based



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

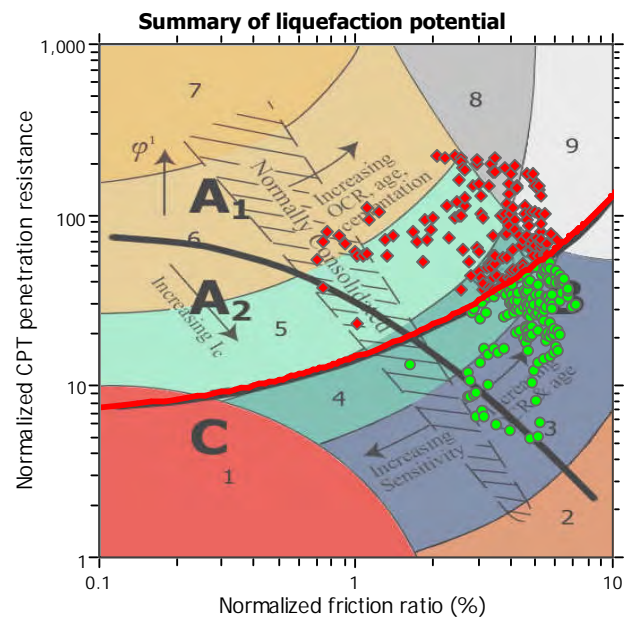
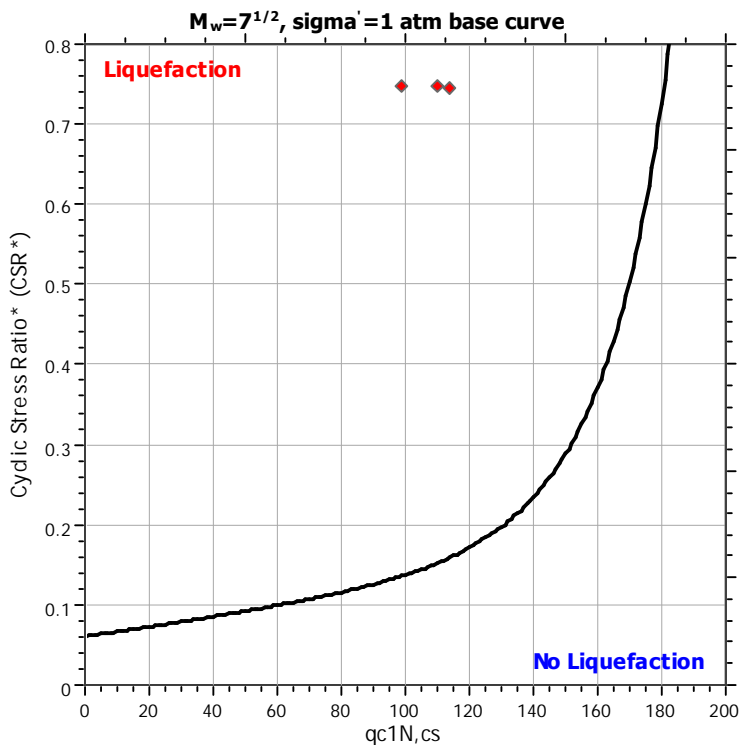
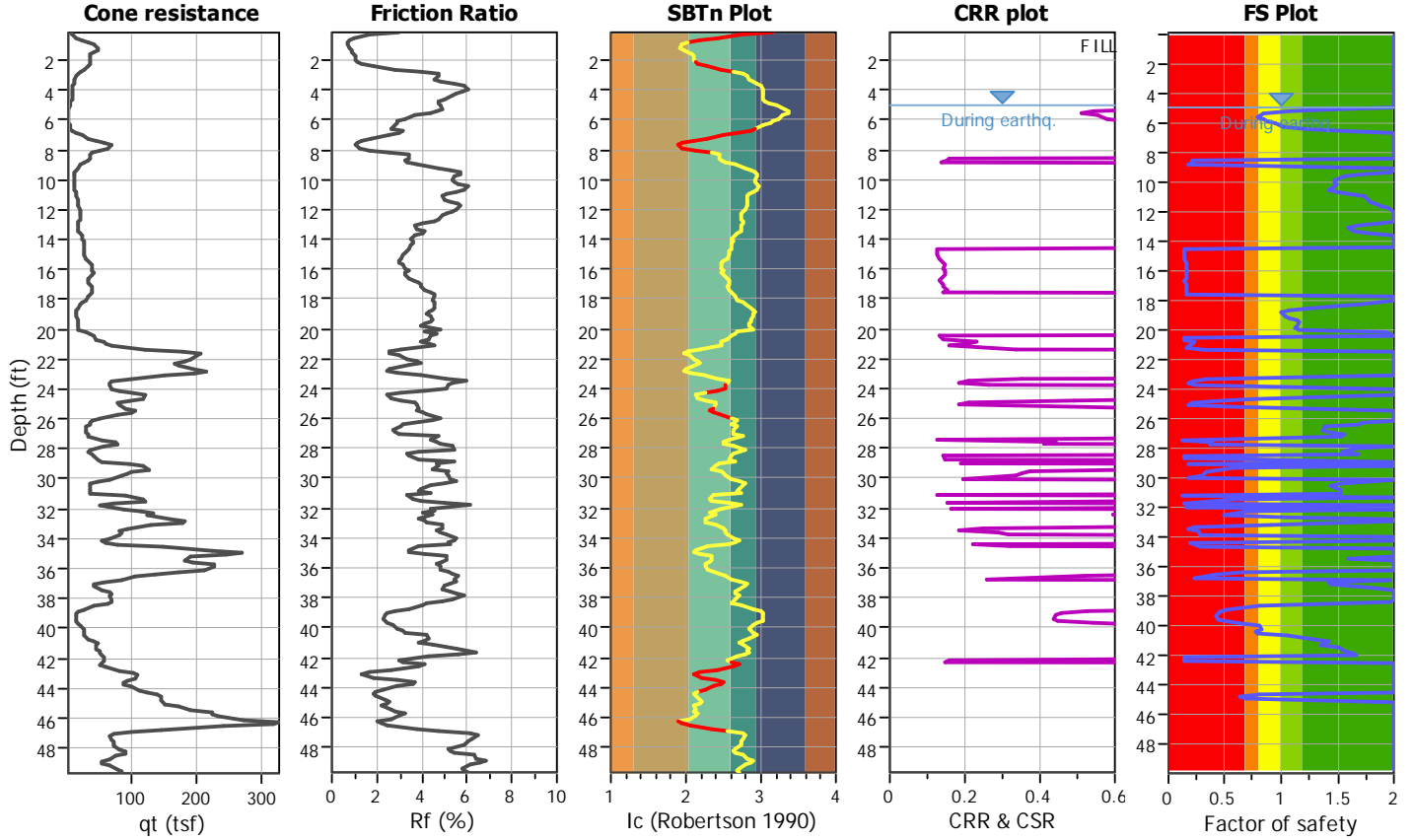
LIQUEFACTION ANALYSIS REPORT

Project title : Geotechnical Recommendation for
CPT file : CPT-4

Location : Rancho Vista

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	10.00 ft	Fill height:	5.00 ft	applied:	Sand & Clay
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	Yes
Earthquake magnitude M_w :	8.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	1.00	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

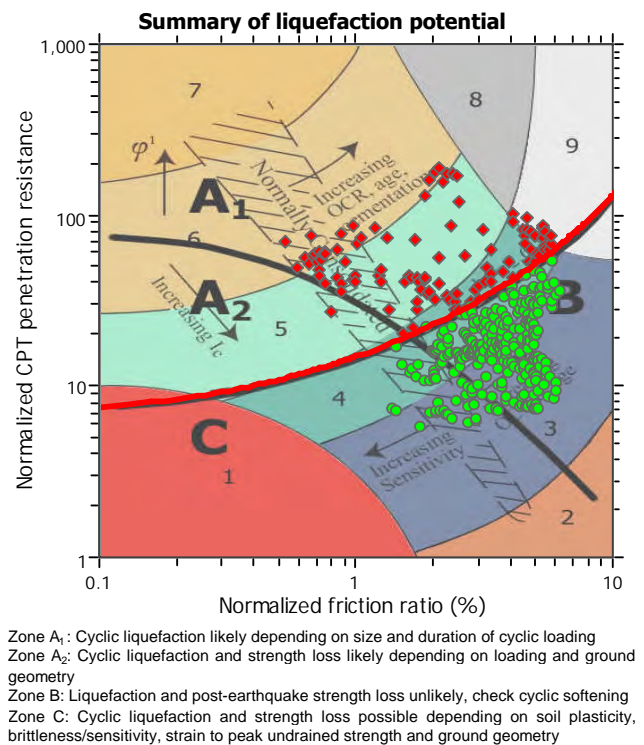
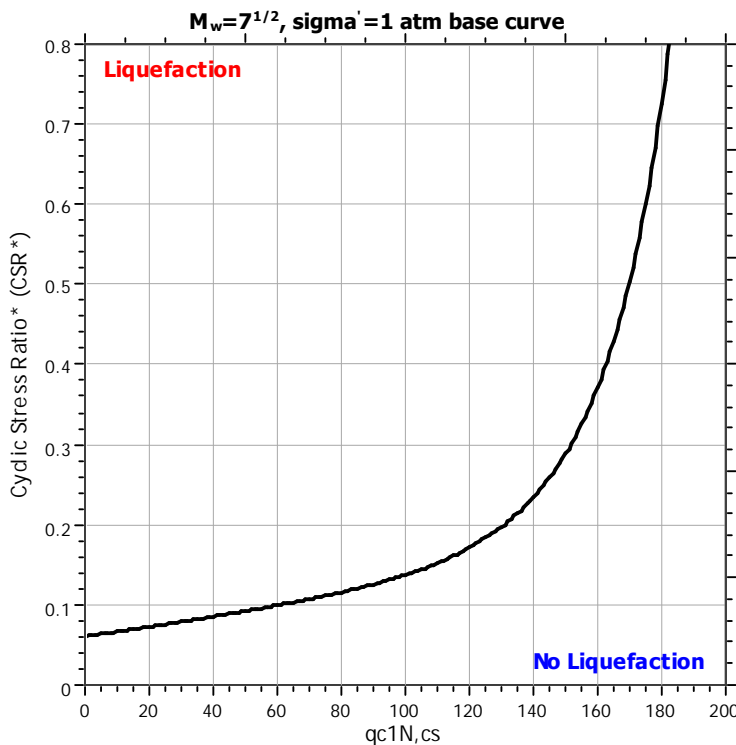
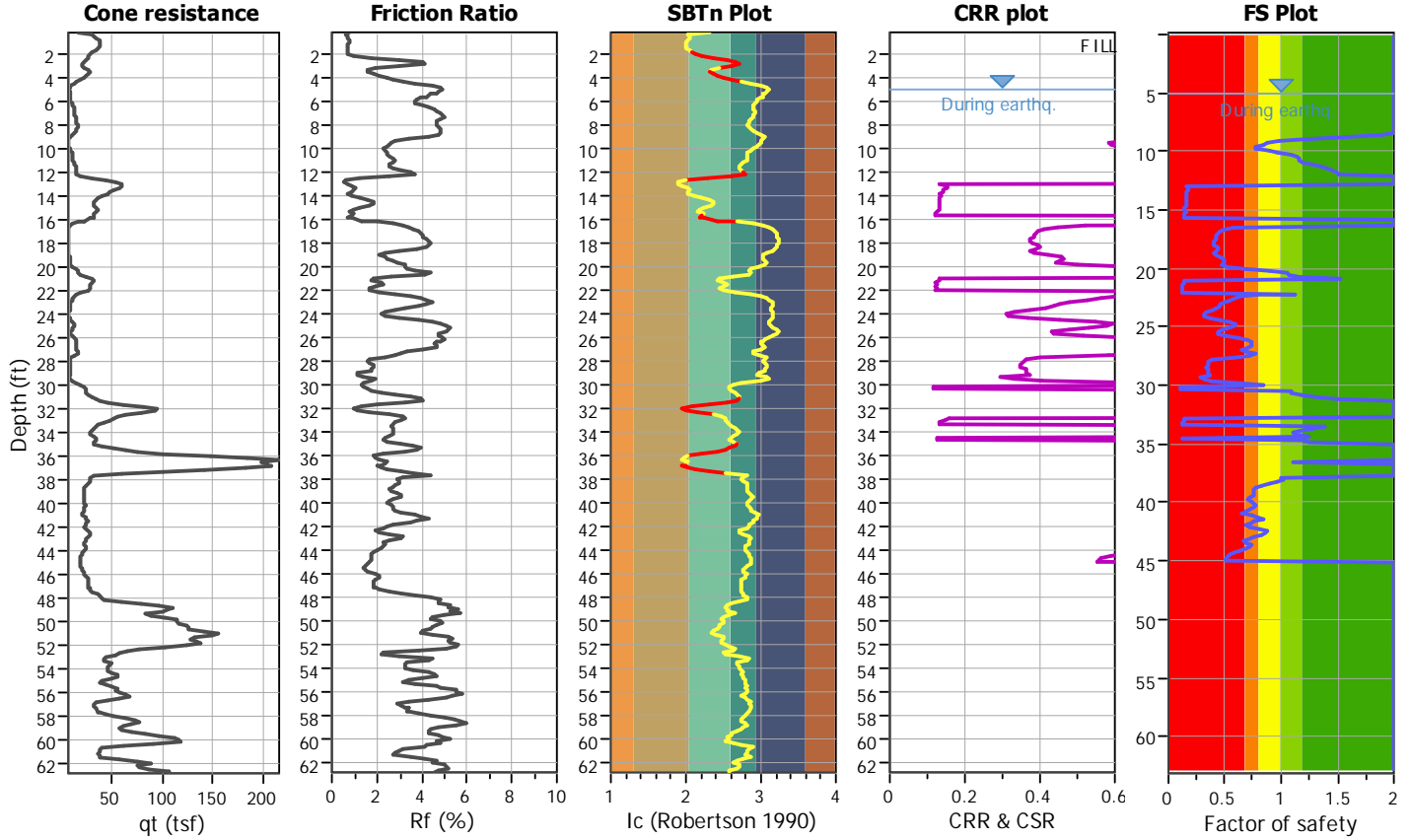
LIQUEFACTION ANALYSIS REPORT

Project title : Geotechnical Recommendation for
CPT file : CPT-5

Location : Rancho Vista

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	10.00 ft	Fill height:	5.00 ft	applied:	Sand & Clay
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	Yes
Earthquake magnitude M_w :	8.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	1.00	Unit weight calculation:	Based on SBT	K_g applied:	Yes	MSF method:	Method based



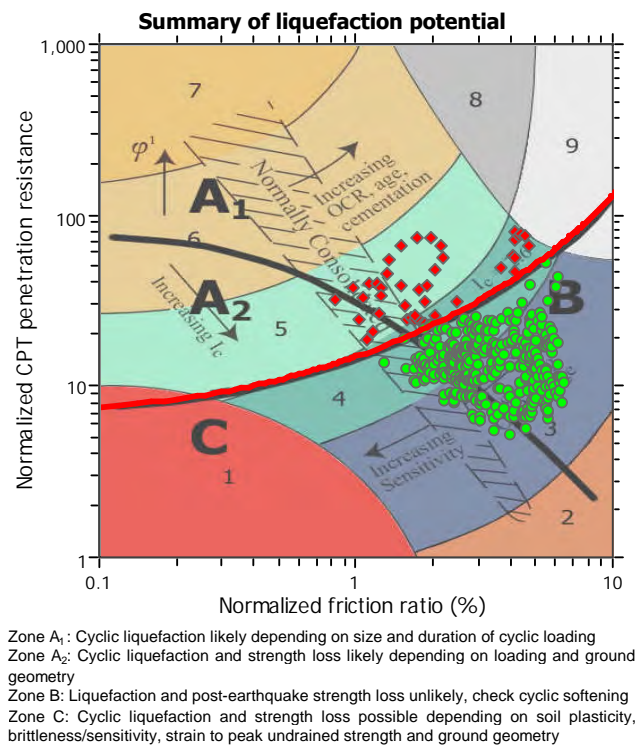
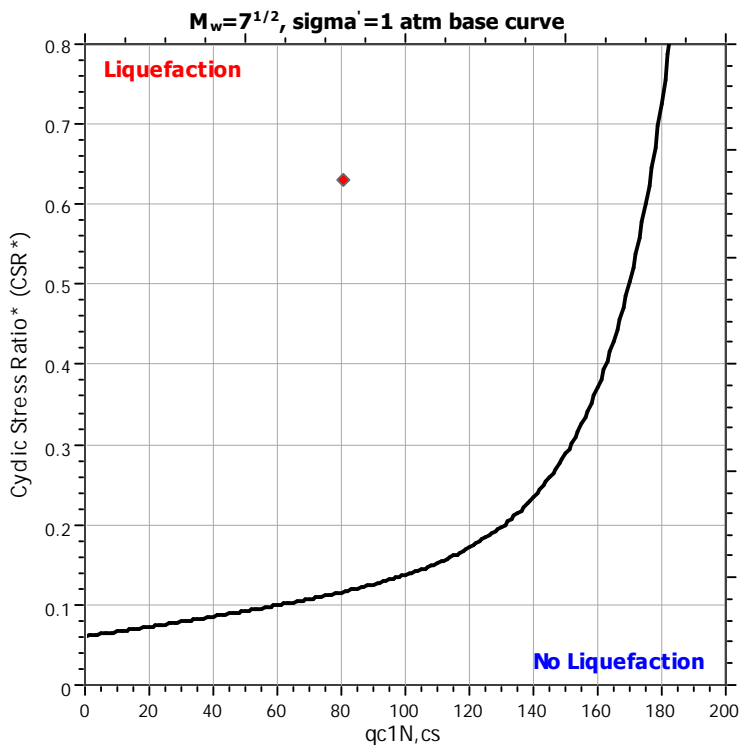
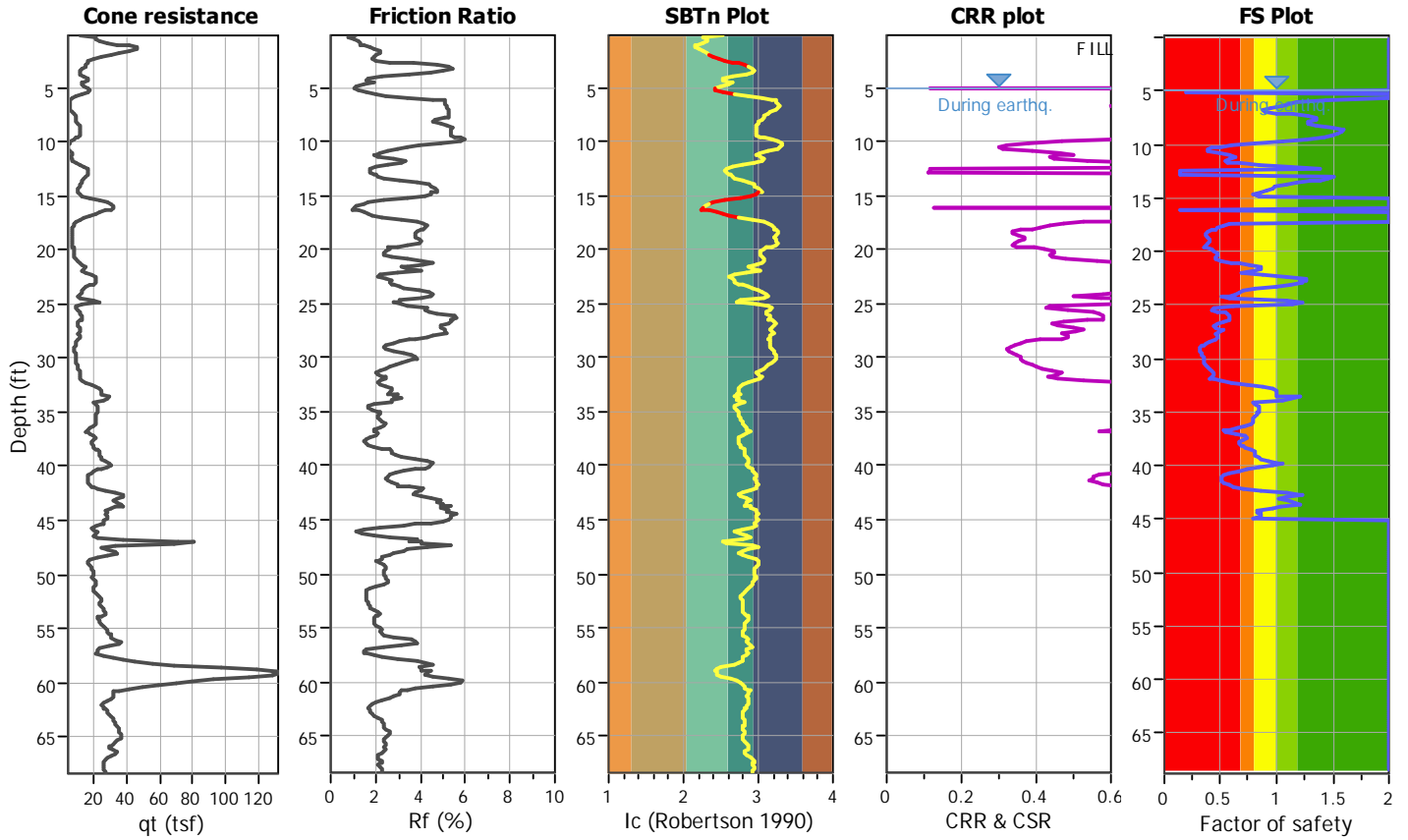
LIQUEFACTION ANALYSIS REPORT

Project title : Geotechnical Recommendation for
CPT file : CPT-6

Location : Rancho Vista

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	10.00 ft	Fill height:	5.00 ft	applied:	Sand & Clay
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	Yes
Earthquake magnitude M_w :	8.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	1.00	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based



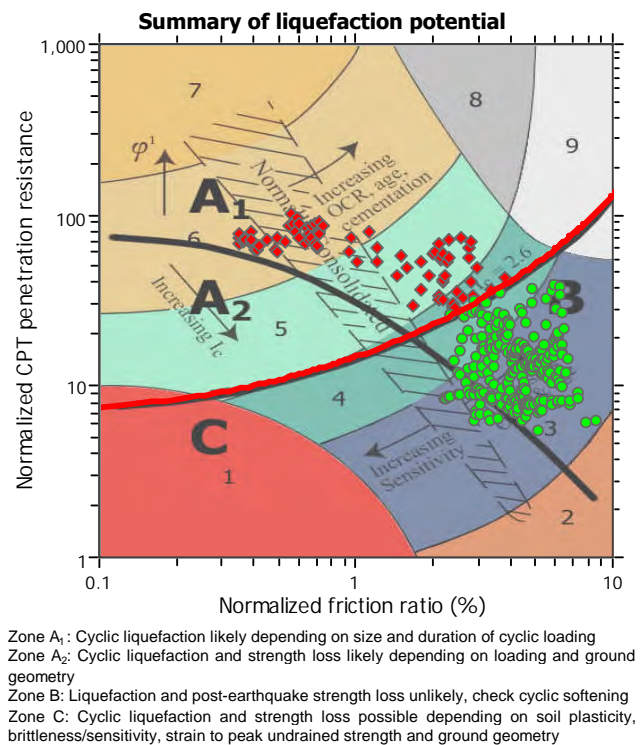
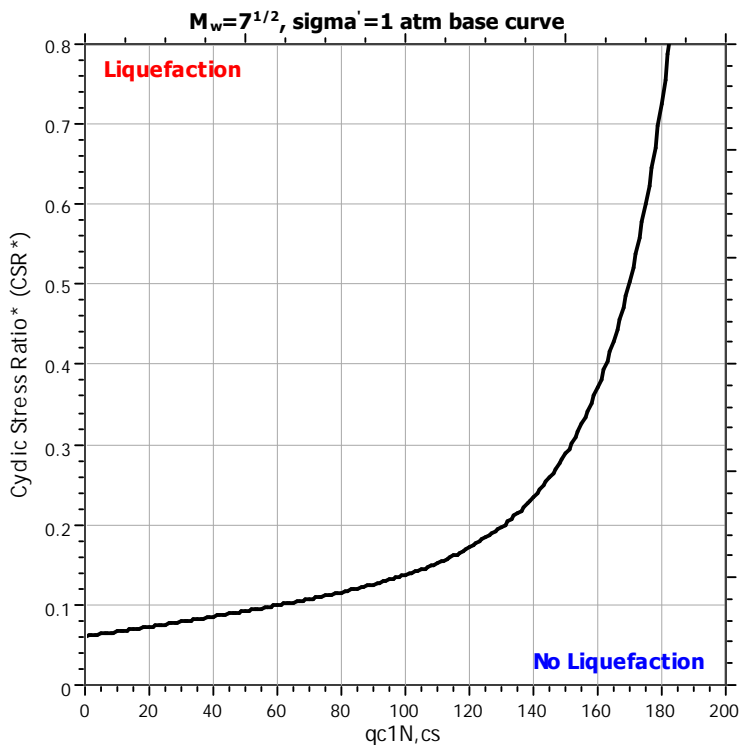
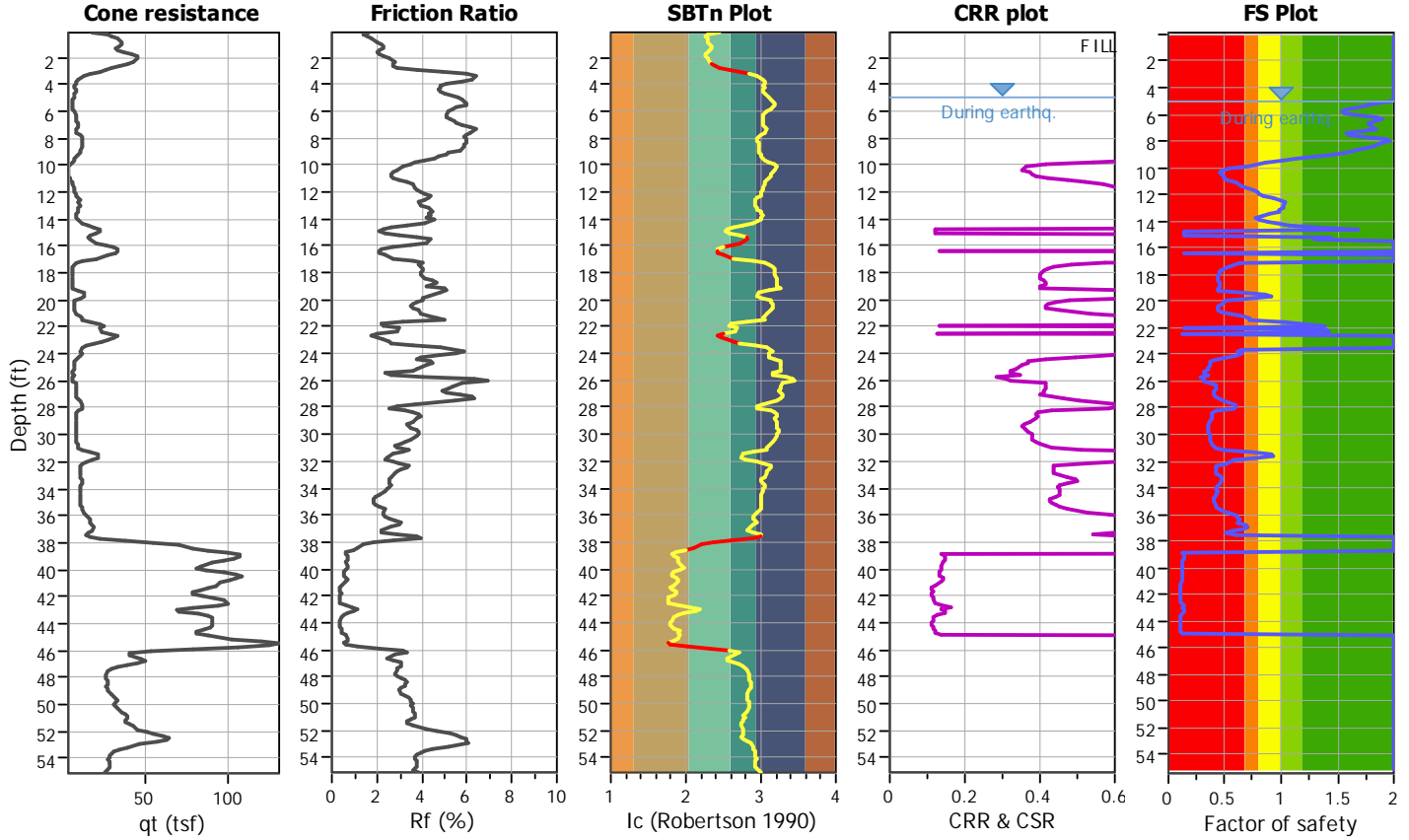
LIQUEFACTION ANALYSIS REPORT

Project title : Geotechnical Recommendation for
CPT file : CPT-7

Location : Rancho Vista

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	10.00 ft	Fill height:	5.00 ft	applied:	Sand & Clay
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	Yes
Earthquake magnitude M_w :	8.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	1.00	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:	Method based



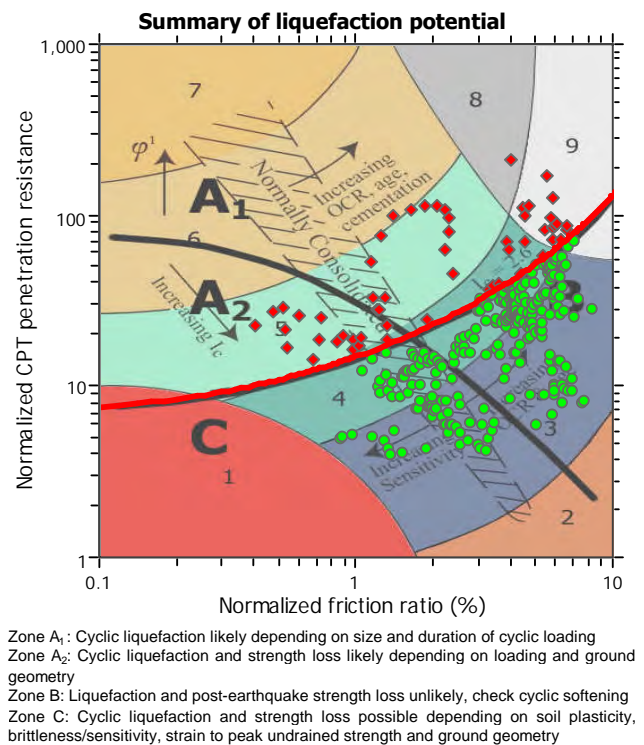
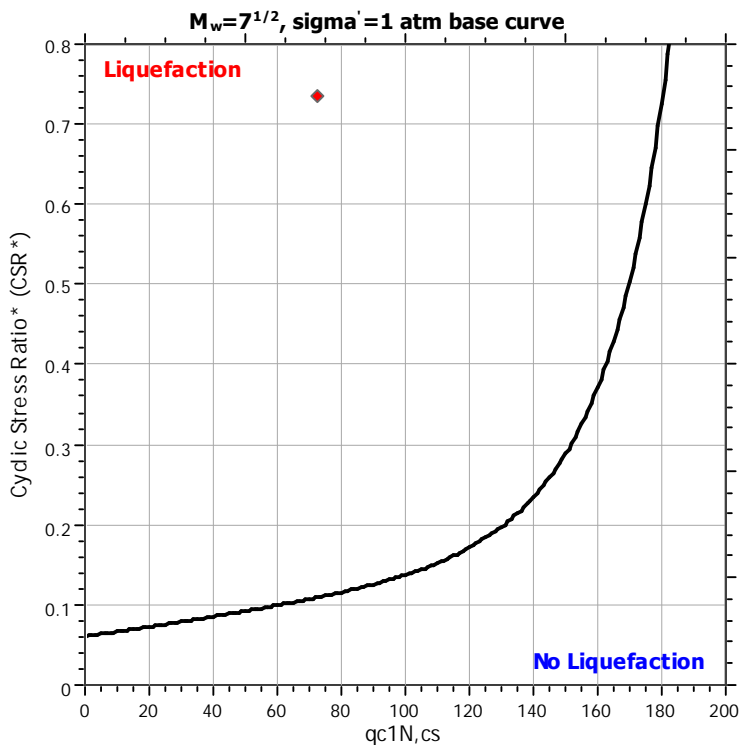
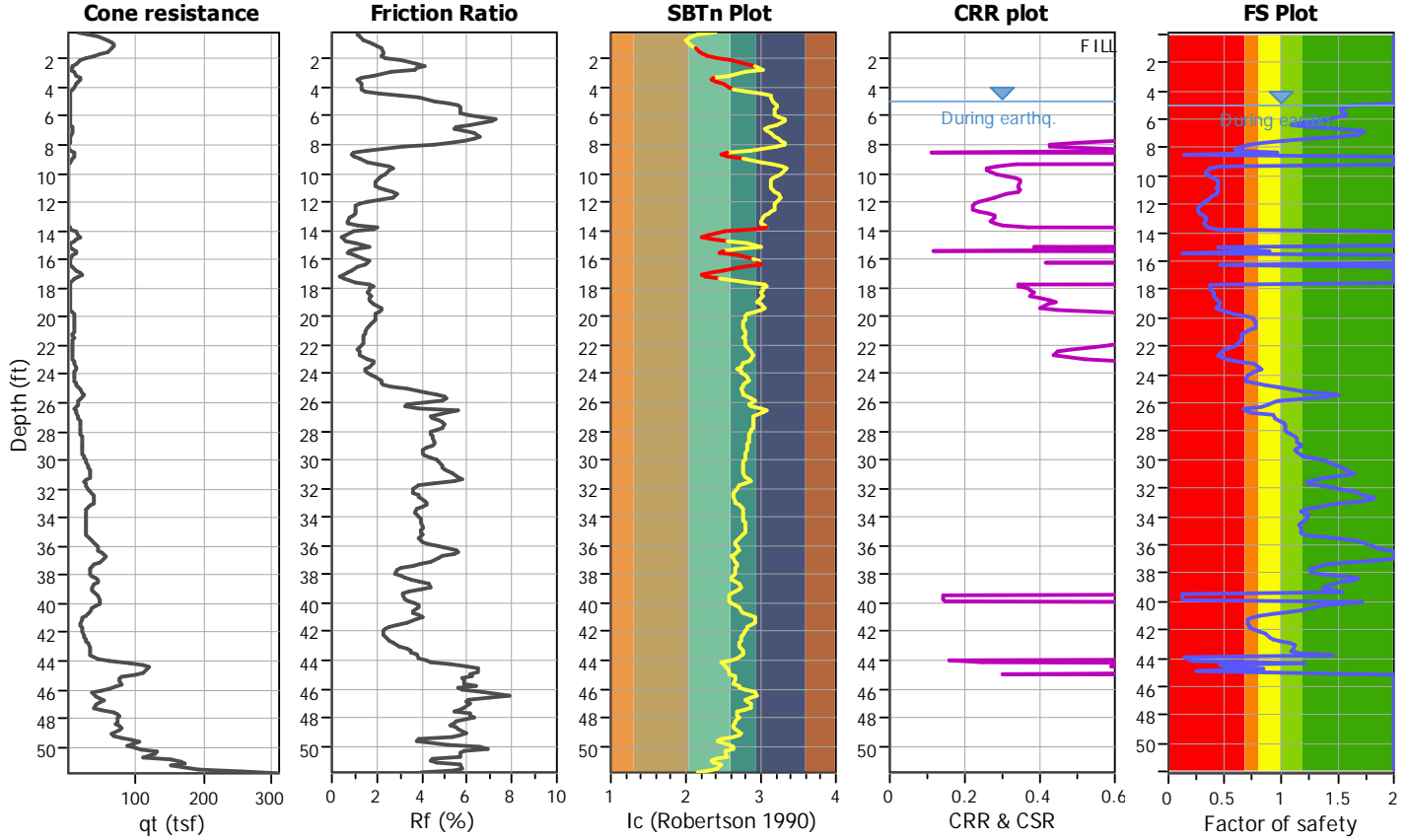
LIQUEFACTION ANALYSIS REPORT

Project title : Geotechnical Recommendation for
CPT file : CPT-8

Location : Rancho Vista

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	10.00 ft	Fill height:	5.00 ft	applied:	Sand & Clay
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	Yes
Earthquake magnitude M_w :	8.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	1.00	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based



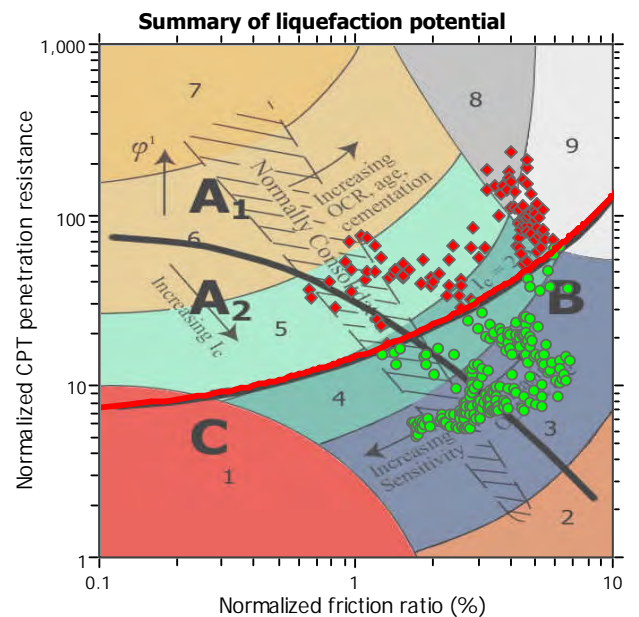
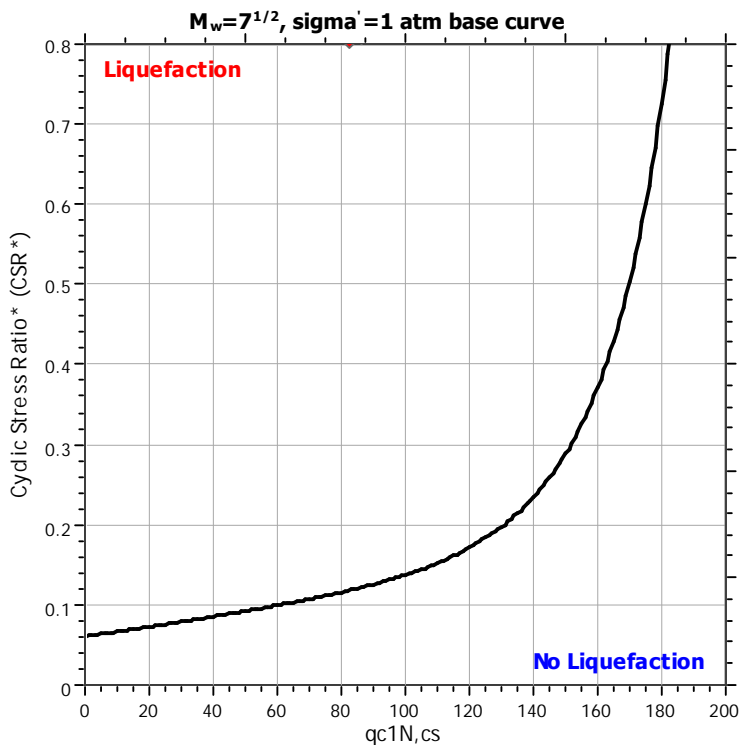
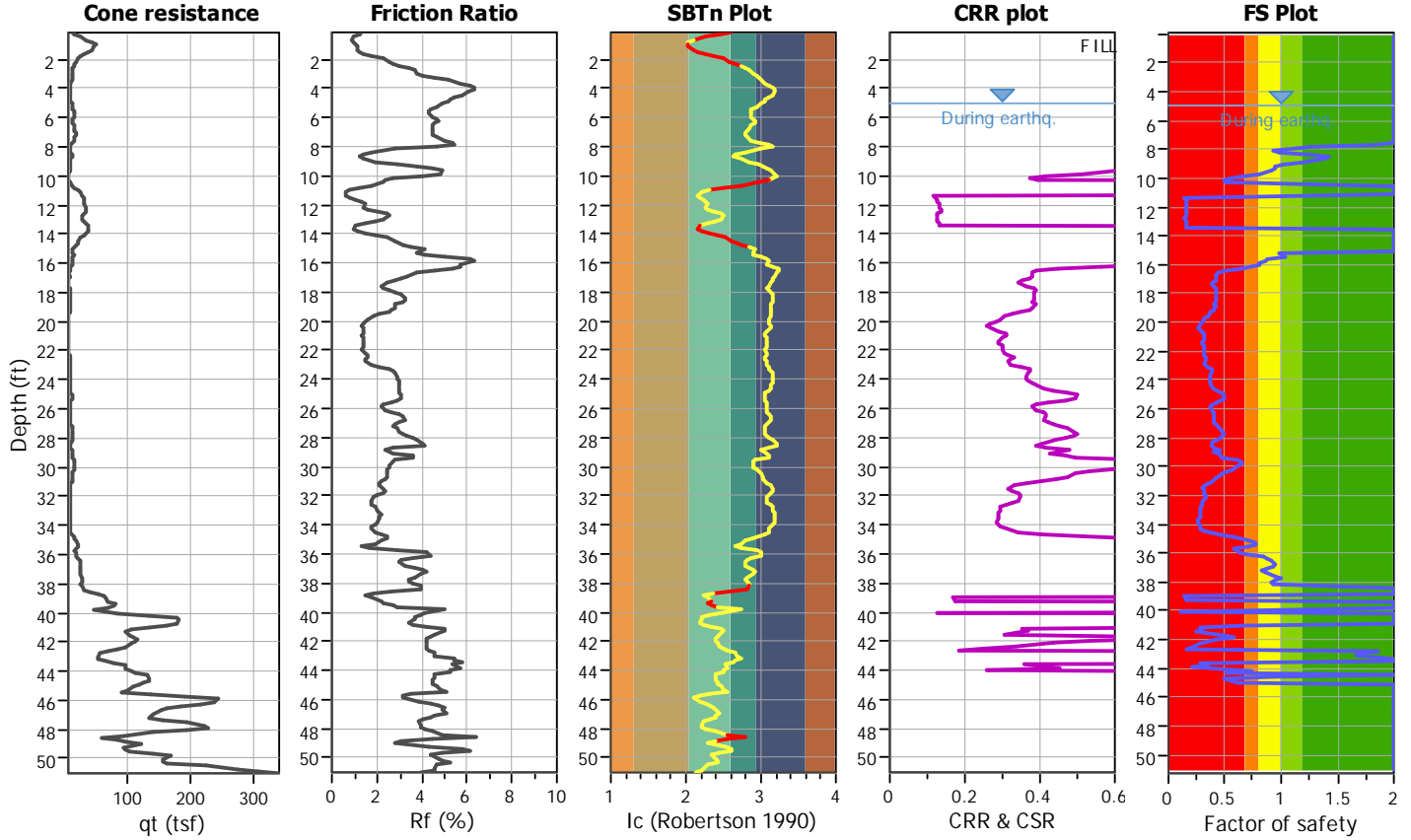
LIQUEFACTION ANALYSIS REPORT

Project title : Geotechnical Recommendation for
CPT file : CPT-9

Location : Rancho Vista

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	10.00 ft	Fill height:	5.00 ft	applied:	Sand & Clay
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	Yes
Earthquake magnitude M_w :	8.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	1.00	Unit weight calculation:	Based on SBT	K_g applied:	Yes	MSF method:	Method based



Zone A₁ : Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

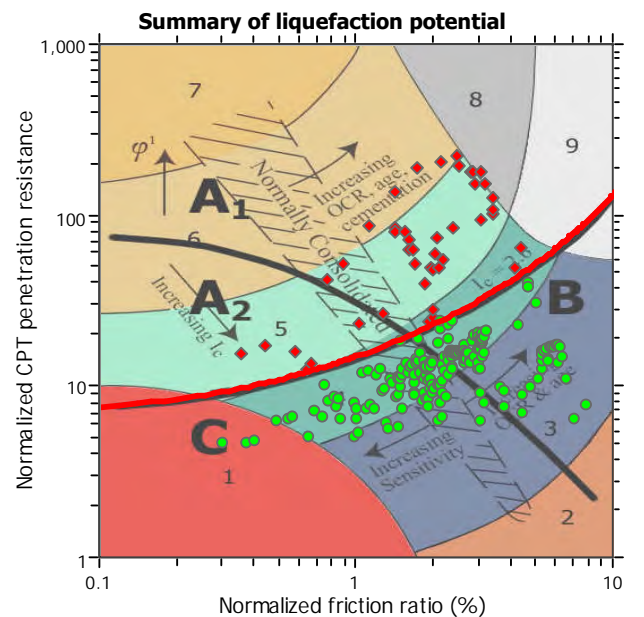
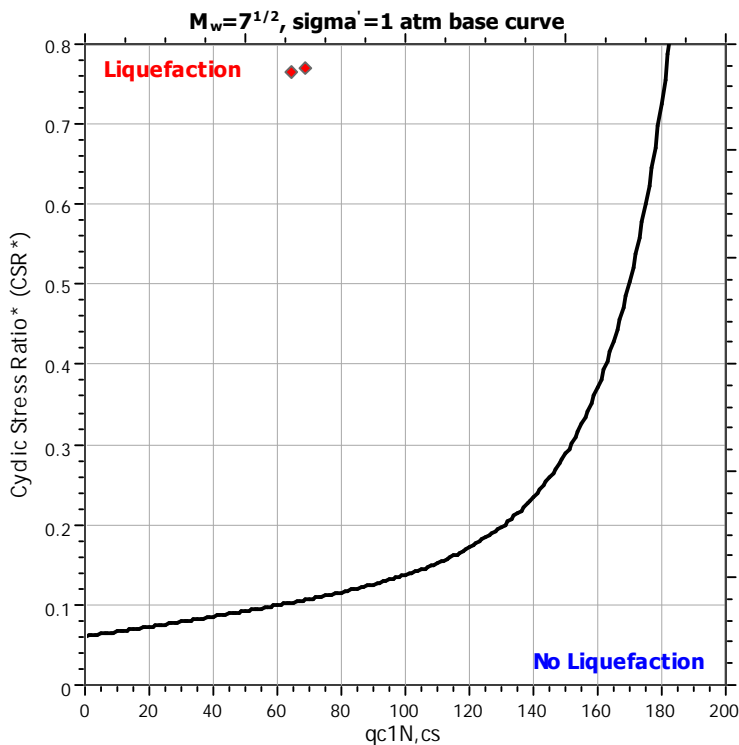
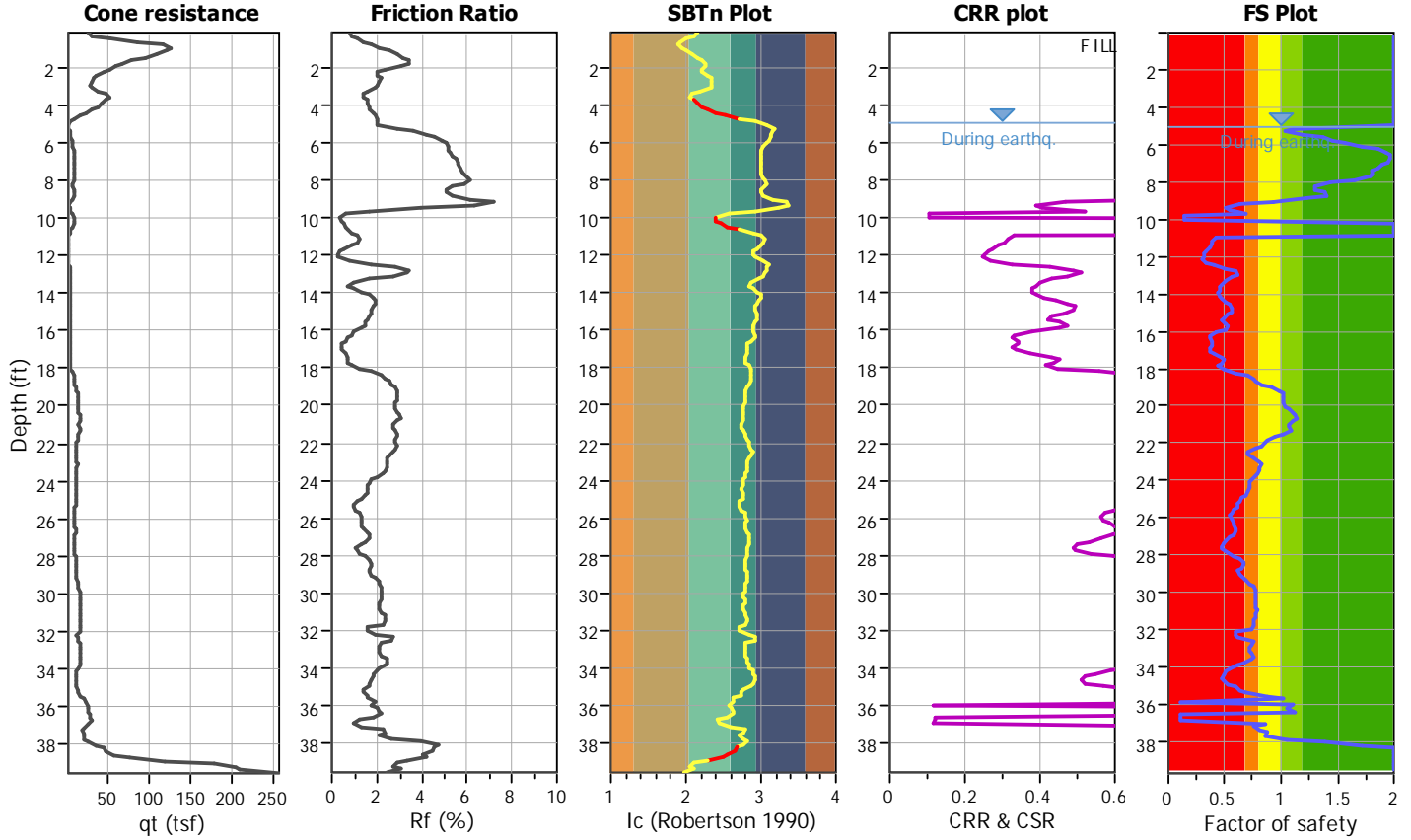
LIQUEFACTION ANALYSIS REPORT

Project title : Geotechnical Recommendation for
CPT file : CPT-10

Location : Rancho Vista

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
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Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	Yes
Earthquake magnitude M_w :	8.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	1.00	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based



Zone A₁ : Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

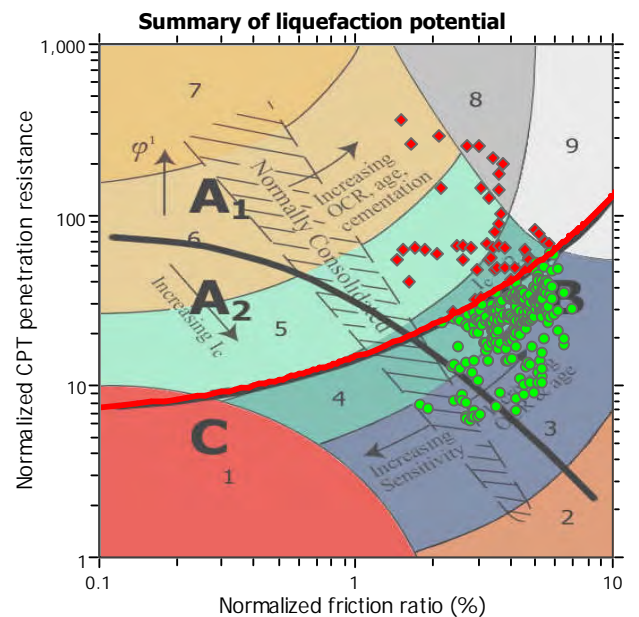
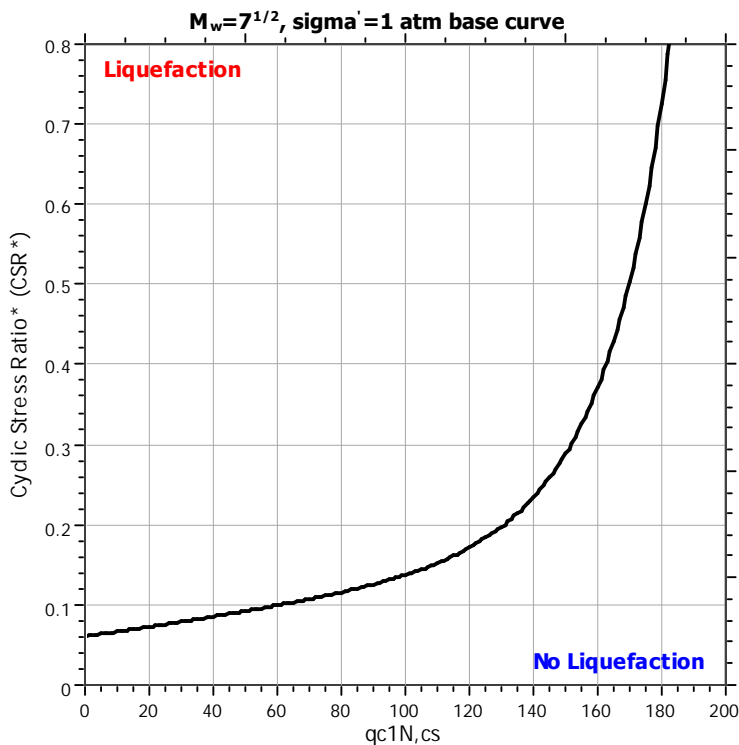
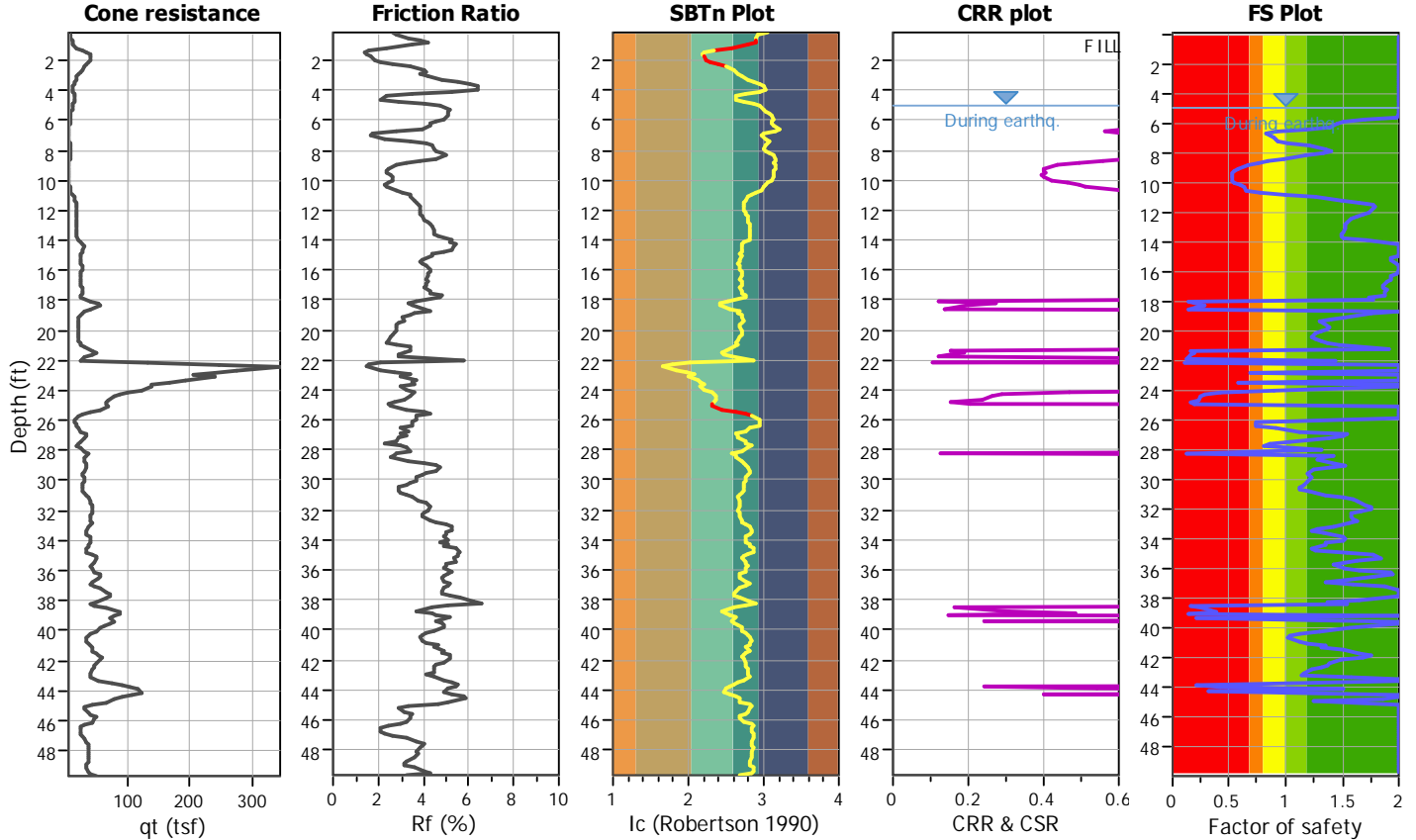
LIQUEFACTION ANALYSIS REPORT

Project title : Geotechnical Recommendation for
CPT file : CPT-11

Location : Rancho Vista

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	10.00 ft	Fill height:	5.00 ft	applied:	Sand & Clay
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	Yes
Earthquake magnitude M_w :	8.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	1.00	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based



Zone A₁ : Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

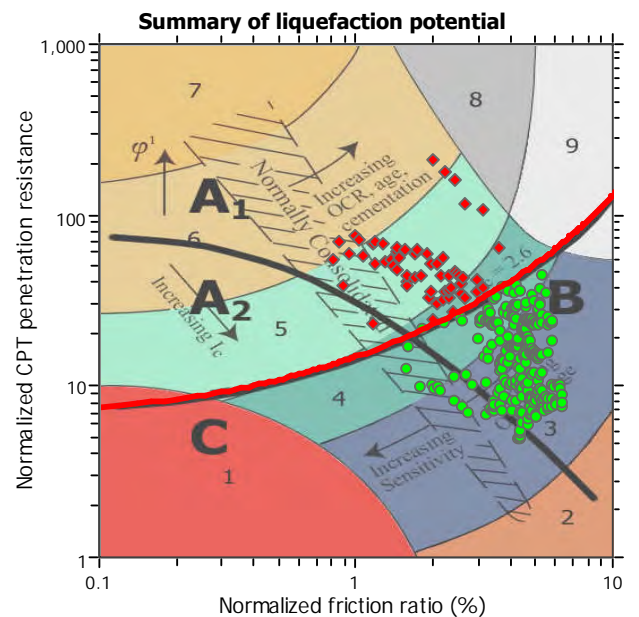
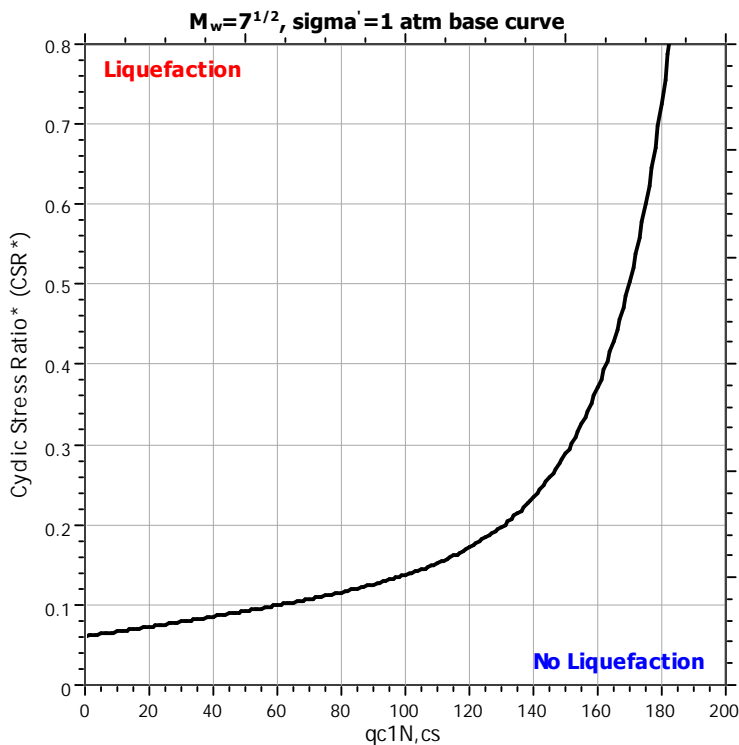
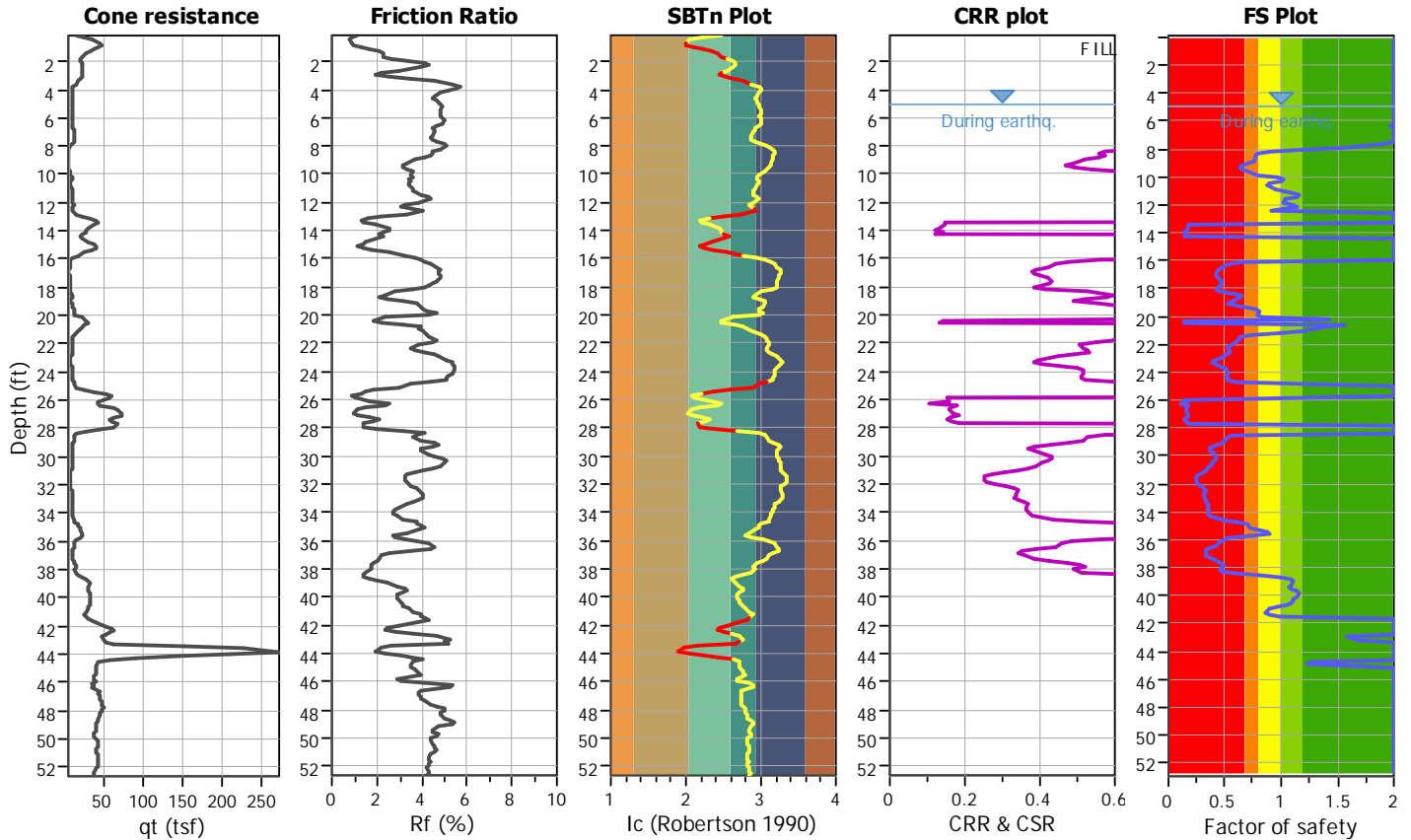
LIQUEFACTION ANALYSIS REPORT

Project title : Geotechnical Recommendation for
CPT file : CPT-12

Location : Rancho Vista

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	10.00 ft	Fill height:	5.00 ft	applied:	Sand & Clay
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	Yes
Earthquake magnitude M_w :	8.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	1.00	Unit weight calculation:	Based on SBT	K_g applied:	Yes	MSF method:	Method based



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

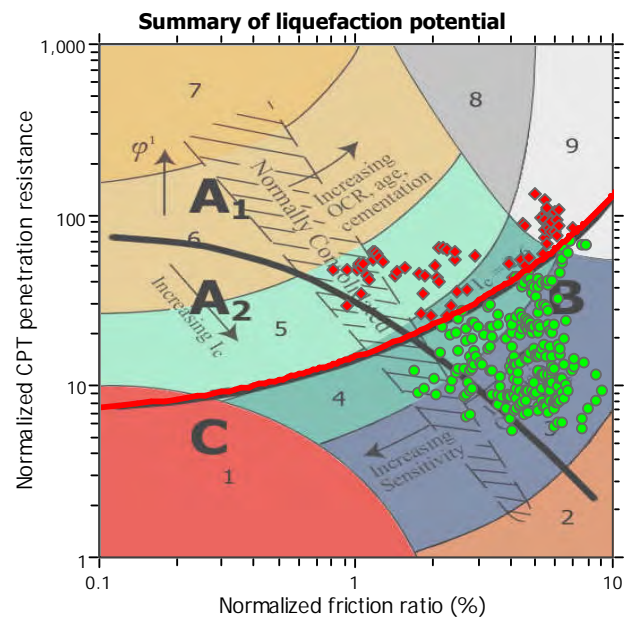
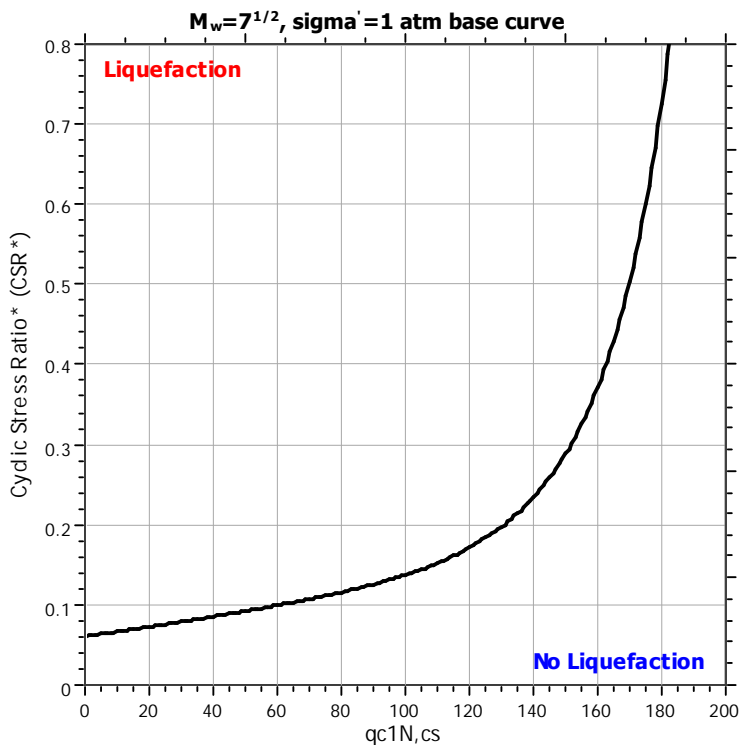
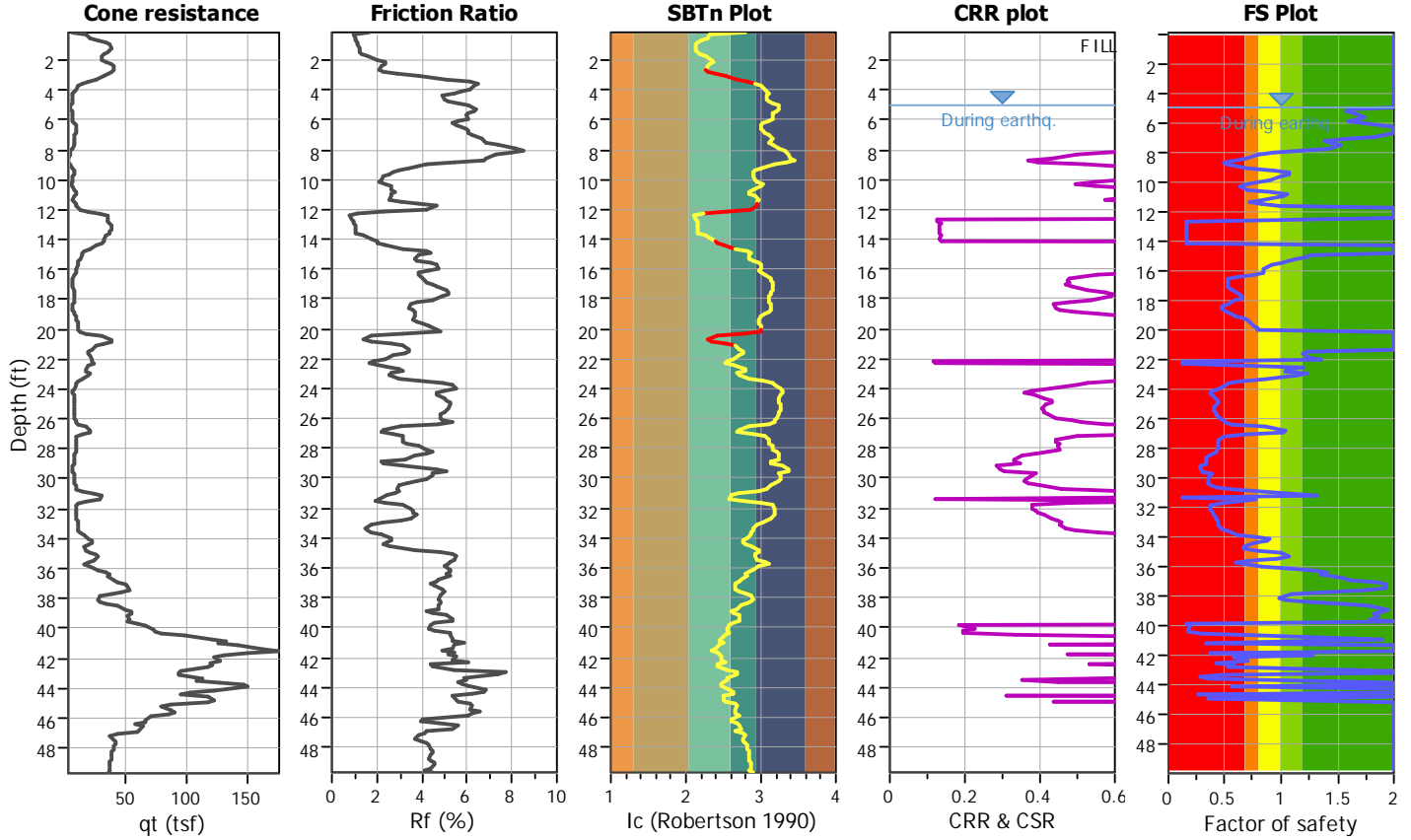
LIQUEFACTION ANALYSIS REPORT

Project title : Geotechnical Recommendation for
CPT file : CPT-13

Location : Rancho Vista

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	10.00 ft	Fill height:	5.00 ft	applied:	Sand & Clay
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	Yes
Earthquake magnitude M_w :	8.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	1.00	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:	Method based



Zone A₁ : Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

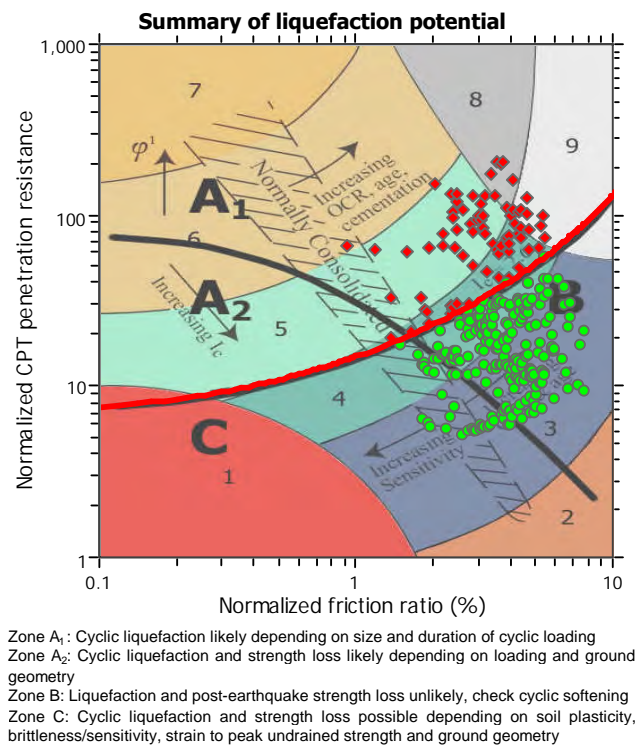
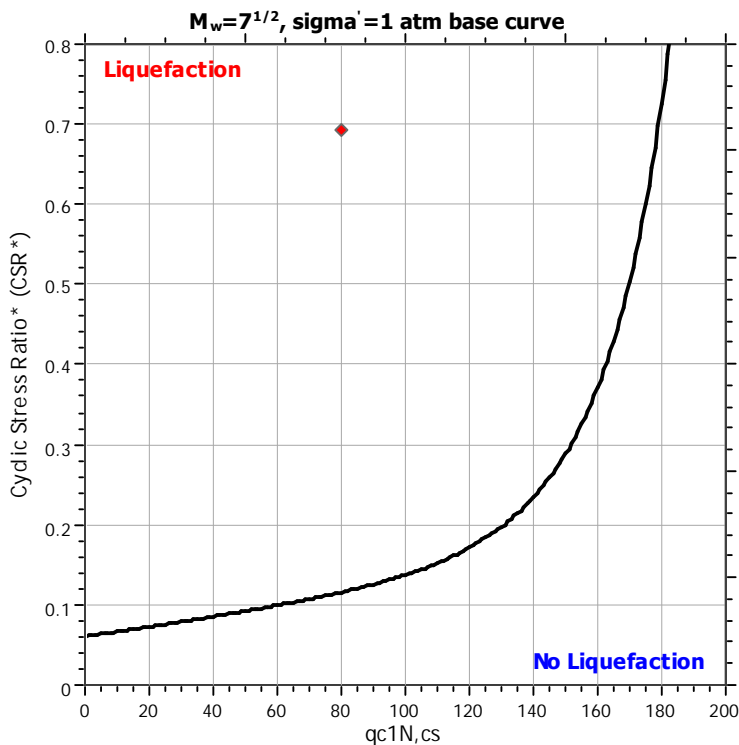
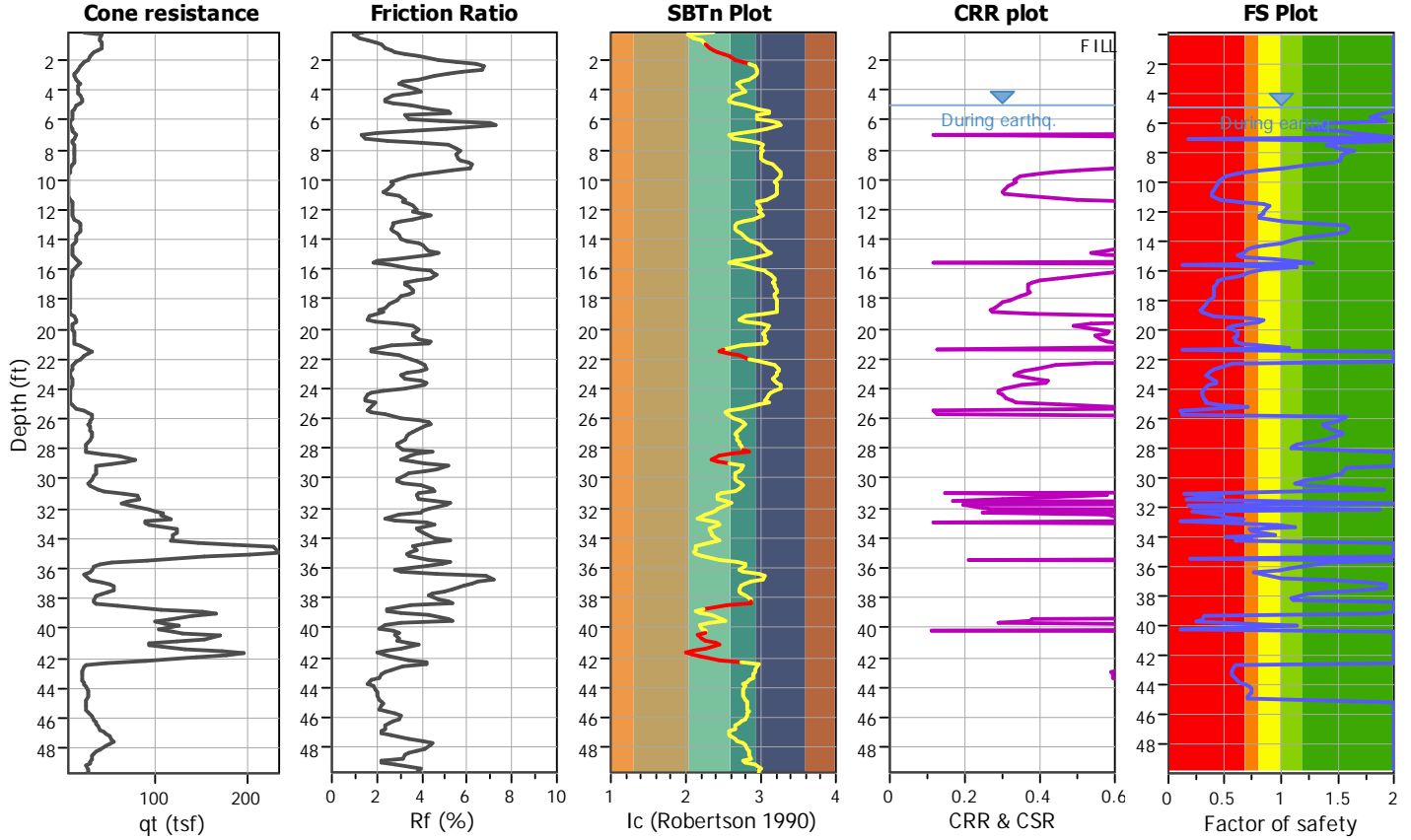
LIQUEFACTION ANALYSIS REPORT

Project title : Geotechnical Recommendation for
CPT file : CPT-14

Location : Rancho Vista

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	10.00 ft	Fill height:	5.00 ft	applied:	Sand & Clay
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	Yes
Earthquake magnitude M_w :	8.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	1.00	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based



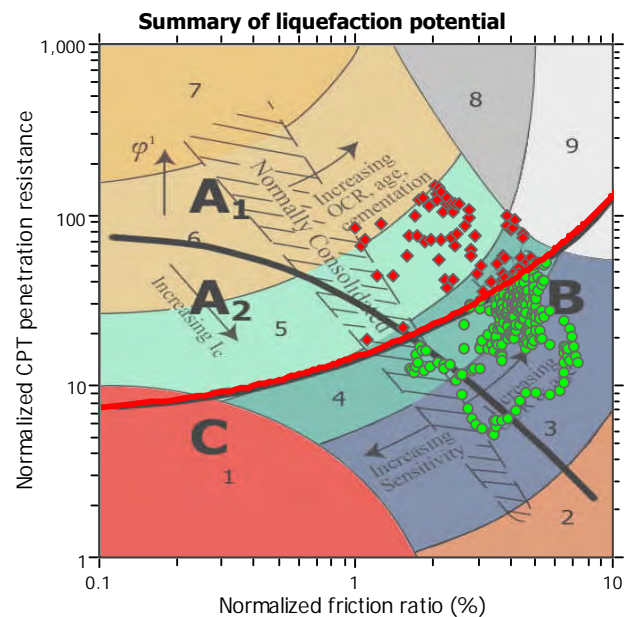
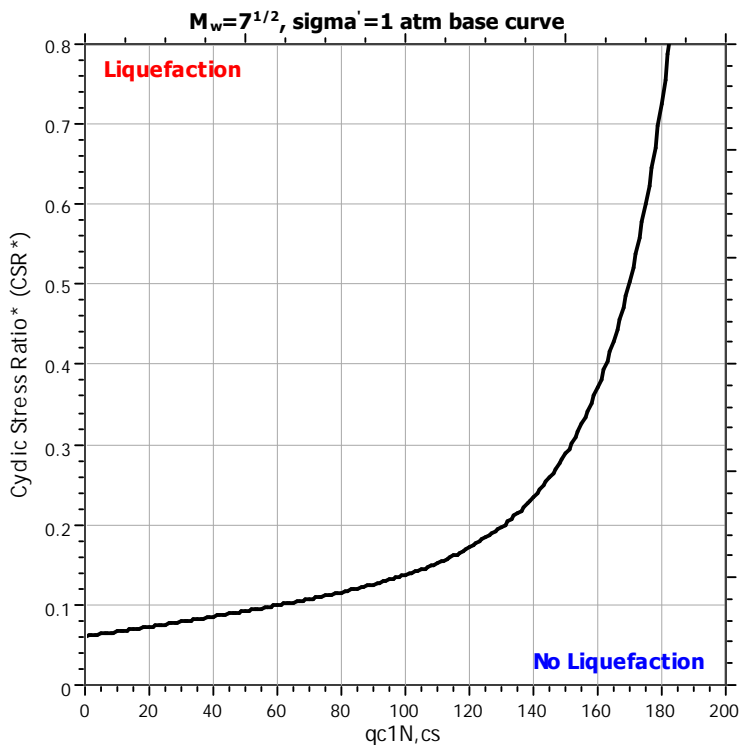
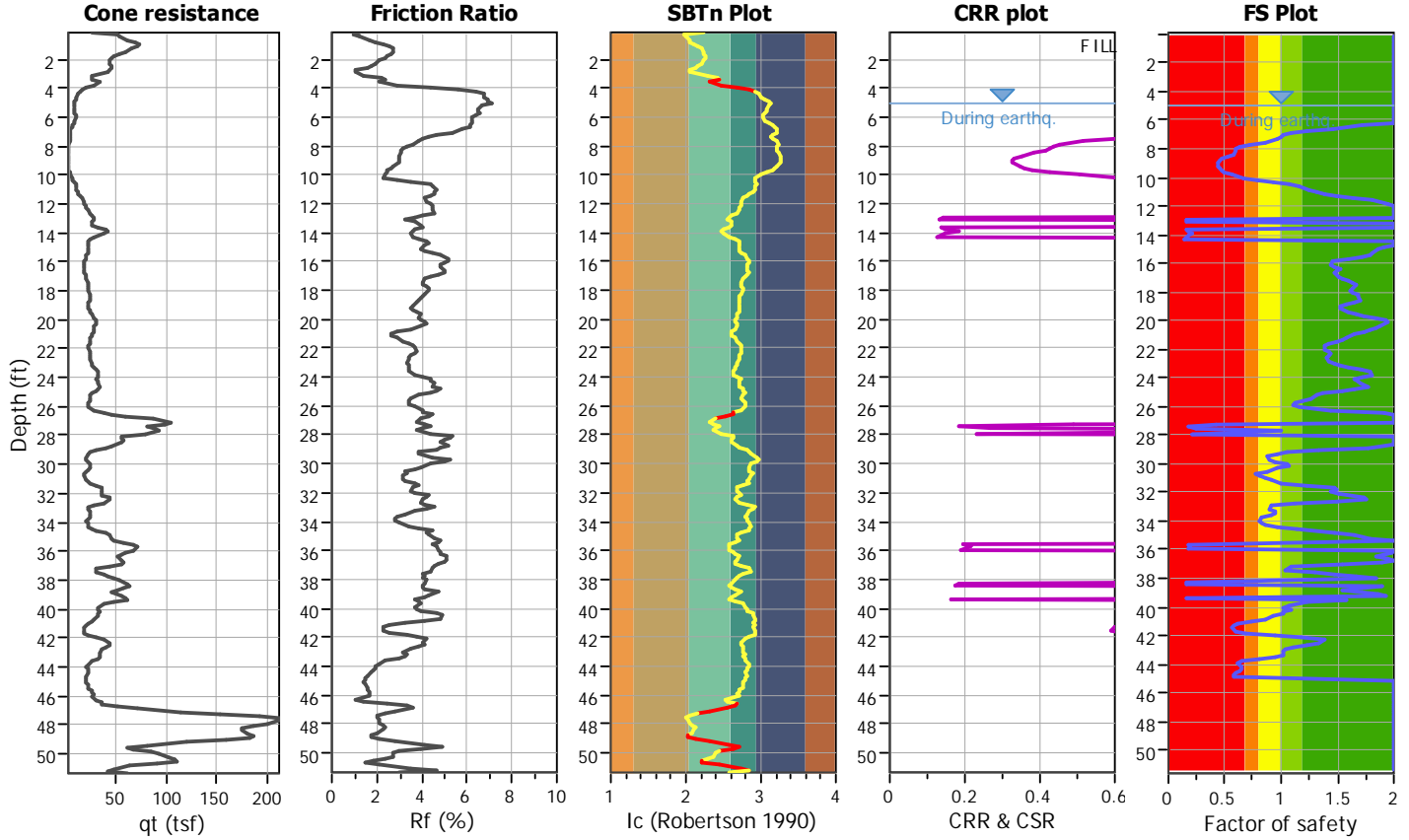
LIQUEFACTION ANALYSIS REPORT

Project title : Geotechnical Recommendation for
CPT file : CPT-15

Location : Rancho Vista

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	10.00 ft	Fill height:	5.00 ft	applied:	Sand & Clay
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	Yes
Earthquake magnitude M_w :	8.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	1.00	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

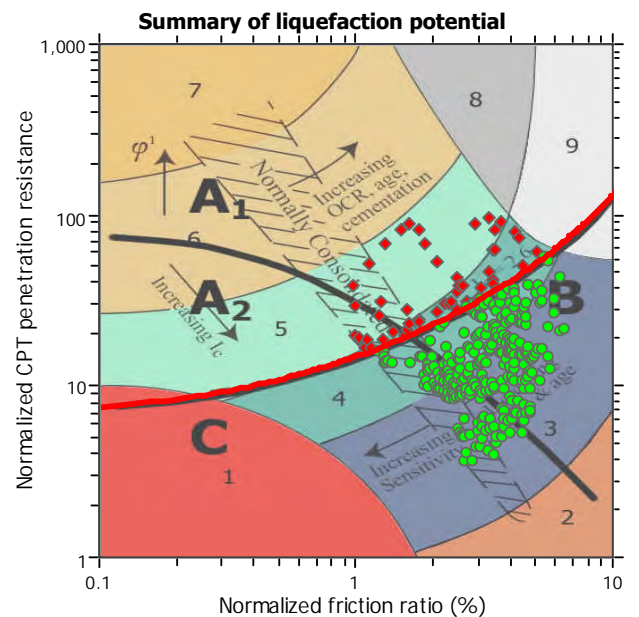
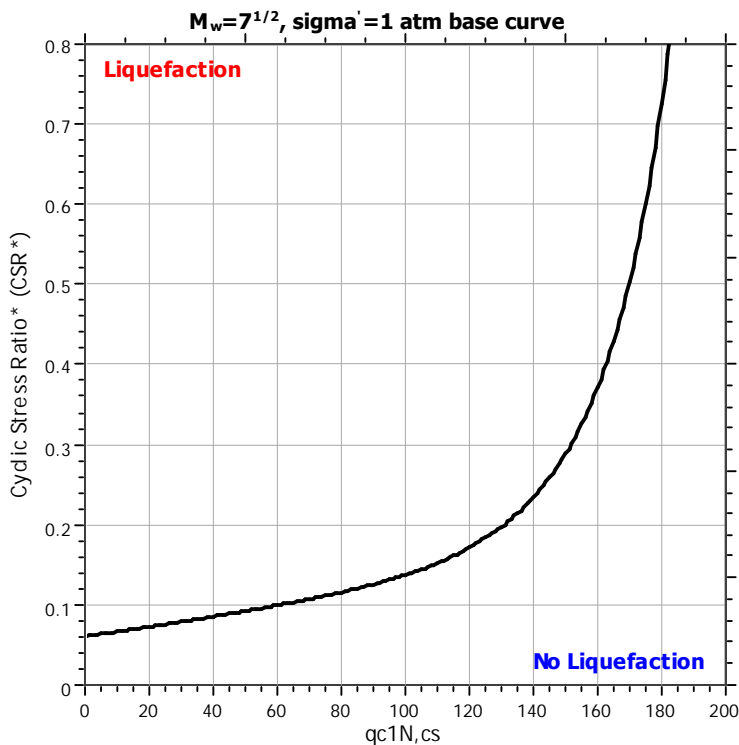
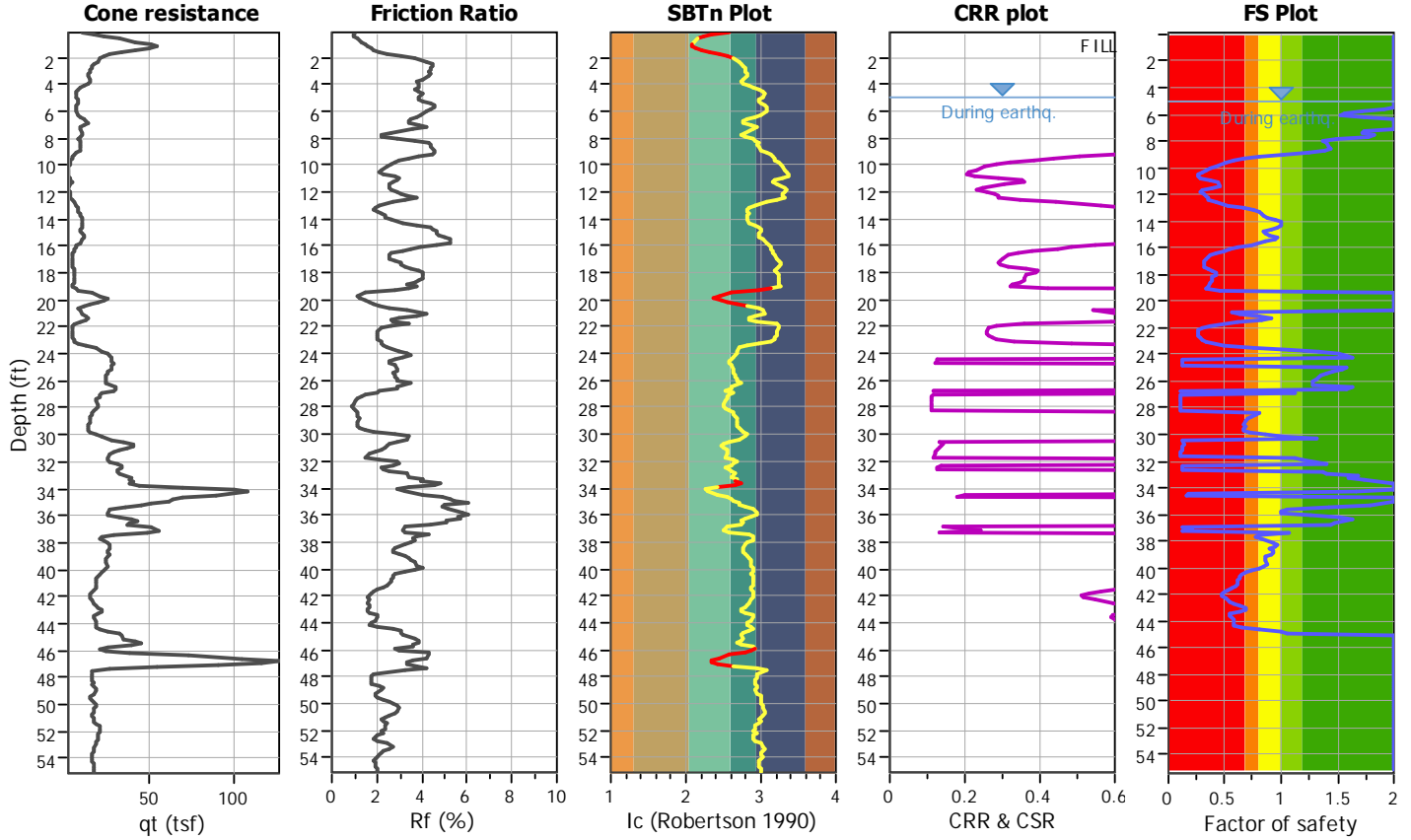
LIQUEFACTION ANALYSIS REPORT

Project title : Geotechnical Recommendation for
CPT file : CPT-16

Location : Rancho Vista

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	10.00 ft	Fill height:	5.00 ft	applied:	Sand & Clay
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	Yes
Earthquake magnitude M_w :	8.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	1.00	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

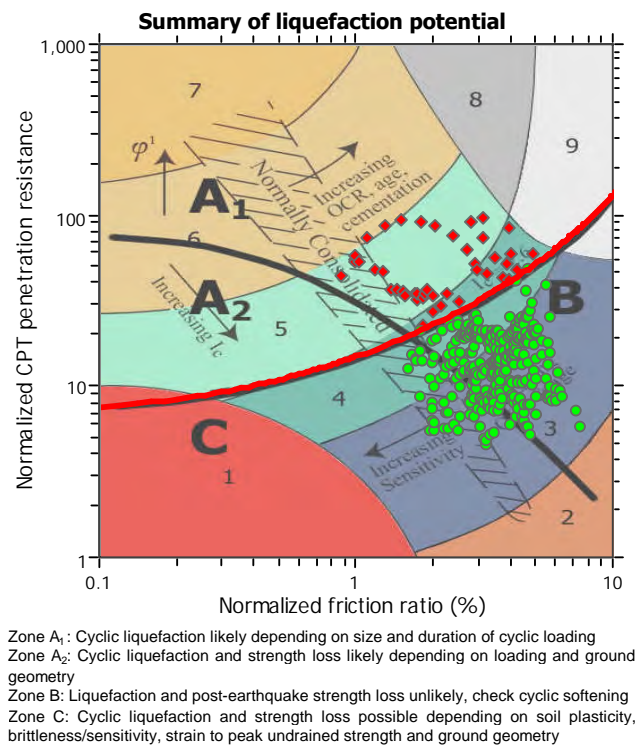
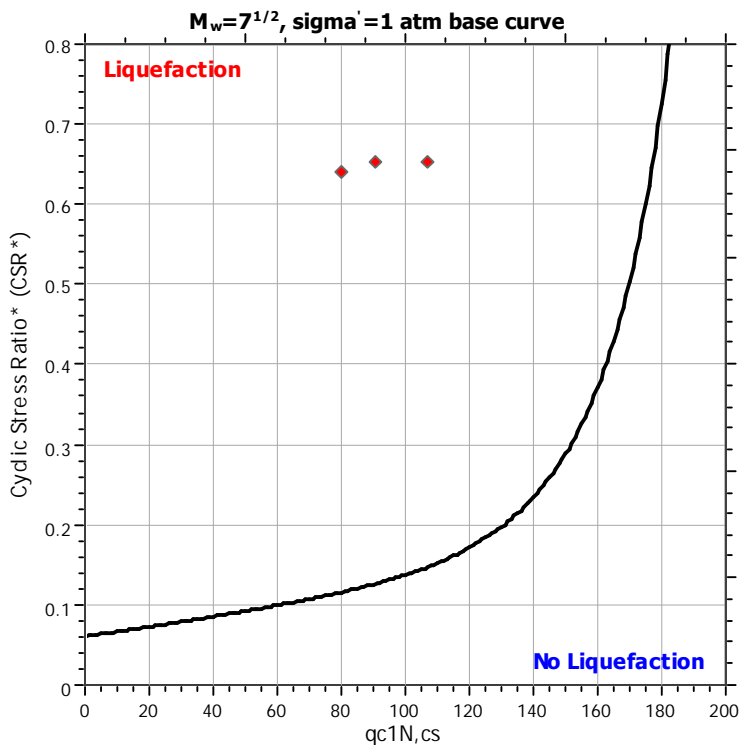
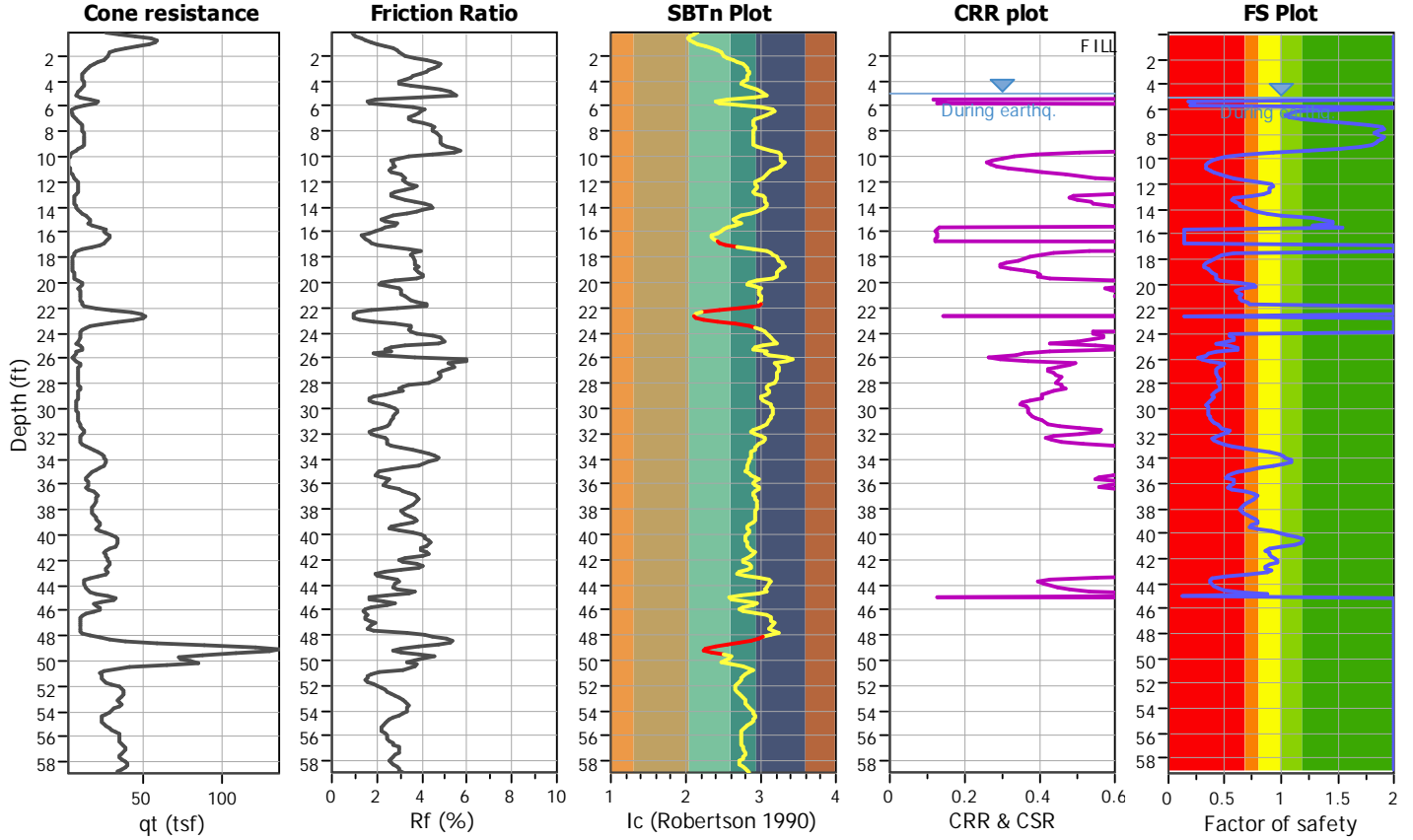
LIQUEFACTION ANALYSIS REPORT

Project title : Geotechnical Recommendation for
CPT file : CPT-17

Location : Rancho Vista

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	10.00 ft	Fill height:	5.00 ft	applied:	Sand & Clay
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	Yes
Earthquake magnitude M_w :	8.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	1.00	Unit weight calculation:	Based on SBT	K_g applied:	Yes	MSF method:	Method based



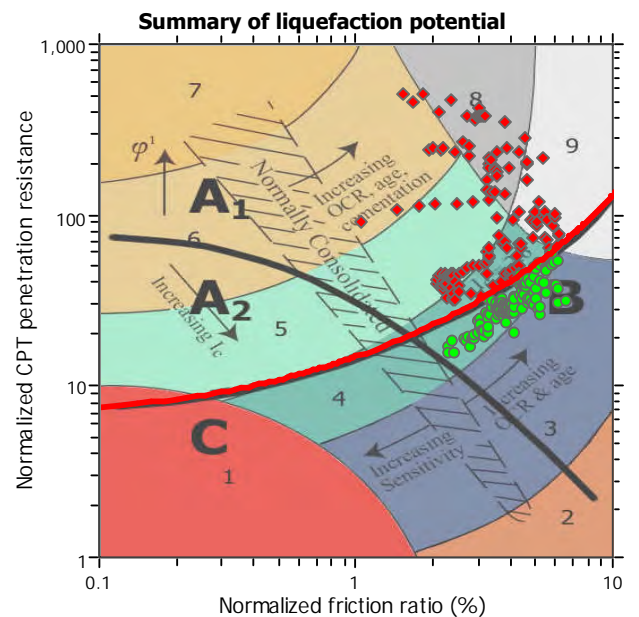
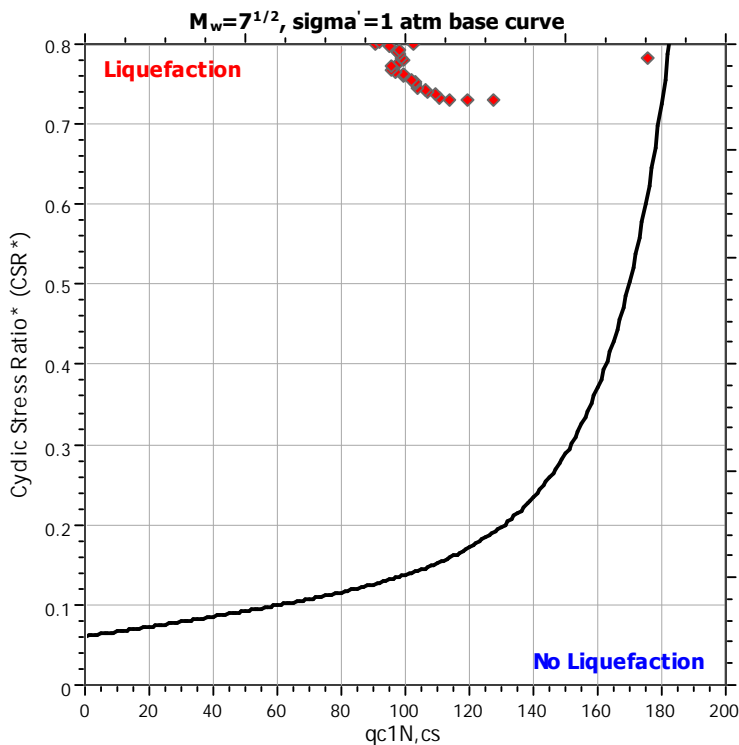
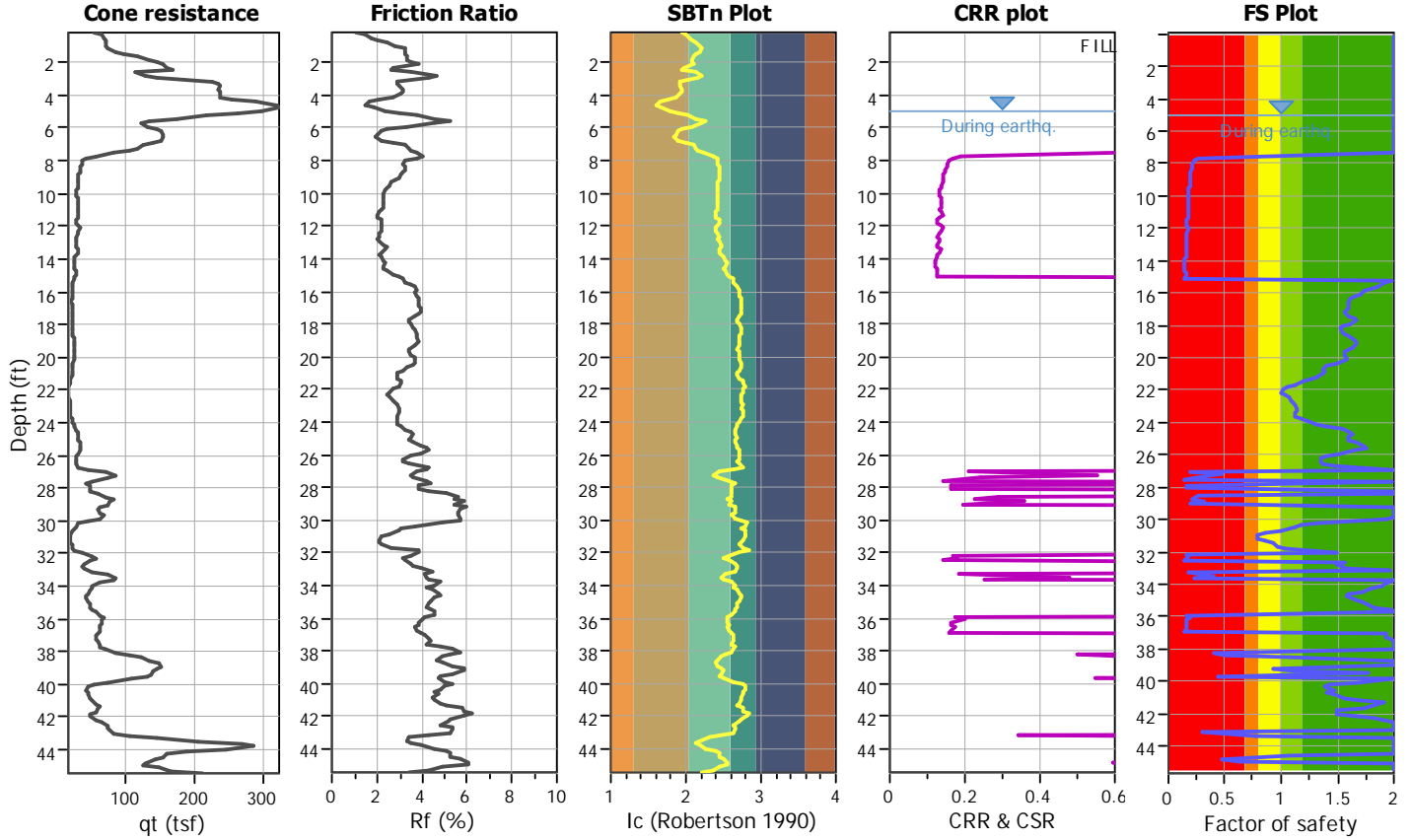
LIQUEFACTION ANALYSIS REPORT

Project title : Geotechnical Recommendation for
CPT file : CPT-18

Location : Rancho Vista

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	10.00 ft	Fill height:	5.00 ft	applied:	Sand & Clay
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	Yes
Earthquake magnitude M_w :	8.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	1.00	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

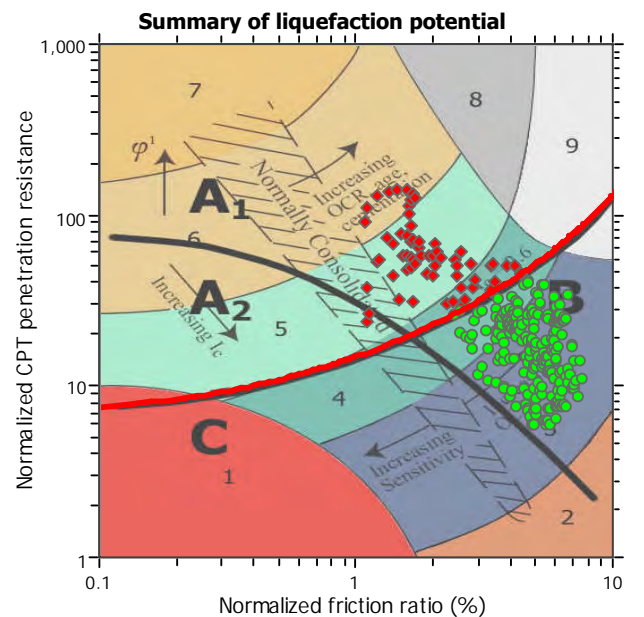
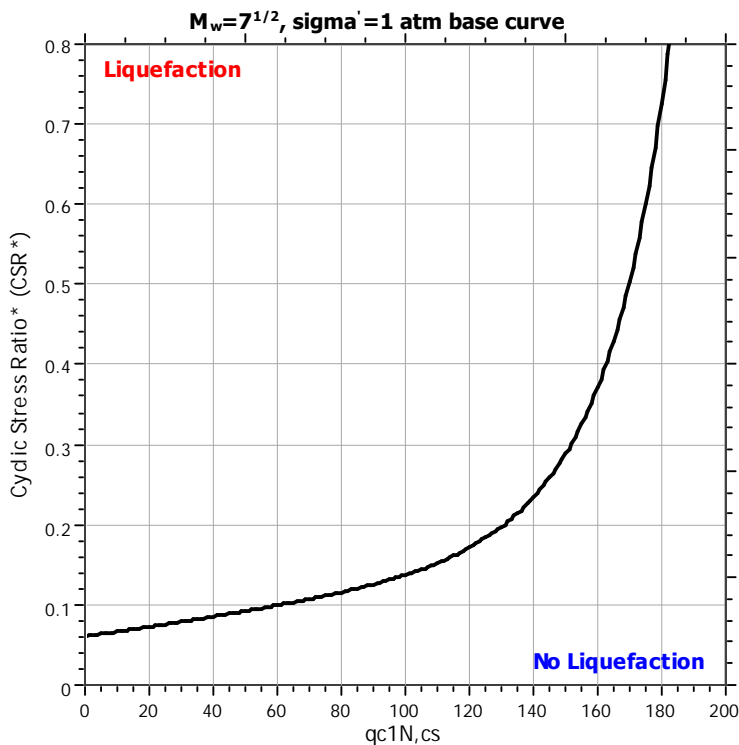
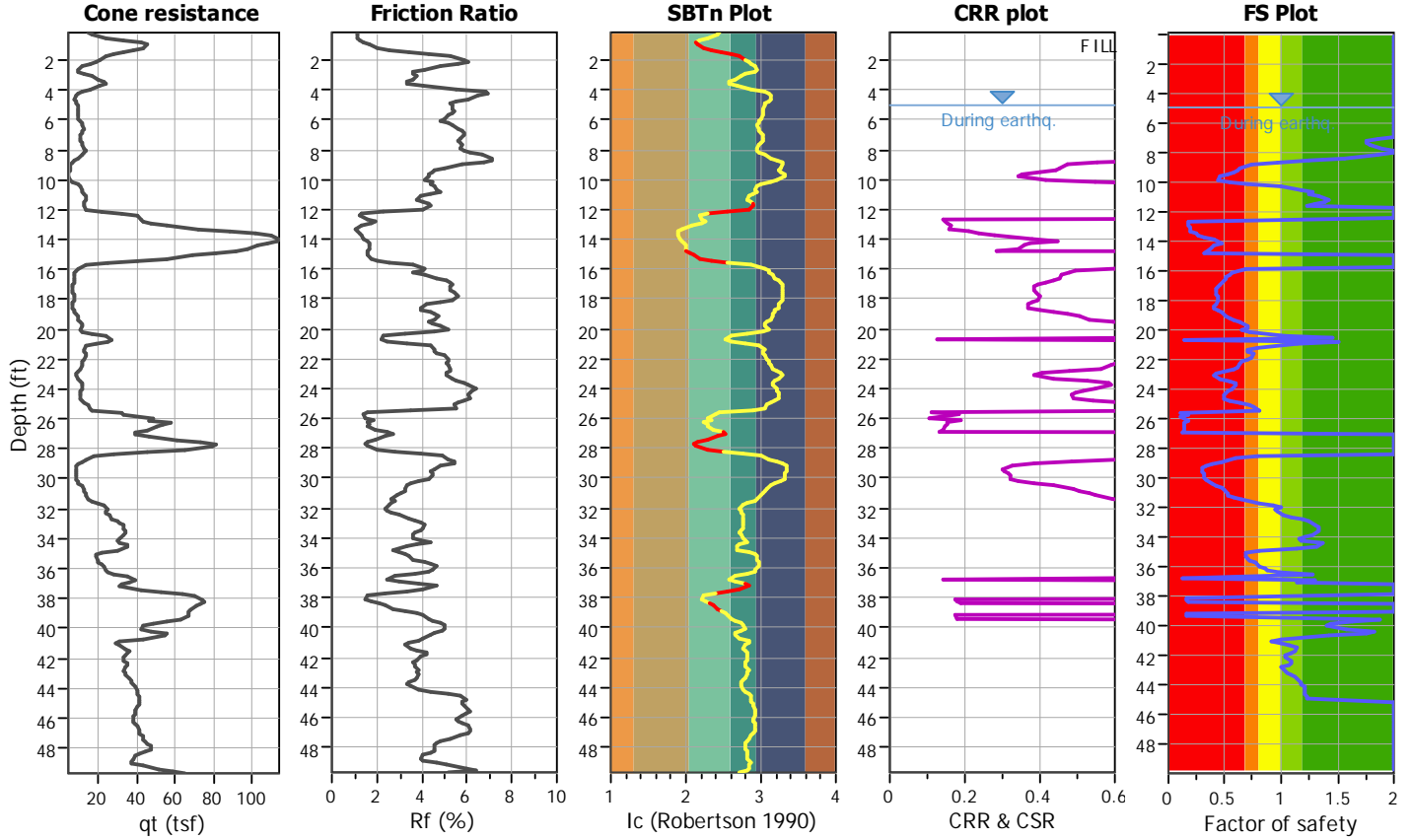
LIQUEFACTION ANALYSIS REPORT

Project title : Geotechnical Recommendation for
CPT file : CPT-19

Location : Rancho Vista

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	10.00 ft	Fill height:	5.00 ft	applied:	Sand & Clay
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	Yes
Earthquake magnitude M_w :	8.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	1.00	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

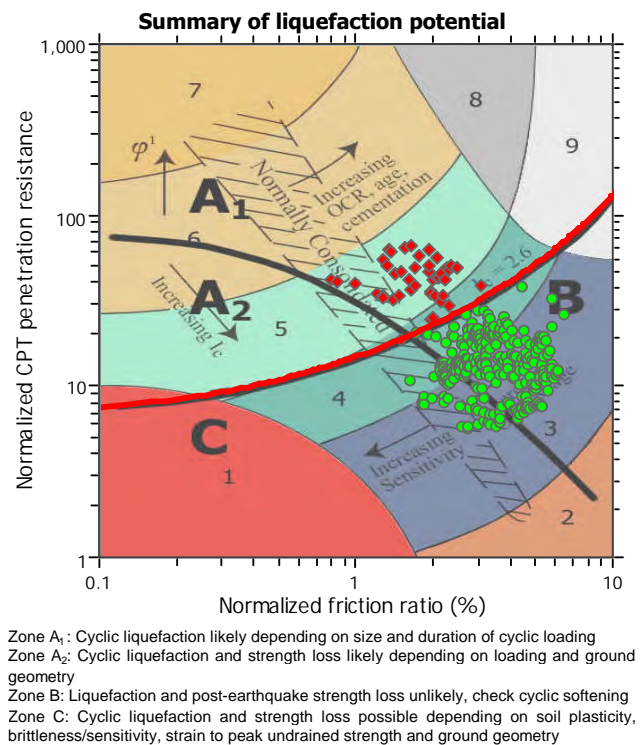
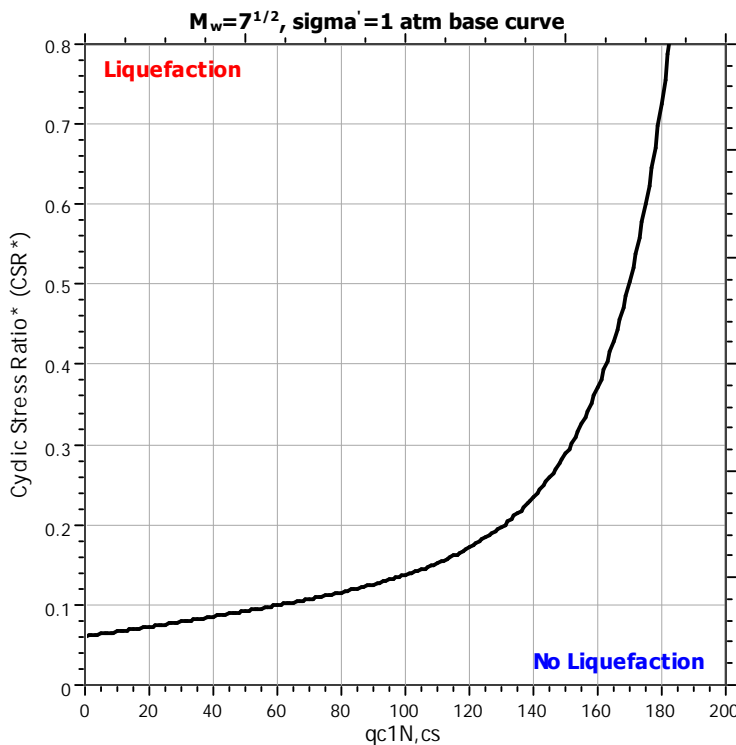
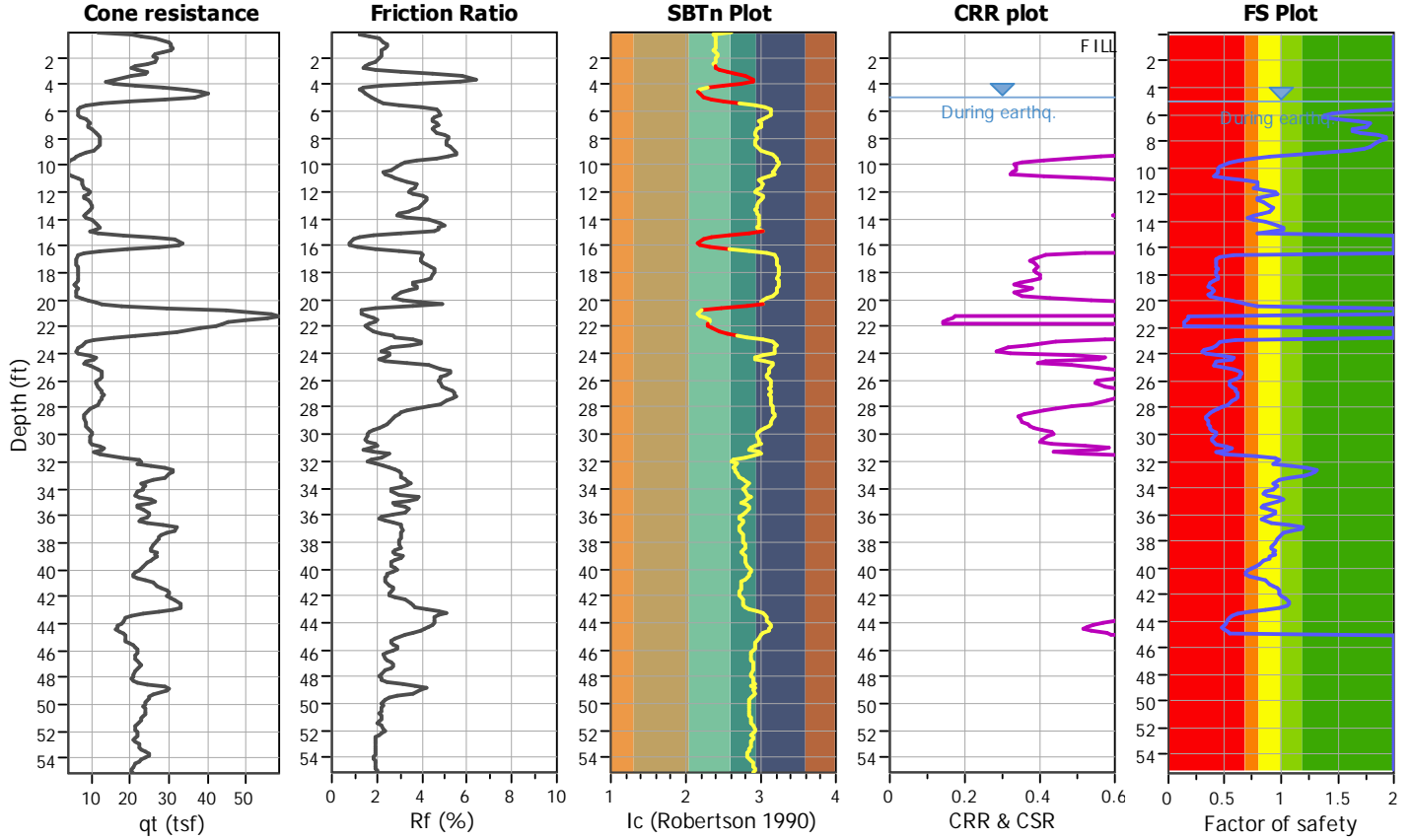
LIQUEFACTION ANALYSIS REPORT

Project title : Geotechnical Recommendation for
CPT file : CPT-20

Location : Rancho Vista

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	10.00 ft	Use fill:	Yes	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	10.00 ft	Fill height:	5.00 ft	applied:	Sand & Clay
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	120.00 lb/ft ³	Limit depth applied:	Yes
Earthquake magnitude M_w :	8.00	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	50.00 ft
Peak ground acceleration:	1.00	Unit weight calculation:	Based on SBT	K_g applied:	Yes	MSF method:	Method based





SAN RAMON
SAN FRANCISCO
SAN JOSE
OAKLAND
LATHROP
ROCKLIN
SANTA CLARITA
IRVINE
CHRISTCHURCH
WELLINGTON
AUCKLAND

APPENDIX B

San Juan Bautista to Hollister Force Main
Mitigation Monitoring and Reporting
Program CEQA & NEPA, September 9,
2022 (EMC Planning Group Inc.)

San Juan Bautista to Hollister Force Main Mitigation Monitoring and Reporting Program CEQA & NEPA, September 9, 2022

INTRODUCTION

California Environmental Quality Act (CEQA)

CEQA Guidelines section 15097 requires public agencies to adopt reporting or monitoring programs when they approve projects subject to an environmental impact report or a negative declaration that includes mitigation measures to avoid significant adverse environmental effects. The reporting or monitoring program is to be designed to ensure compliance with conditions of project approval during project implementation in order to avoid significant adverse environmental effects.

The law was passed in response to chronic non-implementation of mitigation measures presented in environmental documents and subsequently adopted as conditions of project approval. In addition, monitoring ensures that mitigation measures are implemented and thereby provides a mechanism to evaluate the effectiveness of the mitigation measures.

A definitive set of project conditions would include enough detailed information and enforcement procedures to ensure the measure's compliance. This monitoring program is designed to provide a mechanism to ensure that mitigation measures are implemented.

The *San Juan Bautista to Hollister Sanitary Sewer Force Main Mitigated Negative Declaration* (SCH 202110032) was approved by the City of San Juan Bautista on December 14, 2021, and the Notice of Determination was filed on December 15, 2021.

National Environmental Policy Act (NEPA)

Federal agencies are required to ensure that a monitoring program track whether mitigation commitments are being performed as described in the NEPA and related decision documents, and whether the mitigation effort is producing the expected outcomes and resulting environmental effects. Monitoring responsibility ultimately rests with the lead Federal agency, however this responsibility can be shared between the lead agency and a project applicant.

Mitigation Monitoring and Reporting Program

This mitigation monitoring and reporting program includes measures from both the CEQA and NEPA documents. Because NEPA documentation was completed after the CEQA document was adopted, some measures were updated or modified in the Environmental Report based on revised project plans and/or permit conditions. Measures from the CEQA document are denoted with a "C" in parenthesis next to the measure number [e.g., BIO-1 (C)]. Measures from the NEPA document are denoted with a "N" in parenthesis next to the measure number [e.g., BIO-1 (N)].

All mitigation measures shall be included on construction documents.

Prior to Commencement of Grading and Construction Activities

The following mitigation measures will be implemented:

Mitigation Measure AQ-1 (C), AQ-1 (N)

The City of San Juan Bautista will prepare a Construction Management Plan and implement it during construction activities. The plan will include the following restrictions:

- a. Heavy-duty diesel vehicles will have 2010 or newer model year engines, in compliance with the California Air Resources Board’s Truck and Bus Regulation, and will not be staged within 500 feet of occupied residences; and
- b. Idling of construction equipment and heavy-duty diesel trucks will be avoided where feasible, and if idling is necessary, it will not exceed five minutes.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure BIO-1 (C)

Prior to approval of grading permits for the WWTPs and sewer main route, a biologist qualified in botany shall conduct a focused survey of the proposed area of impact (including construction staging areas) for Congdon’s tarplant in accordance with current CDFW and CNPS rare plant survey protocols (CDFW 2018 and CNPS 2001). The survey shall occur during the peak blooming period for this species to determine its presence or absence (typically August through September). If possible, a known reference population of the target species in the project vicinity shall first be visited to verify that the species is observable, and the focused survey shall be conducted within two weeks of observing the reference population in full bloom.

The biologist shall then prepare a brief report documenting the results of the survey and, if appropriate, propose measures for avoiding or minimizing possible impacts to Congdon’s tarplant before and during construction, as included below. If the focused survey concludes the species is not present within the project site boundary, or if it is present but impacts to it can be completely avoided, then no mitigation would be required.

Mitigation Monitoring and Reporting Program

If the focused surveys identify Congdon's tarplant within the project site boundary and it would be affected by the proposed project, then appropriate mitigation shall be developed by the biologist and implemented by the City of San Juan Bautista prior to issuance of a grading permit. Measures may include, but are not limited to:

- a. A qualified biologist shall identify an on-site or off-site mitigation area suitable for restoration of habitat and seed transplantation for this annual herb. The City of San Juan Bautista shall be responsible for the placement of a conservation easement over the mitigation area and the provision of funds to ensure the restoration of the mitigation area and its preservation in perpetuity.
- b. Prior to approval of a grading permit, a qualified biologist or native plant specialist shall perform seed collection from all special-status plants located within the impact areas and implement seed installation at the mitigation area at the optimal time. Additionally, topsoil from the special-status species occurrence area(s) shall be salvaged (where practical) for use in the mitigation area.
- c. A maintenance and monitoring program shall be developed by a qualified biologist and established for a minimum of five years after mitigation area installation to verify that restoration activities have been successful. Maintenance activities may include, but not be limited to, watering during the plant establishment period, supplemental seed planting as needed, and removal of non-native plants. Monitoring shall include, at a minimum, quarterly monitoring reports for the first year and annual reports for the remaining four years. The performance standard for successful mitigation shall be a minimum 3:1 replacement ratio (i.e., three plants observed in mitigation area for each plant lost from the project site) achieved in at least one of the five years of monitoring.

The City of San Juan Bautista will be responsible for implementation of this mitigation measure. Compliance with this measure shall be documented prior to approval of a grading permit.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure BIO-2 (C), BIO-1 (N)

Prior to approval of a grading permit, a qualified biologist shall conduct a training session for all construction personnel. At a minimum, the training shall include a description of special-status species potentially occurring in the project vicinity, including, but not limited to, American badger, San Joaquin kit fox, California tiger salamander, California red-legged frog, burrowing owl, special-status bats, and nesting birds and raptors. Their habitats, general measures that are being implemented to conserve species as they relate to the project, and the boundaries within which construction activities will occur will be explained. Informational handouts with photographs clearly illustrating the species' appearances shall be used in the training session. All new construction personnel shall undergo this mandatory environmental awareness training.

The qualified biologist will train biological monitors selected from the construction crew by the construction contractor (typically the project foreman). Before the start of work each day, the monitor will check for animals under any equipment such as vehicles and stored pipes within active construction zones. The monitor will also check all excavated steep-walled holes or trenches greater than one foot deep for trapped animals. If a special-status species is observed within an active construction zone, the qualified biologist will be notified immediately and all work within 50 feet of the individual will be halted and all equipment turned off until the individual has left the construction area.

The City of San Juan Bautista shall document evidence of completion of this training prior to issuance of a grading permit.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure BIO-3 (C), BIO-2 (N)

Not more than 14 days prior to the commencement of ground-disturbing activities, a qualified wildlife biologist shall conduct surveys of the grassland habitat on site to identify any potential American badger burrows/dens. If the survey results are negative (i.e., no badger dens observed), a letter report confirming absence will be prepared and submitted to the City of San Juan Bautista and no further mitigation is required.

If the results are positive (badger dens are observed), the qualified biologist shall determine if the dens are active by installing a game camera for three days and three nights to determine if the den is in use.

- a. If the biologist determines that a den may be active, coordination with the CDFW shall be undertaken to develop a suitable strategy to avoid impacts to American badger. The strategy may include the following: the biologist shall install a one-way door in the den opening and continue use of the game camera. Once the camera captures the individual exiting the one-way door, the den can be excavated with hand tools to prevent badgers from reusing them. If the biologist determines that the den is a maternity den, construction activities shall be delayed during the maternity season (February to August), or until the badgers leave the den on their own accord or the biologist determines that the den is no longer in use.
- b. If the game camera does not capture an individual entering/exiting the den, the den can be excavated with hand tools to prevent badgers from reusing them.

After dens have been excavated and the absence of American badger confirmed, a letter report will be prepared and submitted to the City of San Juan Bautista.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure BIO-4 (C)

The *U.S. Fish and Wildlife Service Standardized Recommendations for Protection of the San Joaquin Kit Fox Prior to or During Ground Disturbance* (USFWS 2011) shall be implemented prior to initiation of and during any construction activity on the project site to avoid unintended take of individual San Joaquin kit foxes.

Preconstruction/pre-activity surveys for San Joaquin kit fox shall be conducted by a qualified biologist no less than 30 days prior to the beginning of ground disturbance and/or construction activities or any project activity that may impact San Joaquin kit fox. The surveys shall include all work and staging areas and a minimum 200-foot buffer of the project site. The preconstruction surveys shall identify kit fox habitat features on the project site, evaluate use by kit fox and, if possible, assess the potential impacts of the proposed activity. The status of all dens shall be determined and mapped.

If a natal/pupping den is discovered within the project area or within 200 feet of the project boundary, the City shall consult with the California Department of Fish and Wildlife and U.S. Fish and Wildlife Service to establish an appropriate avoidance buffer. The avoidance buffer shall be maintained until such time as the burrow is no longer active and/or an incidental take permit is determined to be required and is obtained.

In addition, the following measures shall be observed:

- a. Project-related vehicles shall observe a 20-mph speed limit in all project areas; this is particularly important at night when kit foxes are most active. To the extent possible, night-time construction shall be minimized. Off-road traffic outside of designated project area shall be prohibited.
- b. To prevent inadvertent entrapment of kit foxes or other animals during the construction phase of the project, all excavated, steep-walled holes or trenches more than two feet deep shall be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they shall be thoroughly inspected for trapped animals. If at any time a trapped or injured kit fox is discovered, the procedures under number 11 of the Construction and Operational Requirements in the Standardized Recommendations must be followed.
- c. Kit foxes are attracted to den-like structures such as pipes and may enter stored pipe becoming trapped or injured. All construction pipes, culverts, or similar structures with a diameter of four inches or greater that are stored at a construction site for one or more overnight periods shall be thoroughly inspected for kit foxes before the pipe is subsequently buried, capped, or otherwise used or

Mitigation Monitoring and Reporting Program

moved in any way. If a kit fox is discovered inside a pipe, that section of pipe shall not be moved until the U.S. Fish and Wildlife Service has been consulted. If necessary, and under the direct supervision of the biologist, the pipe may be moved once to remove it from the path of construction activity, until the fox has escaped.

- d. All food-related trash items such as wrappers, cans, bottles, and food scraps shall be disposed of in closed containers and removed at least once a week from a construction or project site.
- e. No firearms shall be allowed on the project site during construction activities.
- f. To prevent harassment, mortality of kit foxes or destruction of dens by dogs or cats, no pets shall be permitted on site during construction activities.
- g. Use of rodenticides and herbicides on the project site during construction shall be restricted. This is necessary to prevent primary or secondary poisoning of kit foxes and the depletion of prey populations on which they depend. All uses of such compounds shall observe label and other restrictions mandated by the U.S. Environmental Protection Agency, California Department of Food and Agriculture, and other State and Federal legislation, as well as additional project-related restrictions deemed necessary by the U.S. Fish and Wildlife Service. If rodent control must be conducted, zinc phosphide shall be used because of proven lower risk to kit fox.
- h. In the case of trapped animals, escape ramps or structures shall be installed immediately to allow the animal(s) to escape.
- i. Any contractor, employee, or agency personnel who inadvertently kills or injures a San Joaquin kit fox shall immediately report the incident to the City of San Juan Bautista, which will contact the CDFW and USFWS as needed.
- j. The City of San Juan Bautista shall prepare weekly reports on construction monitoring activities for the project file.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure BIO-3 (N)

The following conservation measures from the Biological Opinion for the San Juan Bautista to Hollister Sewer Force Main Project, San Benito County, California (USFWS 2022) shall be implemented prior to initiation of and during any construction activity on the project site to avoid unintended take of individual San Joaquin kit foxes.

1. If San Joaquin kit fox are observed in the work area, activities that may impact the species will cease until the individual(s) has left the work area on its own accord. If the individual(s) does not leave the work area on its own accord the Service will be immediately contacted (within 1 working day).
2. Preconstruction surveys for San Joaquin kit fox will be conducted by a qualified biologist no less than 30 days prior to the beginning of ground disturbance or any project activity that may impact San Joaquin kit fox. The surveys will include all work areas and a minimum 200-foot buffer of the project site. The preconstruction surveys will identify kit fox habitat features on the project site, evaluate use by kit fox and, if possible, assess the potential impacts of the proposed activity. The status of all dens will be determined and mapped.
3. If a natal den is discovered within the project area or within 200 feet of the project boundary, the City will coordinate with the Service to establish an appropriate avoidance buffer. The avoidance buffer will be maintained until such time as the den is no longer active. If the City is not able to maintain the avoidance buffer until the den is no longer active, all project activities will cease until the USDA and the City obtain proper authorization from the Service.
4. Potential and known San Joaquin kit fox dens will be avoided by 100-foot buffers. If it is not possible to avoid potential or known San Joaquin kit fox dens, then measures 5 and 6 below will be followed.
5. If a den cannot be avoided by project activities, the Service will be contacted within 1 working day. Unavoidable potential and known San Joaquin kit fox dens may be excavated under the supervision of a Service-approved biologist in accordance with the following:
 - a. Potential dens with no sign of San Joaquin kit fox presence will be monitored for 3 nights, and may be excavated once it is confirmed that no San Joaquin kit fox is present;
 - b. If San Joaquin kit fox or sign of San Joaquin kit fox is observed at any time during the monitoring or excavation of a potential den, all excavation must stop until proper authorization is obtained from the Service;

- c. Known San Joaquin kit fox dens will be monitored by placing tracking material, or other means of detecting activity (e.g., camera stations), at each den entrance and checking each morning until no San Joaquin kit fox activity is recorded for 3 consecutive days; and
 - d. A qualified biologist will be present during all San Joaquin kit fox den monitoring and excavations.
6. Potential San Joaquin kit fox dens within the recommended buffer may be temporarily blocked after appropriate monitoring and documentation of vacancy, to discourage San Joaquin kit fox from denning during construction or other activities. Once construction activities are completed, blocked dens will be reopened. As with excavation, these measures can only be implemented for known or natal dens with appropriate Service authorization.
7. Project-related vehicles will observe a 15-mile-per-hour speed limit in all project areas; this is particularly important at night when kit foxes are most active. To the extent possible, night-time construction will be minimized.
8. To prevent inadvertent entrapment of kit foxes or other animals during the construction phase of the project, all excavated, steep-walled holes or trenches more than 2-feet deep will be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they will be thoroughly inspected for trapped animals. If at any time a trapped or injured kit fox is discovered, the Service will be contacted immediately.
9. Kit foxes are attracted to den-like structures such as pipes and may enter stored pipe becoming trapped or injured. All construction pipes, culverts, or similar structures with a diameter of 4 inches or greater that are stored at a construction site for one or more overnight periods will be thoroughly inspected for kit foxes before the pipe is subsequently buried, capped, or otherwise used or moved in any way. If a kit fox is discovered inside a pipe, that section of pipe will not be moved until the Service has been contacted.
10. All food-related trash items such as wrappers, cans, bottles, and food scraps will be disposed of in closed containers and removed at least once a week from a construction or project site.
11. No firearms will be allowed on the project site during construction activities.
12. Pets will not be permitted on site during construction activities.

13. Use of rodenticides and herbicides on the project site during construction will be restricted.
14. In the case of trapped animals, escape ramps or structures will be installed immediately to allow the animal(s) to escape.
15. Any contractor, employee, or agency personnel who inadvertently kills or injures a San Joaquin kit fox will immediately report the incident to the City, which will contact the Service and the USDA within 1 working day.
16. The City will prepare weekly reports on construction monitoring activities for the project file.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure BIO-5 (C), BIO-4 (N)

To avoid/minimize impacts to burrowing owls potentially occurring within the project site and staging areas, a biologist qualified in ornithology shall conduct surveys for burrowing owl. The approved biologist shall conduct a two-visit (i.e., morning and evening) presence/absence survey at areas of suitable habitat on and adjacent to the project site boundary no less than 14 days prior to the start of construction or ground disturbance activities. Surveys shall be conducted according to the methods for take avoidance described in the *Burrowing Owl Survey Protocol and Mitigation Guidelines* (California Burrowing Owl Consortium 1993) and the *Staff Report on Burrowing Owl Mitigation* (CDFW 2012). If no burrowing owls are found, a letter report confirming absence will be prepared and submitted to the City of San Juan Bautista and no further mitigation is required.

Because burrowing owls occupy habitat year-round, seasonal no-disturbance buffers, as outlined in the *Burrowing Owl Survey Protocol and Mitigation Guidelines* (CBOC 1993) and the *Staff Report on Burrowing Owl Mitigation* (CDFW 2012), shall be in place around occupied habitat prior to and during any ground disturbance activities. The following table includes buffer areas based on the time of year and level of disturbance (CDFW 2012), unless a qualified biologist approved by the CDFW verifies through non-invasive measures that either: 1) birds have not begun egg laying and incubation; or 2) that juveniles from the occupied burrows are foraging independently and are capable of independent survival.

Mitigation Monitoring and Reporting Program

Location	Time of Year	Level of Disturbance Buffers (meters)		
		Low	Med	High
Nesting Sites	April 1 – Aug 15	200 m	500 m	500 m
Nesting Sites	Aug 16 – Oct 15	200 m	200 m	500 m
Nesting Sites	Oct 16 – Mar 31	50 m	100 m	500 m

If burrowing owl is found and avoidance is not possible, burrow exclusion may be conducted by qualified biologists only during the non-breeding season, before breeding behavior is exhibited and after the burrow is confirmed empty through non-invasive methods, such as surveillance. Occupied burrows shall be replaced with artificial burrows at a ratio of one collapsed burrow to one constructed artificial burrow (1:1). Evicted burrowing owls may attempt to colonize or re-colonize an area that would be impacted, thus ongoing surveillance during project activities shall be conducted at a rate sufficient to detect burrowing owls if they return.

If surveys locate occupied burrows in or near construction areas, consultation with the CDFW shall occur to interpret survey results and develop a project-specific avoidance and minimization approach. Once the absence of burrowing owl has been confirmed, a letter report will be prepared and submitted to the City of San Juan Bautista.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure BIO-6 (C), BIO-6 (N)

Approximately 14 days prior to tree removal or construction activities, a qualified biologist shall conduct a habitat assessment for bats and potential roosting sites in trees to be removed and in trees within 50 feet of the construction easement. These surveys shall include a visual inspection of potential roosting features (bats need not be present) and a search for presence of guano within the project site, construction access routes, and 50 feet around these areas. Cavities, crevices, exfoliating bark, and bark fissures that could provide suitable potential nest or roost habitat for bats shall be surveyed. Assumptions can be made on what species is present due to observed visual characteristics along with habitat use, or the bats can be identified to the species level with the use of a bat echolocation detector such as an “Anabat” unit. Potential roosting features found during the survey shall be flagged or marked.

If no roosting sites or bats are found, a letter report confirming absence shall be prepared and submitted to City of San Juan Bautista and no further mitigation is required.

If bats or roosting sites are found, bats shall not be disturbed without specific notice to and consultation with CDFW.

If bats are found roosting outside of the nursery season (May 1 through October 1), CDFW shall be consulted prior to any eviction or other action. If avoidance or postponement is not feasible, a Bat Eviction Plan will be submitted to CDFW for written approval prior to project implementation. A request to evict bats from a roost includes details for excluding bats from the roost site and monitoring to ensure that all bats have exited the roost prior to the start of activity and are unable to re-enter the roost until activity is completed. Any bat eviction shall be timed to avoid lactation and young-rearing. If bats are found roosting during the nursery season, they shall be monitored to determine if the roost site is a maternal roost. This could occur by either visual inspection of the roost bat pups, if possible, or by monitoring the roost after the adults leave for the night to listen for bat pups. Because bat pups cannot leave the roost until they are mature enough, eviction of a maternal roost cannot occur during the nursery season. Therefore, if a maternal roost is present, a 50-foot buffer zone (or different size if determined in consultation with the CDFW) shall be established around the roosting site within which no construction activities including tree removal or structure disturbance shall occur until after the nursery season.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure BIO-7 (C)

California tiger salamander, California red-legged frog, Coast Range newt, western spadefoot, and western pond turtle have been recorded in close proximity to the proposed project. Impacts to these federally and state listed species are considered potentially significant.

The City of San Juan Bautista shall obtain Incidental Take Permits from the USFWS and CDFW for potential project impacts to California tiger salamander, California red-legged frog, Coast Range newt, western spadefoot, and western pond turtle, and implement all avoidance, minimization, and compensatory mitigation measures required by these permits.

Take permit conditions may include, but not be limited to, the following avoidance and minimization measures identified below before/during construction to minimize the potential for “take” of California tiger salamander, California red-legged frog, Coast Range newt, western spadefoot, and western pond turtle:

- a. At least 15 days prior to ground disturbance, the biologist shall submit the name and credentials of the project biologists who would conduct activities specified in this measure. No project activities shall begin until the biologist has received written approval from the USFWS and CDFW that the biologists are qualified to conduct the work.
- b. The biologists shall have the authority to halt construction work at any time to prevent harm to California tiger salamander, California red-legged frog, Coast Range newt, western spadefoot, and western pond turtle or when any of the permit-specified protection measures have been violated. Work shall recommence only when authorized by the biologists. If work is stopped due to potential harm to protected species, the project biologists shall contact the USFWS and/or CDFW by telephone or email on the same day to communicate the event and coordinate appropriate action.
- c. A biologist shall conduct biological construction monitoring in all work and staging areas with potential to impact California tiger salamander, California red-legged frog, Coast Range newt, western spadefoot, and western pond turtle. Before the start of work each day, a biologist shall check for wildlife under any equipment such as vehicles and stored pipes within active construction zones. A biologist shall also check all excavated steep-walled holes or trenches greater than one foot deep for trapped animals. If California tiger salamander, California red-legged frog, Coast Range newt, western spadefoot, and western pond turtle is observed within an active construction zone, a biologist shall be notified immediately and all work within 100 feet of the individual animal shall be halted and all equipment turned off until the biologist has captured and removed the individual from the work area. California tiger salamander, California red-legged frog, Coast Range newt, western spadefoot, and western pond turtle shall be relocated to a USFWS/CDFW-approved off-site location according to permit specifications.
- d. Offsite habitat mitigation. If necessary, offsite habitat shall be procured at an appropriate ratio of project site impact area to compensation habitat area, as determined in coordination with USFWS and/or CDFW. Offsite mitigation may include purchasing credits at a mitigation bank, or permanent protection of land with established aquatic and upland habitat or sites with known upland habitat where the creation of a pond may enhance the habitat value of the site.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure BIO-5 (N)

California tiger salamander, California red-legged frog, Coast Range newt, western spadefoot, and western pond turtle have been recorded in close proximity to the proposed project. Impacts to these federally and state listed species are considered potentially significant.

Consultation with the USFWS for incidental take authorization has been completed and the City of San Juan Bautista is in the process of obtaining a Section 2081 permit from CDFW. The following conservation measures from the Biological Opinion for the San Juan Bautista to Hollister Sewer Force Main Project, San Benito County, California (USFWS 2022) shall be implemented prior to initiation of and during any construction activity on the project site to avoid unintended take of individual California red-legged frog and California tiger salamander. Once consultation with CDFW for Section 2081 take authorization, these measures may be added to and modified to accommodate conditions from both permits. It is anticipated that measures implemented for the protection of California red-legged frog and California tiger salamander would also provide protection to Coast Range newt, western spadefoot, and western pond turtle, if present at the site

1. Only Service-approved biologists will participate in activities associated with the capture, handling, and monitoring of California red-legged frogs and California tiger salamanders. The project proponent will not begin ground disturbance until they receive written approval from the Service that the biologist is qualified to conduct the work. Biologists approved under this biological opinion do not need to re-submit their qualifications for subsequent project activities conducted pursuant to this biological opinion, unless we have revoked their approval at any time during the life of this biological opinion.
2. All employees and contractors have the authority to halt construction work at any time to prevent harm to the California tiger salamander or California red-legged frog, or when any of the permit-specified protection measures have been violated. Work will re-commence only when authorized by the Service-approved biologist.

3. Before any activities begin on a project, a Service-approved biologist will conduct a training session for all construction personnel. At a minimum, the training will include a description of the California red-legged frog and California tiger salamander and their habitat, the specific measures that are being implemented to conserve the California red-legged frog and California tiger salamander, and the boundaries within which the project will be accomplished. The Service-approved biologist may use brochures, books, and briefings in the training session. The City will document evidence of completion of this training prior to ground disturbing activities.
4. When working in potential aquatic habitat of the species, a Service-approved biologist will conduct aquatic surveys to determine presence or absence, and subsequently capture and relocate California tiger salamanders and California red-legged frogs. When draining aquatic features, such as the SJB WWTP ponds and No Name Creek, a Service-approved biologist must conduct aquatic surveys periodically throughout the features, and prior to complete draining of the features. Prior to working in these habitats, the Service-approved biologist must provide the Service with potential relocation sites in the event larval life stages of California red-legged frogs and California tiger salamanders are found.
5. For work sites that are dewatered by pumping, intakes will be completely screened with mesh not larger than 0.2 inch to prevent California red-legged frogs and California tiger salamanders from entering the pump system. Upon completion of construction activities, any diversions or barriers to flow will be removed in a manner that will allow flow to resume with the least disturbance to the substrate. Alteration of water ways will be minimized to the maximum extent possible and any imported material will be removed from the water ways upon completion of the project.
6. When working in terrestrial habitat of the species, a Service-approved biologist will conduct biological construction monitoring for California tiger salamanders and California red-legged frogs. Before the start of work when working in potential habitat of the species, a biologist will check for wildlife within vegetation, under any equipment such as vehicles and stored pipes within active construction zones. A biologist will also check all excavated steep-walled holes or trenches greater than 1 foot deep for trapped animals. If any life stage of the California tiger salamander or California red-legged frog is observed within an active construction zone, a Service-approved biologist will be notified immediately and all work that may impact the individual will be halted and all equipment turned off until the Service-approved biologist has captured and

removed the individual from the work area. California tiger salamanders and California red-legged frogs will be relocated out of harm's way to a Service-approved off-site location. The Service-approved biologist will provide the proposed relocation site(s) to the Service for their approval prior to the start of project activities.

7. The Service-approved biologist will train biological monitors selected from the construction crew by the construction contractor (typically the project foreman). When working outside of potential habitat of the species, before the start of work each day, the monitor will check for animals under any equipment such as vehicles and stored pipes within active construction zones. The monitor will also check all excavated steep-walled holes or trenches greater than 1 foot deep for trapped animals. If California red-legged frogs or California tiger salamanders are observed within an active construction zone, the Service-approved biologist will be notified immediately and all work within 50 feet of the individual(s) will be halted and all equipment turned off until the individual(s) has left the construction area; or, until the Service-approved biologist has captured and relocated the individual(s).
8. Trenches will be covered or have adequate means of escape (earthen ramps not more than 2:1 slope, wooden boards, etc.).
9. During project activities the project proponent will properly contain all trash that may attract predators by removing it from the work site and disposing of it regularly. Following construction, the project proponent will remove all trash and construction debris from work areas.
10. Prior to the onset of work, the project proponent will ensure that a plan is in place for a prompt and effective response to any accidental spills. All workers will be informed of the importance of preventing spills and of the appropriate measures should a spill occur.
11. The project proponent will conduct all refueling, maintenance, and staging of equipment and vehicles at least 60 feet from aquatic or riparian habitat and not in a location from where a spill would drain directly toward aquatic habitat. The Service-approved biologist or biological monitor will ensure contamination of aquatic or riparian habitat does not occur during such operations by implementing the spill response plan described in measure 10.
12. The project proponent will limit the number of access routes, size of staging areas, and the total area of the activity to the minimum necessary to achieve the project goals. The project proponent will delineate Environmentally Sensitive Areas to

Mitigation Monitoring and Reporting Program

confine access routes and construction areas to the minimum area necessary to complete construction, and minimize the impact to California red-legged frog and California tiger salamander habitat; this goal includes locating access routes and construction areas outside of wetlands and riparian areas to the maximum extent practicable.

13. No work will occur during or 24 hours after any rain event to minimize impacts to dispersing California red-legged frogs and California tiger salamanders. A rain event is considered any precipitation resulting in 0.2 inch or greater of precipitation. A Service-approved biologist will survey the project site immediately before resuming project activities.
14. Work in wetland areas and drainages will be conducted only during the dry season, from April 15 to October 15. If work needs to be completed outside of the dry season timeframe, the Service will be contacted for guidance.
15. The project proponent will conduct project activities no earlier than 30 minutes after sunrise and no later than 30 minutes before sunset each day.
16. To ensure that diseases are not conveyed between work sites by the Service-approved biologist, the fieldwork code of practice developed by the Declining Amphibian Populations Task Force will be followed at all times (DAPTF 1998).
17. Temporarily affected project sites will be re-vegetated with an assemblage of native riparian, wetland, and upland vegetation suitable for the area. Locally collected plant materials would be used to the extent practicable. Invasive, exotic plants will be controlled to the maximum extent practicable. This measure will be implemented in all areas temporarily disturbed by activities associated with the project, unless the Service and the USDA determine that it is not feasible or practical.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure BIO-8 (C), BIO-7 (N)

To avoid impacts to nesting birds during the nesting season (January 15 through September 15), all construction activities should be conducted between September 16 and January 14, which is outside of the bird nesting season. If construction occurs during the bird nesting season, then a qualified biologist will conduct a pre-construction survey for nesting birds to ensure that no nests would be disturbed during project construction.

If project-related work is scheduled during the nesting season (February 15 to August 30 for small bird species such as passerines; January 15 to September 15 for owls; and February 15 to September 15 for other raptors), a qualified biologist shall conduct nesting bird surveys.

- a. Two surveys for active bird nests will occur within 14 days prior to start of construction, with the final survey conducted within 48 hours prior to construction. Appropriate minimum survey radii surrounding each work area are typically 250 feet for passerines, 500 feet for smaller raptors, and 1,000 feet for larger raptors. Surveys will be conducted at the appropriate times of day to observe nesting activities. Locations off the site to which access is not available may be surveyed from within the site or from public areas. If no nesting birds are found, a letter report confirming absence will be prepared and submitted to the City of San Juan Bautista and no further mitigation is required.
- b. If the qualified biologist documents active nests within the project site or in nearby surrounding areas, an appropriate buffer between each nest and active construction shall be established. The buffer shall be clearly marked and maintained until the young have fledged and are foraging independently. Prior to construction, the qualified biologist shall conduct baseline monitoring of each nest to characterize “normal” bird behavior and establish a buffer distance, which allows the birds to exhibit normal behavior. The qualified biologist shall monitor the nesting birds daily during construction activities and increase the buffer if birds show signs of unusual or distressed behavior (e.g., defensive flights and vocalizations, standing up from a brooding position, and/or flying away from the nest). If buffer establishment is not possible, the qualified biologist or construction foreman shall have the authority to cease all construction work in the area until the young have fledged and the nest is no longer active. Once the absence of nesting birds has been confirmed, a letter report will be prepared and submitted to the City of San Juan Bautista.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure BIO-9 (C)

Prior to issuance of a grading permit within the project boundary, the City of San Juan Bautista will retain a qualified biologist to determine the extent of potential wetlands and waterways regulated by the United States Army Corps of Engineers (USACE), Regional Water Quality Control Board (RWQCB), and CDFW. If the USACE claims jurisdiction, the City shall retain a qualified biologist to obtain a Clean Water Act Section 404 Nationwide Permit. If the impacts to the drainage features do not qualify for a Nationwide Permit, the City will proceed with the qualified biologist in obtaining an Individual Permit from the USACE. The City will then retain a qualified biologist to coordinate with the RWQCB to obtain a Clean Water Act Section 401 Water Quality Certification. If necessary, the City will also retain a qualified biologist to coordinate with the CDFW to obtain a Streambed Alteration Agreement.

To compensate for temporary and/or permanent impacts to Waters of the U.S. that would be impacted as a result of the proposed project, mitigation shall be provided as required by the regulatory permits. Mitigation would be provided through one of the following mechanisms:

- i. *A Wetland Mitigation and Monitoring Plan* shall be developed that will outline mitigation and monitoring obligations for temporary impacts to wetlands and other waters as a result of construction activities. The Wetland Mitigation and Monitoring Plan would include thresholds of success, monitoring and reporting requirements, and site-specific plans to compensate for wetland losses resulting from the project. The Wetland Mitigation and Monitoring Plan shall be submitted to the appropriate regulatory agencies for review and approval during the permit application process.
- ii. To compensate for permanent impacts, the purchase and/or dedication of land to provide suitable wetland restoration or creation shall ensure a no net loss of wetland values or functions. If restoration is available and feasible, a minimum 1:1 mitigation to impact ratio would apply to projects for which mitigation is provided in advance.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure BIO-8 (N)

The City of San Juan Bautista conducted an analysis to determine the extent of potential wetlands and waterways regulated by the United States Army Corps of Engineers (USACE), Regional Water Quality Control Board (RWQCB), and CDFW. After review of a Nationwide Permit application, USACE has determined that a permit is not necessary (USACE 2022). Written documentation of this determination is in progress. During the course of project design and construction, if it is determined that the project will adversely affect a wetland, as defined by the Food Security Act of 1985, no federal funds can be used for the wetland conversion in accordance with Section 363 of the Consolidated Farm and Rural Development Act (CONACT).

The City is in the process of coordinating with the RWQCB to obtain a Clean Water Act Section 401 Water Quality Certification and with the CDFW to obtain a Streambed Alteration Agreement. Underground facilities (Linear Underground Projects) including any conveyance or pipeline affecting more than one acre are subject to the NPDES General Construction Permit (Order 2009-0009-DWQ). Under the Construction General Permit, the Contractor will be required to develop and implement a Stormwater Pollution Prevention Plan (SWPPP) that contains Best Management Practices (BMPs) to control sediment and other construction-related pollutants in storm water discharges from the construction site. The City of San Juan Bautista shall adhere to the BMPs outlined in the SWPPP. Modifications and additions to these measures may be required to comply with permit conditions in the Water Quality Certification and Streambed Alteration Agreement, currently in progress.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure BIO-10 (C)

An arborist evaluation of all trees and project plans will be conducted prior to construction; implementation of specific protections for preserved trees during construction will be followed; and replacement plantings for damaged or removed trees will be installed. Compliance with this mitigation measure will ensure that impacts to protected trees are avoided, minimized, or mitigated.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure CUL-3 (C), CUL-3 (N)

Pursuant to a request made by the Amah Mutsan Tribal Band of the Mission San Juan Bautista during tribal consultation, the construction crew shall receive cultural resource training prior to initiation of grading activities.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure GHG-1 (C)

To reduce construction GHG emissions, the City will include the following language on all construction documents requiring all contractors to implement the following construction best management practices where feasible:

- a. Diesel-powered, off-road construction equipment shall meet Tier 4 emissions standards, or in the alternative, Tier 2 or 3 engines may be used provided they include particular matter emissions control;
- b. Use alternative fuel equipment;
- c. Minimize construction equipment idling time to no more than five minutes;

- d. Use grid electric power to reduce the use of fuel-powered construction equipment;
- e. Power portable equipment with electricity or batteries; and
- f. Implement waste, disposal, and recycling strategies in accordance with Sections 4.408 and 5.408 of the 2016 California Green Building Standards Code (CALGreen Code).

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure N-1 (C), N-1 (N)

During all project construction activities, the following mitigation measures will be incorporated into construction documents and shall be implemented by the contractors:

- a. All construction equipment shall be properly maintained and equipped with intake and exhaust mufflers that are in good condition and recommended by the vehicle manufacturer.
- b. Unnecessary idling of internal combustion engines shall be strictly prohibited.
- c. Wheeled earth moving equipment shall be used rather than track equipment.
- d. A detailed construction plan shall be prepared and submitted with the grading and improvement plans identifying the schedule for major noise-generating construction activities. The construction plan shall identify a procedure for coordination with adjacent residential land uses so that construction activities can be scheduled to minimize noise disturbance.
- e. A noise disturbance coordinator shall be designated to handle complaints and the site shall be posted with a phone number and email address so that the nearby residents have a contact person in case of a noise problem.
- f. Vehicle routes clean and smooth both on site and off site to minimize noise and vibration from vehicles rolling over rough surfaces.
- g. Nail guns shall be used where possible as they are less noisy than manual hammering.

Mitigation Monitoring and Reporting Program

- h. Stationary equipment, such as compressor and generators shall be housed in acoustical enclosures and placed as far from sensitive receptors as feasible.
- i. Utilize “quiet” air compressors and other stationary noise sources where technology exists.
- j. Control noise from construction workers’ radios to a point where they are not audible at existing residences bordering the project site.
- k. Restrict noise-generating activities at the construction site or in areas adjacent to the construction site to the hours of 7:00 AM to 7:00 PM Monday through Friday and 8:00 AM and 6:00 PM on Saturday. Construction-related noise-generating activities shall be prohibited on Sundays.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

During Construction

The following mitigation measures will be implemented:

Mitigation Measure AQ-1 (C), AQ-1 (N)

The City of San Juan Bautista will prepare a Construction Management Plan and implement it during construction activities. The plan will include the following restrictions:

- a. Heavy-duty diesel vehicles will have 2010 or newer model year engines, in compliance with the California Air Resources Board's Truck and Bus Regulation, and will not be staged within 500 feet of occupied residences; and
- b. Idling of construction equipment and heavy-duty diesel trucks will be avoided where feasible, and if idling is necessary, it will not exceed five minutes.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure AQ-2 (C), AQ-2 (N)

All construction equipment will be maintained and properly tuned in accordance with manufacturer's specifications and will be checked by a certified visible emissions evaluator. All non-road diesel construction equipment will, at a minimum, meet Tier 3 emission standards listed in the Code of Federal Regulations Title 40, Part 89, Subpart B, §89.112. Further, where feasible, construction equipment will use alternative fuels such as compressed natural gas, propane, electricity or biodiesel.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure BIO-4 (C)

The *U.S. Fish and Wildlife Service Standardized Recommendations for Protection of the San Joaquin Kit Fox Prior to or During Ground Disturbance* (USFWS 2011) shall be implemented prior to initiation of and during any construction activity on the project site to avoid unintended take of individual San Joaquin kit foxes.

Preconstruction/pre-activity surveys for San Joaquin kit fox shall be conducted by a qualified biologist no less than 30 days prior to the beginning of ground disturbance and/or construction activities or any project activity that may impact San Joaquin kit fox. The surveys shall include all work and staging areas and a minimum 200-foot buffer of the project site. The preconstruction surveys shall identify kit fox habitat features on the project site, evaluate use by kit fox and, if possible, assess the potential impacts of the proposed activity. The status of all dens shall be determined and mapped.

If a natal/pupping den is discovered within the project area or within 200 feet of the project boundary, the City shall consult with the California Department of Fish and Wildlife and U.S. Fish and Wildlife Service to establish an appropriate avoidance buffer. The avoidance buffer shall be maintained until such time as the burrow is no longer active and/or an incidental take permit is determined to be required and is obtained.

In addition, the following measures shall be observed:

- a. Project-related vehicles shall observe a 20-mph speed limit in all project areas; this is particularly important at night when kit foxes are most active. To the extent possible, night-time construction shall be minimized. Off-road traffic outside of designated project area shall be prohibited.
- b. To prevent inadvertent entrapment of kit foxes or other animals during the construction phase of the project, all excavated, steep-walled holes or trenches more than two feet deep shall be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they shall be thoroughly inspected for trapped animals. If at any time a trapped or injured kit fox is discovered, the procedures under number 11 of the Construction and Operational Requirements in the Standardized Recommendations must be followed.
- c. Kit foxes are attracted to den-like structures such as pipes and may enter stored pipe becoming trapped or injured. All construction pipes, culverts, or similar structures with a diameter of four inches or greater that are stored at a construction site for one or more overnight periods shall be thoroughly inspected for kit foxes before the pipe is subsequently buried, capped, or otherwise used or

moved in any way. If a kit fox is discovered inside a pipe, that section of pipe shall not be moved until the U.S. Fish and Wildlife Service has been consulted. If necessary, and under the direct supervision of the biologist, the pipe may be moved once to remove it from the path of construction activity, until the fox has escaped.

- d. All food-related trash items such as wrappers, cans, bottles, and food scraps shall be disposed of in closed containers and removed at least once a week from a construction or project site.
- e. No firearms shall be allowed on the project site during construction activities.
- f. To prevent harassment, mortality of kit foxes or destruction of dens by dogs or cats, no pets shall be permitted on site during construction activities.
- g. Use of rodenticides and herbicides on the project site during construction shall be restricted. This is necessary to prevent primary or secondary poisoning of kit foxes and the depletion of prey populations on which they depend. All uses of such compounds shall observe label and other restrictions mandated by the U.S. Environmental Protection Agency, California Department of Food and Agriculture, and other State and Federal legislation, as well as additional project-related restrictions deemed necessary by the U.S. Fish and Wildlife Service. If rodent control must be conducted, zinc phosphide shall be used because of proven lower risk to kit fox.
- h. In the case of trapped animals, escape ramps or structures shall be installed immediately to allow the animal(s) to escape.
- i. Any contractor, employee, or agency personnel who inadvertently kills or injures a San Joaquin kit fox shall immediately report the incident to the City of San Juan Bautista, which will contact the CDFW and USFWS as needed.
- j. The City of San Juan Bautista shall prepare weekly reports on construction monitoring activities for the project file.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure BIO-3 (N)

The following conservation measures from the Biological Opinion for the San Juan Bautista to Hollister Sewer Force Main Project, San Benito County, California (USFWS 2022) shall be implemented prior to initiation of and during any construction activity on the project site to avoid unintended take of individual San Joaquin kit foxes.

1. If San Joaquin kit fox are observed in the work area, activities that may impact the species will cease until the individual(s) has left the work area on its own accord. If the individual(s) does not leave the work area on its own accord the Service will be immediately contacted (within 1 working day).
2. Preconstruction surveys for San Joaquin kit fox will be conducted by a qualified biologist no less than 30 days prior to the beginning of ground disturbance or any project activity that may impact San Joaquin kit fox. The surveys will include all work areas and a minimum 200-foot buffer of the project site. The preconstruction surveys will identify kit fox habitat features on the project site, evaluate use by kit fox and, if possible, assess the potential impacts of the proposed activity. The status of all dens will be determined and mapped.
3. If a natal den is discovered within the project area or within 200 feet of the project boundary, the City will coordinate with the Service to establish an appropriate avoidance buffer. The avoidance buffer will be maintained until such time as the den is no longer active. If the City is not able to maintain the avoidance buffer until the den is no longer active, all project activities will cease until the USDA and the City obtain proper authorization from the Service.
4. Potential and known San Joaquin kit fox dens will be avoided by 100-foot buffers. If it is not possible to avoid potential or known San Joaquin kit fox dens, then measures 5 and 6 below will be followed.
5. If a den cannot be avoided by project activities, the Service will be contacted within 1 working day. Unavoidable potential and known San Joaquin kit fox dens may be excavated under the supervision of a Service-approved biologist in accordance with the following:
 - a. Potential dens with no sign of San Joaquin kit fox presence will be monitored for 3 nights, and may be excavated once it is confirmed that no San Joaquin kit fox is present;
 - b. If San Joaquin kit fox or sign of San Joaquin kit fox is observed at any time during the monitoring or excavation of a potential den, all excavation must stop until proper authorization is obtained from the Service;

- c. Known San Joaquin kit fox dens will be monitored by placing tracking material, or other means of detecting activity (e.g., camera stations), at each den entrance and checking each morning until no San Joaquin kit fox activity is recorded for 3 consecutive days; and
 - d. A qualified biologist will be present during all San Joaquin kit fox den monitoring and excavations.
6. Potential San Joaquin kit fox dens within the recommended buffer may be temporarily blocked after appropriate monitoring and documentation of vacancy, to discourage San Joaquin kit fox from denning during construction or other activities. Once construction activities are completed, blocked dens will be reopened. As with excavation, these measures can only be implemented for known or natal dens with appropriate Service authorization.
7. Project-related vehicles will observe a 15-mile-per-hour speed limit in all project areas; this is particularly important at night when kit foxes are most active. To the extent possible, night-time construction will be minimized.
8. To prevent inadvertent entrapment of kit foxes or other animals during the construction phase of the project, all excavated, steep-walled holes or trenches more than 2-feet deep will be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they will be thoroughly inspected for trapped animals. If at any time a trapped or injured kit fox is discovered, the Service will be contacted immediately.
9. Kit foxes are attracted to den-like structures such as pipes and may enter stored pipe becoming trapped or injured. All construction pipes, culverts, or similar structures with a diameter of 4 inches or greater that are stored at a construction site for one or more overnight periods will be thoroughly inspected for kit foxes before the pipe is subsequently buried, capped, or otherwise used or moved in any way. If a kit fox is discovered inside a pipe, that section of pipe will not be moved until the Service has been contacted.
10. All food-related trash items such as wrappers, cans, bottles, and food scraps will be disposed of in closed containers and removed at least once a week from a construction or project site.
11. No firearms will be allowed on the project site during construction activities.
12. Pets will not be permitted on site during construction activities.

Mitigation Monitoring and Reporting Program

13. Use of rodenticides and herbicides on the project site during construction will be restricted.
14. In the case of trapped animals, escape ramps or structures will be installed immediately to allow the animal(s) to escape.
15. Any contractor, employee, or agency personnel who inadvertently kills or injures a San Joaquin kit fox will immediately report the incident to the City, which will contact the Service and the USDA within 1 working day.
16. The City will prepare weekly reports on construction monitoring activities for the project file.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure BIO-7 (C)

California tiger salamander, California red-legged frog, Coast Range newt, western spadefoot, and western pond turtle have been recorded in close proximity to the proposed project. Impacts to these federally and state listed species are considered potentially significant.

The City of San Juan Bautista shall obtain Incidental Take Permits from the USFWS and CDFW for potential project impacts to California tiger salamander, California red-legged frog, Coast Range newt, western spadefoot, and western pond turtle, and implement all avoidance, minimization, and compensatory mitigation measures required by these permits.

Take permit conditions may include, but not be limited to, the following avoidance and minimization measures identified below before/during construction to minimize the potential for “take” of California tiger salamander, California red-legged frog, Coast Range newt, western spadefoot, and western pond turtle:

- a. At least 15 days prior to ground disturbance, the biologist shall submit the name and credentials of the project biologists who would conduct activities specified in this measure. No project activities shall begin until the biologist has received written approval from the USFWS and CDFW that the biologists are qualified to conduct the work.

- b. The biologists shall have the authority to halt construction work at any time to prevent harm to California tiger salamander, California red-legged frog, Coast Range newt, western spadefoot, and western pond turtle or when any of the permit-specified protection measures have been violated. Work shall recommence only when authorized by the biologists. If work is stopped due to potential harm to protected species, the project biologists shall contact the USFWS and/or CDFW by telephone or email on the same day to communicate the event and coordinate appropriate action.

- c. A biologist shall conduct biological construction monitoring in all work and staging areas with potential to impact California tiger salamander, California red-legged frog, Coast Range newt, western spadefoot, and western pond turtle. Before the start of work each day, a biologist shall check for wildlife under any equipment such as vehicles and stored pipes within active construction zones. A biologist shall also check all excavated steep-walled holes or trenches greater than one foot deep for trapped animals. If California tiger salamander, California red-legged frog, Coast Range newt, western spadefoot, and western pond turtle is observed within an active construction zone, a biologist shall be notified immediately and all work within 100 feet of the individual animal shall be halted and all equipment turned off until the biologist has captured and removed the individual from the work area. California tiger salamander, California red-legged frog, Coast Range newt, western spadefoot, and western pond turtle shall be relocated to a USFWS/CDFW-approved off-site location according to permit specifications.

- d. Offsite habitat mitigation. If necessary, offsite habitat shall be procured at an appropriate ratio of project site impact area to compensation habitat area, as determined in coordination with USFWS and/or CDFW. Offsite mitigation may include purchasing credits at a mitigation bank, or permanent protection of land with established aquatic and upland habitat or sites with known upland habitat where the creation of a pond may enhance the habitat value of the site.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure BIO-5 (N)

California tiger salamander, California red-legged frog, Coast Range newt, western spadefoot, and western pond turtle have been recorded in close proximity to the proposed project. Impacts to these federally and state listed species are considered potentially significant.

Consultation with the USFWS for incidental take authorization has been completed and the City of San Juan Bautista is in the process of obtaining a Section 2081 permit from CDFW. The following conservation measures from the Biological Opinion for the San Juan Bautista to Hollister Sewer Force Main Project, San Benito County, California (USFWS 2022) shall be implemented prior to initiation of and during any construction activity on the project site to avoid unintended take of individual California red-legged frog and California tiger salamander. Once consultation with CDFW for Section 2081 take authorization, these measures may be added to and modified to accommodate conditions from both permits. It is anticipated that measures implemented for the protection of California red-legged frog and California tiger salamander would also provide protection to Coast Range newt, western spadefoot, and western pond turtle, if present at the site

1. Only Service-approved biologists will participate in activities associated with the capture, handling, and monitoring of California red-legged frogs and California tiger salamanders. The project proponent will not begin ground disturbance until they receive written approval from the Service that the biologist is qualified to conduct the work. Biologists approved under this biological opinion do not need to re-submit their qualifications for subsequent project activities conducted pursuant to this biological opinion, unless we have revoked their approval at any time during the life of this biological opinion.
2. All employees and contractors have the authority to halt construction work at any time to prevent harm to the California tiger salamander or California red-legged frog, or when any of the permit-specified protection measures have been violated. Work will re-commence only when authorized by the Service-approved biologist.
3. Before any activities begin on a project, a Service-approved biologist will conduct a training session for all construction personnel. At a minimum, the training will include a description of the California red-legged frog and California tiger salamander and their habitat, the specific measures that are being implemented to conserve the California red-legged frog and California tiger salamander, and the boundaries within which the project will be accomplished. The Service-approved biologist may use brochures, books, and briefings in the training session. The City will document evidence of completion of this training prior to ground disturbing activities.

4. When working in potential aquatic habitat of the species, a Service-approved biologist will conduct aquatic surveys to determine presence or absence, and subsequently capture and relocate California tiger salamanders and California red-legged frogs. When draining aquatic features, such as the SJB WWTP ponds and No Name Creek, a Service-approved biologist must conduct aquatic surveys periodically throughout the features, and prior to complete draining of the features. Prior to working in these habitats, the Service-approved biologist must provide the Service with potential relocation sites in the event larval life stages of California red-legged frogs and California tiger salamanders are found.
5. For work sites that are dewatered by pumping, intakes will be completely screened with mesh not larger than 0.2 inch to prevent California red-legged frogs and California tiger salamanders from entering the pump system. Upon completion of construction activities, any diversions or barriers to flow will be removed in a manner that will allow flow to resume with the least disturbance to the substrate. Alteration of water ways will be minimized to the maximum extent possible and any imported material will be removed from the water ways upon completion of the project.
6. When working in terrestrial habitat of the species, a Service-approved biologist will conduct biological construction monitoring for California tiger salamanders and California red-legged frogs. Before the start of work when working in potential habitat of the species, a biologist will check for wildlife within vegetation, under any equipment such as vehicles and stored pipes within active construction zones. A biologist will also check all excavated steep-walled holes or trenches greater than 1 foot deep for trapped animals. If any life stage of the California tiger salamander or California red-legged frog is observed within an active construction zone, a Service-approved biologist will be notified immediately and all work that may impact the individual will be halted and all equipment turned off until the Service-approved biologist has captured and removed the individual from the work area. California tiger salamanders and California red-legged frogs will be relocated out of harm's way to a Service-approved off-site location. The Service-approved biologist will provide the proposed relocation site(s) to the Service for their approval prior to the start of project activities.
7. The Service-approved biologist will train biological monitors selected from the construction crew by the construction contractor (typically the project foreman). When working outside of potential habitat of the species, before the start of work each day, the monitor will check for animals under any equipment such as vehicles and stored pipes within active construction zones. The monitor will also

check all excavated steep-walled holes or trenches greater than 1 foot deep for trapped animals. If California red-legged frogs or California tiger salamanders are observed within an active construction zone, the Service-approved biologist will be notified immediately and all work within 50 feet of the individual(s) will be halted and all equipment turned off until the individual(s) has left the construction area; or, until the Service-approved biologist has captured and relocated the individual(s).

8. Trenches will be covered or have adequate means of escape (earthen ramps not more than 2:1 slope, wooden boards, etc.).
9. During project activities the project proponent will properly contain all trash that may attract predators by removing it from the work site and disposing of it regularly. Following construction, the project proponent will remove all trash and construction debris from work areas.
10. Prior to the onset of work, the project proponent will ensure that a plan is in place for a prompt and effective response to any accidental spills. All workers will be informed of the importance of preventing spills and of the appropriate measures should a spill occur.
11. The project proponent will conduct all refueling, maintenance, and staging of equipment and vehicles at least 60 feet from aquatic or riparian habitat and not in a location from where a spill would drain directly toward aquatic habitat. The Service-approved biologist or biological monitor will ensure contamination of aquatic or riparian habitat does not occur during such operations by implementing the spill response plan described in measure 10.
12. The project proponent will limit the number of access routes, size of staging areas, and the total area of the activity to the minimum necessary to achieve the project goals. The project proponent will delineate Environmentally Sensitive Areas to confine access routes and construction areas to the minimum area necessary to complete construction, and minimize the impact to California red-legged frog and California tiger salamander habitat; this goal includes locating access routes and construction areas outside of wetlands and riparian areas to the maximum extent practicable.
13. No work will occur during or 24 hours after any rain event to minimize impacts to dispersing California red-legged frogs and California tiger salamanders. A rain event is considered any precipitation resulting in 0.2 inch or greater of precipitation. A Service-approved biologist will survey the project site immediately before resuming project activities.

- 14. Work in wetland areas and drainages will be conducted only during the dry season, from April 15 to October 15. If work needs to be completed outside of the dry season timeframe, the Service will be contacted for guidance.
- 15. The project proponent will conduct project activities no earlier than 30 minutes after sunrise and no later than 30 minutes before sunset each day.
- 16. To ensure that diseases are not conveyed between work sites by the Service-approved biologist, the fieldwork code of practice developed by the Declining Amphibian Populations Task Force will be followed at all times (DAPTF 1998).
- 17. Temporarily affected project sites will be re-vegetated with an assemblage of native riparian, wetland, and upland vegetation suitable for the area. Locally collected plant materials would be used to the extent practicable. Invasive, exotic plants will be controlled to the maximum extent practicable. This measure will be implemented in all areas temporarily disturbed by activities associated with the project, unless the Service and the USDA determine that it is not feasible or practical.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure BIO-10 (C)

An arborist evaluation of all trees and project plans will be conducted prior to construction; implementation of specific protections for preserved trees during construction will be followed; and replacement plantings for damaged or removed trees will be installed. Compliance with this mitigation measure will ensure that impacts to protected trees are avoided, minimized, or mitigated.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure CUL-1 (C), CUL-1 (N)

In the event that prehistoric traces (human remains, artifacts, concentrations of shell/bone/rock/ash) are encountered during excavation and/or grading of the site, all activity within a 50-foot radius of the find will be stopped, the San Juan Bautista Director of Community Development will be notified, and a qualified archaeologist will examine the find and make appropriate recommendations prior to commencement of construction. Recommendations could include collection, recordation, and analysis of any significant cultural materials. A report of findings documenting any data recovery during monitoring would be submitted to the Director of Community Development.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure CUL-2 (C), CUL-2 (N)

In the event that human remains are discovered during excavation and/or grading of the site, all activity within a 50-foot radius of the find will be stopped. The San Benito County Coroner will be notified and will make a determination as to whether the remains are of Native American origin. If the remains are determined to be Native American, the Coroner will notify the Native American Heritage Commission (NAHC) immediately. Once NAHC identifies the most likely descendants, the descendants will make recommendations regarding proper burial, which will be implemented in accordance with Section 15064.5(e) of the CEQA Guidelines.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure CUL-4 (C), CUL-4 (N)

If during project implementation it is determined that the undertaking will affect a previously unidentified property that may be eligible for inclusion in the National Register or will affect a known historic property, USDA will be notified, and the Owner will take all reasonable measures to avoid or minimize harm to the property until USDA concludes consultation with the State Historic Preservation Officer.

Party Responsible for Implementation: Owner

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure GEO-1 (C)

If paleontological resources (i.e., fossil remains) are discovered during excavation activities, the contractor will notify the City and cease excavation within 100 feet of the find until a qualified paleontological professional can provide an evaluation of the site. The qualified paleontological professional will evaluate the significance of the find and recommend appropriate measures for the disposition of the site (e.g., fossil recovery, curation, data recovery, and/or monitoring). Construction activities may continue on other parts of the construction site while evaluation and treatment of the paleontological resource takes place.

Mitigation Measure GHG-1 (C)

To reduce construction GHG emissions, the City will include the following language on all construction documents requiring all contractors to implement the following construction best management practices where feasible:

- a. Diesel-powered, off-road construction equipment shall meet Tier 4 emissions standards, or in the alternative, Tier 2 or 3 engines may be used provided they include particular matter emissions control;
- b. Use alternative fuel equipment;
- c. Minimize construction equipment idling time to no more than five minutes;
- d. Use grid electric power to reduce the use of fuel-powered construction equipment;
- e. Power portable equipment with electricity or batteries; and

Mitigation Monitoring and Reporting Program

- f. Implement waste, disposal, and recycling strategies in accordance with Sections 4.408 and 5.408 of the 2016 California Green Building Standards Code (CALGreen Code).

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

Mitigation Measure N-1 (C), N-1 (N)

During all project construction activities, the following mitigation measures will be incorporated into construction documents and shall be implemented by the contractors:

- a. All construction equipment shall be properly maintained and equipped with intake and exhaust mufflers that are in good condition and recommended by the vehicle manufacturer.
- b. Unnecessary idling of internal combustion engines shall be strictly prohibited.
- c. Wheeled earth moving equipment shall be used rather than track equipment.
- d. A detailed construction plan shall be prepared and submitted with the grading and improvement plans identifying the schedule for major noise-generating construction activities. The construction plan shall identify a procedure for coordination with adjacent residential land uses so that construction activities can be scheduled to minimize noise disturbance.
- e. A noise disturbance coordinator shall be designated to handle complaints and the site shall be posted with a phone number and email address so that the nearby residents have a contact person in case of a noise problem.
- f. Vehicle routes clean and smooth both on site and off site to minimize noise and vibration from vehicles rolling over rough surfaces.
- g. Nail guns shall be used where possible as they are less noisy than manual hammering.
- h. Stationary equipment, such as compressor and generators shall be housed in acoustical enclosures and placed as far from sensitive receptors as feasible.

- i. Utilize “quiet” air compressors and other stationary noise sources where technology exists.
- j. Control noise from construction workers’ radios to a point where they are not audible at existing residences bordering the project site.
- k. Restrict noise-generating activities at the construction site or in areas adjacent to the construction site to the hours of 7:00 AM to 7:00 PM Monday through Friday and 8:00 AM and 6:00 PM on Saturday. Construction-related noise-generating activities shall be prohibited on Sundays.

Party Responsible for Implementation: City of San Juan Bautista

Party Responsible for Monitoring: City of San Juan Bautista

Monitoring Notes: _____

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APPENDIX C

Biological Opinion for the San Juan
Bautista to Hollister Sewer Force Main
Project, San Benito County, California
(USFWS 2022)



United States Department of the Interior

U.S. FISH AND WILDLIFE SERVICE

Ecological Services
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003



IN REPLY REFER TO:
08EVEN00-2022-0031493-S7

August 23, 2022

Esther De La Cruz
Area Specialist, Rural Development
U.S. Department of Agriculture
744-A La Guardia Street
Salinas, California 93905

Subject: Biological Opinion for the San Juan Bautista to Hollister Sewer Force Main Project, San Benito County, California

Dear Esther De La Cruz:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of U.S. Department of Agriculture's (USDA) proposed funding to the City of San Juan Bautista (City) for the San Juan Bautista to Hollister Sewer Force Main Project and its effects on the federally threatened California red-legged frog (*Rana draytonii*) and California tiger salamander (*Ambystoma californiense*), in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 et seq.). We received your May 18, 2022, request for formal consultation on the same date.

We have based this biological opinion on information that accompanied your May 18, 2022, request for consultation; electronic mail correspondence among USDA, Service, and City staff; the biological assessment (EMC 2022a); and information in our files.

Not Likely to Adversely Affect Determination

The USDA's request for consultation also included the determination that the proposed action may affect but is not likely to adversely affect the federally endangered San Joaquin kit fox (*Vulpes macrotis mutica*).

Conservation Measures:

1. If San Joaquin kit fox are observed in the work area, activities that may impact the species will cease until the individual(s) has left the work area on its own accord. If the individual(s) does not leave the work area on its own accord the Service will be immediately contacted (within 1 working day).

2. Preconstruction surveys for San Joaquin kit fox will be conducted by a qualified biologist no less than 30 days prior to the beginning of ground disturbance or any project activity that may impact San Joaquin kit fox. The surveys will include all work areas and a minimum 200-foot buffer of the project site. The preconstruction surveys will identify kit fox habitat features on the project site, evaluate use by kit fox and, if possible, assess the potential impacts of the proposed activity. The status of all dens will be determined and mapped.
3. If a natal den is discovered within the project area or within 200 feet of the project boundary, the City will coordinate with the Service to establish an appropriate avoidance buffer. The avoidance buffer will be maintained until such time as the den is no longer active. If the City is not able to maintain the avoidance buffer until the den is no longer active, all project activities will cease until the USDA and the City obtain proper authorization from the Service.
4. Potential and known San Joaquin kit fox dens will be avoided by 100-foot buffers. If it is not possible to avoid potential or known San Joaquin kit fox dens, then measures 5 and 6 below will be followed.
5. If a den cannot be avoided by project activities, the Service will be contacted within 1 working day. Unavoidable potential and known San Joaquin kit fox dens may be excavated under the supervision of a Service-approved biologist in accordance with the following:
 - a. Potential dens with no sign of San Joaquin kit fox presence will be monitored for 3 nights, and may be excavated once it is confirmed that no San Joaquin kit fox is present;
 - b. If San Joaquin kit fox or sign of San Joaquin kit fox is observed at any time during the monitoring or excavation of a potential den, all excavation must stop until proper authorization is obtained from the Service;
 - c. Known San Joaquin kit fox dens will be monitored by placing tracking material, or other means of detecting activity (e.g., camera stations), at each den entrance and checking each morning until no San Joaquin kit fox activity is recorded for 3 consecutive days; and
 - d. A qualified biologist will be present during all San Joaquin kit fox den monitoring and excavations.
6. Potential San Joaquin kit fox dens within the recommended buffer may be temporarily blocked after appropriate monitoring and documentation of vacancy, to discourage San Joaquin kit fox from denning during construction or other activities. Once construction

activities are completed, blocked dens will be reopened. As with excavation, these measures can only be implemented for known or natal dens with appropriate Service authorization.

7. Project-related vehicles will observe a 15-mile-per-hour speed limit in all project areas; this is particularly important at night when kit foxes are most active. To the extent possible, night-time construction will be minimized.
8. To prevent inadvertent entrapment of kit foxes or other animals during the construction phase of the project, all excavated, steep-walled holes or trenches more than 2-feet deep will be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they will be thoroughly inspected for trapped animals. If at any time a trapped or injured kit fox is discovered, the Service will be contacted immediately.
9. Kit foxes are attracted to den-like structures such as pipes and may enter stored pipe becoming trapped or injured. All construction pipes, culverts, or similar structures with a diameter of 4 inches or greater that are stored at a construction site for one or more overnight periods will be thoroughly inspected for kit foxes before the pipe is subsequently buried, capped, or otherwise used or moved in any way. If a kit fox is discovered inside a pipe, that section of pipe will not be moved until the Service has been contacted.
10. All food-related trash items such as wrappers, cans, bottles, and food scraps will be disposed of in closed containers and removed at least once a week from a construction or project site.
11. No firearms will be allowed on the project site during construction activities.
12. Pets will not be permitted on site during construction activities.
13. Use of rodenticides and herbicides on the project site during construction will be restricted.
14. In the case of trapped animals, escape ramps or structures will be installed immediately to allow the animal(s) to escape.
15. Any contractor, employee, or agency personnel who inadvertently kills or injures a San Joaquin kit fox will immediately report the incident to the City, which will contact the Service and the USDA within 1 working day.
16. The City will prepare weekly reports on construction monitoring activities for the project file.

The California Natural Diversity Database (CNDDDB) contains seven historical observations that were recorded within 10.0 miles of the project site (EMC 2022a). The nearest and most recent observation of this species was documented in 1992, approximately 0.18 mile southeast of the Hollister Wastewater Treatment Plant (WWTP). The remainder of the observations were recorded in the 1970s, approximately 5 miles east of the project site. Biologists conducted two surveys in 2021 and found no evidence of San Joaquin kit fox presence within the action area (EMC 2022a). The foothill grassland habitat east of the Hollister WWTP is potential dispersal habitat for San Joaquin kit fox. Habitat within and around the action area is low quality due to extensive agriculture, infrastructure, and residential development, and it is likely that only dispersing individuals would move through habitat within and around the project area. San Joaquin kit foxes disperse an average of 4.8 miles, although they have been documented making long distance dispersals of between 25 to 50 miles. Therefore, although unlikely, occasional dispersants from San Joaquin Valley populations may occur in the vicinity of the action area.

After reviewing the information provided, we concur with your determination that the proposed action may affect, but is not likely to adversely affect the San Joaquin kit fox. Our concurrence is based on the following:

1. There is a low likelihood for San Joaquin kit fox to be present in the project area.
2. Habitat within the project area is of low quality.
3. The City will implement several conservation measures that are intended to ensure impacts to the species are avoided.

Our concurrence with the determination that the proposed action may affect but is not likely to adversely affect the San Joaquin kit fox is contingent on the measures outlined above being implemented by the USDA and the City. If the USDA or the City fails to implement these measures, we will consider our concurrence invalid. If the proposed action changes in any manner or if new information reveals the presence of listed species in the project area, you should contact our office immediately and suspend all project activities until the appropriate compliance with the Act is completed.

Consultation History

On July 6, 2022, Service staff met with City staff and project consultants onsite to discuss project activities. Service staff provided recommendations regarding information needs.

On July 18, 2022, the USDA requested emergency consultation in order to meet the Environmental Protection Agency's deadline for compliance with its Administrative Order on Consent concerning the City of San Juan Bautista's wastewater treatment plant being out of compliance with its National Pollutant Discharge Elimination System permit. On August 9, 2022, the Ventura Fish and Wildlife Office issued a response stating that the proposed action did not meet the emergency definition, which is defined as "a situation involving an act of God,

disasters, casualties, national defense or security emergencies, etc., and includes response activities that must be taken to prevent imminent loss of human life or property” (50 CFR 402.05(a)).

On August 9, 2022, we initiated formal consultation upon the receipt of additional project information and the City’s agreement concerning the implementation of conservation measures.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The USDA proposes to fund the City’s decommissioning and repurposing of a wastewater treatment system and the installation of a new 10-inch diameter high-density polyethylene sewer force main that would divert the City’s wastewater to the Hollister WWTP influent pump station, where it would be processed. The project would involve decommissioning the City’s two wastewater ponds, eliminating the flow of 160,000 gallons of water per day into No Name Creek, and the installation of the sewer force main.

The City would decommission the San Juan Bautista Wastewater Treatment Plant (SJB WWTP) and operate the two existing ponds as emergency storage when needed. Upon completion of the project, the two ponds would be drained as they would no longer be configured to hold wastewater. The current discharge of approximately 160,000 gallons per day from the ponds to No Name Creek would be eliminated.

The sewer force main installation would involve installing the new 10-inch force main inside an existing, unused 18-inch gravity sewer for 0.43 mile north until it reaches the northwest end of Caetano Place. The 6.97-mile sewer main route would cross two stream drainages, No Name Creek along First Street, and a drainage intersecting Prescott Road near the True Leaf Farms agricultural processing facility. Where the route crosses water features, the City would utilize pipe bridges. Drainage crossing construction would take place only during the dry season, from April 15 to October 15. The area of impact for the force main installation would include a trench width up to 3-feet wide and would be 7 to 8 feet deep along most of the route, and up to 15-feet deep where it will be placed within the existing 18-inch sewer line. The force main route would primarily be installed within roads, road shoulders, and rights-of-way.

The City anticipates that eight construction staging areas would be located throughout the project site, within the public rights-of-way or on agricultural fields. Project construction is anticipated to take place between October 2022 to December 2025.

Conservation Measures

The USDA and the City propose to implement the following measures to minimize effects to California red-legged frogs and California tiger salamanders:

1. Only Service-approved biologists will participate in activities associated with the capture, handling, and monitoring of California red-legged frogs and California tiger salamanders.

The project proponent will not begin ground disturbance until they receive written approval from the Service that the biologist is qualified to conduct the work. Biologists approved under this biological opinion do not need to re-submit their qualifications for subsequent project activities conducted pursuant to this biological opinion, unless we have revoked their approval at any time during the life of this biological opinion.

2. All employees and contractors have the authority to halt construction work at any time to prevent harm to the California tiger salamander or California red-legged frog, or when any of the permit-specified protection measures have been violated. Work will recommence only when authorized by the Service-approved biologist.
3. Before any activities begin on a project, a Service-approved biologist will conduct a training session for all construction personnel. At a minimum, the training will include a description of the California red-legged frog and California tiger salamander and their habitat, the specific measures that are being implemented to conserve the California red-legged frog and California tiger salamander, and the boundaries within which the project will be accomplished. The Service-approved biologist may use brochures, books, and briefings in the training session. The City will document evidence of completion of this training prior to ground disturbing activities.
4. When working in potential aquatic habitat of the species, a Service-approved biologist will conduct aquatic surveys to determine presence or absence, and subsequently capture and relocate California tiger salamanders and California red-legged frogs. When draining aquatic features, such as the SJB WWTP ponds and No Name Creek, a Service-approved biologist must conduct aquatic surveys periodically throughout the features, and prior to complete draining of the features. Prior to working in these habitats, the Service-approved biologist must provide the Service with potential relocation sites in the event larval life stages of California red-legged frogs and California tiger salamanders are found.
5. For work sites that are dewatered by pumping, intakes will be completely screened with mesh not larger than 0.2 inch to prevent California red-legged frogs and California tiger salamanders from entering the pump system. Upon completion of construction activities, any diversions or barriers to flow will be removed in a manner that will allow flow to resume with the least disturbance to the substrate. Alteration of water ways will be minimized to the maximum extent possible and any imported material will be removed from the water ways upon completion of the project.
6. When working in terrestrial habitat of the species, a Service-approved biologist will conduct biological construction monitoring for California tiger salamanders and California red-legged frogs. Before the start of work when working in potential habitat of the species, a biologist will check for wildlife within vegetation, under any equipment such as vehicles and stored pipes within active construction zones. A biologist will also check all excavated steep-walled holes or trenches greater than 1 foot deep for trapped animals. If any life stage of the California tiger salamander or California red-legged frog is observed within an active construction zone, a Service-approved biologist will be

notified immediately and all work that may impact the individual will be halted and all equipment turned off until the Service-approved biologist has captured and removed the individual from the work area. California tiger salamanders and California red-legged frogs will be relocated out of harm's way to a Service-approved off-site location. The Service-approved biologist will provide the proposed relocation site(s) to the Service for their approval prior to the start of project activities.

7. The Service-approved biologist will train biological monitors selected from the construction crew by the construction contractor (typically the project foreman). When working outside of potential habitat of the species, before the start of work each day, the monitor will check for animals under any equipment such as vehicles and stored pipes within active construction zones. The monitor will also check all excavated steep-walled holes or trenches greater than 1 foot deep for trapped animals. If California red-legged frogs or California tiger salamanders are observed within an active construction zone, the Service-approved biologist will be notified immediately and all work within 50 feet of the individual(s) will be halted and all equipment turned off until the individual(s) has left the construction area; or, until the Service-approved biologist has captured and relocated the individual(s).
8. Trenches will be covered or have adequate means of escape (earthen ramps not more than 2:1 slope, wooden boards, etc.).
9. During project activities the project proponent will properly contain all trash that may attract predators by removing it from the work site and disposing of it regularly. Following construction, the project proponent will remove all trash and construction debris from work areas.
10. Prior to the onset of work, the project proponent will ensure that a plan is in place for a prompt and effective response to any accidental spills. All workers will be informed of the importance of preventing spills and of the appropriate measures should a spill occur.
11. The project proponent will conduct all refueling, maintenance, and staging of equipment and vehicles at least 60 feet from aquatic or riparian habitat and not in a location from where a spill would drain directly toward aquatic habitat. The Service-approved biologist or biological monitor will ensure contamination of aquatic or riparian habitat does not occur during such operations by implementing the spill response plan described in measure 10.
12. The project proponent will limit the number of access routes, size of staging areas, and the total area of the activity to the minimum necessary to achieve the project goals. The project proponent will delineate Environmentally Sensitive Areas to confine access routes and construction areas to the minimum area necessary to complete construction, and minimize the impact to California red-legged frog and California tiger salamander habitat; this goal includes locating access routes and construction areas outside of wetlands and riparian areas to the maximum extent practicable.

13. No work will occur during or 24 hours after any rain event to minimize impacts to dispersing California red-legged frogs and California tiger salamanders. A rain event is considered any precipitation resulting in 0.2 inch or greater of precipitation. A Service-approved biologist will survey the project site immediately before resuming project activities.
14. Work in wetland areas and drainages will be conducted only during the dry season, from April 15 to October 15. If work needs to be completed outside of the dry season timeframe, the Service will be contacted for guidance.
15. The project proponent will conduct project activities no earlier than 30 minutes after sunrise and no later than 30 minutes before sunset each day.
16. To ensure that diseases are not conveyed between work sites by the Service-approved biologist, the fieldwork code of practice developed by the Declining Amphibian Populations Task Force will be followed at all times (DAPTF 1998).
17. Temporarily affected project sites will be re-vegetated with an assemblage of native riparian, wetland, and upland vegetation suitable for the area. Locally collected plant materials would be used to the extent practicable. Invasive, exotic plants will be controlled to the maximum extent practicable. This measure will be implemented in all areas temporarily disturbed by activities associated with the project, unless the Service and the USDA determine that it is not feasible or practical.

Compensation for Loss of Habitat

The USDA and the City commit to compensating for loss of California red-legged frog and California tiger salamander habitat through the purchase of 7.8 acres of dual species conservation credits at the Sparling Ranch Conservation Bank. Prior to groundbreaking activities, the USDA or the City must provide receipt of payment to the Service for the purchase of 7.8 acres of dual species conservation credits from the Sparling Ranch Conservation Bank, or another Service-approved conservation bank. Dual species conservation credits are defined as a combination of California red-legged frog and California tiger salamander conservation credits.

ANALYTICAL FRAMEWORK FOR THE JEOPARDY DETERMINATION

Section 7(a)(2) of the Endangered Species Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species. "Jeopardize the continued existence of" means "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02).

The jeopardy analysis in this biological opinion relies on four components: (1) the Status of the Species, which describes the current rangewide condition of the California red-legged frog and California tiger salamander, the factors responsible for that condition, and its survival and

recovery needs; (2) the Environmental Baseline, which analyzes the condition of the California red-legged frog and California tiger salamander in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the California red-legged frog and California tiger salamander; (3) the Effects of the Action, which determines all consequences to the California red-legged frog and California tiger salamander caused by the proposed action that are reasonably certain to occur in the action area; and (4) the Cumulative Effects, which evaluates the effects of future, non-Federal activities, that are reasonably certain to occur in the action area, on the California red-legged frog and California tiger salamander.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the current status of the California red-legged frog and California tiger salamander, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to reduce appreciably the likelihood of both the survival and recovery of the California red-legged frog and California tiger salamander in the wild by reducing the reproduction, numbers, and distribution of that species.

STATUS OF THE SPECIES

California red-legged frog

Legal Status

The California red-legged frog was federally listed as threatened on May 23, 1996 (Service 1996). Revised critical habitat for the California red-legged frog was designated on March 17, 2010 (Service 2010). The Service issued a recovery plan for the species on May 28, 2002 (Service 2002).

Natural History

California red-legged frogs use a variety of habitat types ranging from sea level to approximately 5,000 feet elevation, including aquatic systems, riparian, and upland habitats. Individual California red-legged frogs may use the environment in varying ways, for example, an individual may complete their entire life cycle in a particular habitat without using other components (i.e., a pond is suitable for each life stage and use of upland habitat or a riparian corridor is not necessary). However, populations appear to persist where a mosaic of habitat elements exists, embedded within a matrix of dispersal habitat. Adults are often associated with dense, shrubby riparian or emergent vegetation and areas with deep (greater than 1.6 feet) still or slow-moving water; the largest summer densities of California red-legged frogs are associated with deep-water pools with dense stands of overhanging willows (*Salix* spp.) and an intermixed fringe of cattails (*Typha latifolia*) (Hayes and Jennings 1988, p. 147).

California red-legged frogs can breed in both natural and anthropogenic aquatic habitats; tadpoles, juveniles, and adult frogs have been collected from streams, creeks, ponds, marshes, deep riverine pools and backwaters within streams and creeks, dune ponds, lagoons, estuaries, and artificial impoundments such as stock ponds. Important factors influencing the suitability of aquatic breeding sites are the general lack of invasive aquatic predators, sufficient hydro-period,

percent emergent vegetation, and topography. Accessibility to upland sheltering habitat is essential for the survival of California red-legged frogs within a watershed and can be a factor limiting population numbers and distribution.

California red-legged frogs are “irruptive” breeders where their breeding capacity is highly dependent on local environmental conditions, specifically the availability of cool water for egg deposition and larval maturation (Jennings and Hayes 1994, p. 62). California red-legged frogs breed from November to May and breeding activity typically begins earlier at southern coastal than northern coastal localities (Storer 1925, p. 2; Alvarez et al. 2013, pp. 547–548). Breeding may start as late as March or April in Sierra Nevada localities, due to low temperatures at these sites in January and February (Tatarian 2008, p. 16). Breeding in southern California localities may start as late as April, as exemplified in Matilija Canyon following the 2017 Thomas Fire (Patrick Lieske, U.S. Forest Service, in litt. 2021). High water flows in the winter and spring also can delay breeding in streams and rivers (Fellers et al. 2001, p. 157).

Female California red-legged frogs lay only one egg mass in a breeding year and each egg mass contains between 300 to 4,000 eggs (Storer 1925, p. 240). Frogs typically deposit egg masses in relatively shallow water (approximately 1.6 to 2 feet deep) on emergent vegetation within 4 feet of shore (Storer 1925, p. 239; Jennings and Hayes 1994, p. 64). However, the species can deposit eggs on a wide variety of substrates including boulders and cobbled substrate and submerged tips of overhanging branches, and egg masses have been documented 39 feet from shore and in water up to 10.5 feet deep (Alvarez et al. 2013, pp. 544–545; Wilcox et al. 2017, p. 68). California red-legged frog tadpoles hatch from egg masses after 6 to 14 days (Storer 1925, p. 241). Tadpole development and growth rates are variable and likely temperature dependent (Fellers 2005, pp. 552–554). Occasionally, tadpoles may overwinter and then metamorphose the following spring, a phenomenon so far observed in Santa Clara, Marin, Contra Costa, and San Luis Obispo Counties (Fellers et al. 2001, entire). The juvenile California red-legged frog life stage is defined as the time after an individual undergoes metamorphosis (when they lose their tails and become small froglets) which typically occurs 4 to 5 months after hatching and it spans to when an individual is able to breed (Storer 1925, p. 241; Wright and Wright 1949, p. 422). On average, the juvenile life stage is from about 5 months of age to 3 years in California red-legged frogs. Immediately after metamorphosis, juveniles shelter near their natal pond. However, some juveniles may disperse in the fall to nearby moist uplands or different aquatic habitat to avoid predation by larger, older frogs. Hayes and Tennant (1985, p. 604) found juveniles to seek prey diurnally and nocturnally, whereas adults were largely nocturnal.

During periods of wet weather, starting with the first rains of fall, some individual California red-legged frogs may make long-distance overland excursions through upland habitats to reach breeding sites. In Santa Cruz County, Bulger et al. (2003, p. 90) found marked California red-legged frogs moving up to 1.74 miles through upland habitats, via point-to-point, straight-line migrations without regard to topography, rather than following riparian corridors. Most of these overland movements occurred at night and took up to 2 months. Similarly, in San Luis Obispo County, Rathbun and Schneider (2001, p. 1302) documented the movement of a male California red-legged frog between two ponds that were 1.78 miles apart in less than 32 days; however, most California red-legged frogs in the Bulger et al. (2003, p. 93) study were non-migrating frogs and always remained within 426 feet of their aquatic site of residence (half of the frogs

always stayed within 82 feet of water). Rathbun et al. (1993, p. 15) radio-tracked three California red-legged frogs near the coast in San Luis Obispo County at various times between July and January; these frogs also stayed close to water and never strayed more than 85 feet into upland vegetation. Scott (2002, p. 2) radio-tracked nine California red-legged frogs in East Las Virgenes Creek in Ventura County from January to June 2001, which remained relatively sedentary as well; the longest within-channel movement was 280 feet and the farthest movement away from the stream was 30 feet.

After breeding, California red-legged frogs often disperse from their breeding habitat to forage and seek suitable dry-season habitat. Cover within dry-season aquatic habitat could include boulders, downed trees, and logs; agricultural features such as drains, watering troughs, spring boxes, abandoned sheds, or hayricks, and industrial debris. California red-legged frogs use small mammal burrows and moist leaf litter (Rathbun et al. 1993, p. 15; Jennings and Hayes 1994, p. 64); incised stream channels with portions narrower and deeper than 18 inches may also provide habitat (Service 2002, p. 14). This type of dispersal and habitat use, however, is not observed in all California red-legged frogs and is most likely dependent on the year-to-year variations in climate and habitat suitability and varying requisites per life stage.

Although the presence of California red-legged frogs is correlated with still water deeper than approximately 1.6 feet, riparian shrubbery, and emergent vegetation (Jennings and Hayes 1994, p. 64), California red-legged frogs appear to be absent from numerous locations in its historical range where these elements are well represented. The cause of local extirpations does not appear to be restricted solely to loss of aquatic habitat. The most likely causes of local extirpation are thought to be changes in faunal composition of aquatic ecosystems (i.e., the introduction of invasive predators and competitors) and landscape-scale disturbances that disrupt California red-legged frog population processes, such as dispersal and colonization. The introduction of contaminants or changes in water temperature may also play a role in local extirpations. These changes may also promote the spread of predators, competitors, invasive plants, parasites, and diseases.

Rangewide Status

The historical range of the California red-legged frog extended coastally from southern Mendocino County and inland from the vicinity of Redding, California, southward to northwestern Baja California, Mexico (Storer 1925, p. 235; Jennings and Hayes 1985, p. 95; Shaffer et al. 2004, p. 2673). The California red-legged frog has sustained a 70 percent reduction in its geographic range because of several factors acting singly or in combination (Davidson et al. 2001, p. 465).

Over-harvesting, habitat loss, non-native species introduction, and urban encroachment are the primary factors that have negatively affected the California red-legged frog throughout its range (Jennings and Hayes 1985, pp. 99-100; Hayes and Jennings 1988, p. 152). Habitat loss and degradation, combined with over-exploitation and introduction of exotic predators, were important factors in the decline of the California red-legged frog in the early to mid-1900s. Continuing threats to the California red-legged frog include direct habitat loss due to stream alteration and loss of aquatic habitat, indirect effects of expanding urbanization, competition or predation from non-native species including the bullfrog, catfish (*Ictalurus* spp.), bass

(*Micropterus* spp.), mosquito fish (*Gambusia affinis*), red swamp crayfish (*Procambarus clarkii*), and signal crayfish (*Pacifastacus leniusculus*). Chytrid fungus (*Batrachochytrium dendrobatidis*) is a waterborne fungus that can decimate amphibian populations, and is considered a threat to California red-legged frog populations.

Recovery

The 2002 final recovery plan for the California red-legged frog (Service 2002) states that the goal of recovery efforts is to reduce threats and improve the population status of the California red-legged frog sufficiently to warrant delisting. The recovery plan describes a strategy for delisting, which includes: (1) protecting known populations and reestablishing historical populations; (2) protecting suitable habitat, corridors, and core areas; (3) developing and implementing management plans for preserved habitat, occupied watersheds, and core areas; (4) developing land use guidelines; (5) gathering biological and ecological data necessary for conservation of the species; (6) monitoring existing populations and conducting surveys for new populations; and (7) establishing an outreach program. The California red-legged frog will be considered for delisting when:

1. Suitable habitats within all core areas are protected or managed for California red-legged frogs in perpetuity, and the ecological integrity of these areas is not threatened by adverse anthropogenic habitat modification (including indirect effects of upstream/downstream land uses).
2. Existing populations throughout the range are stable (i.e., reproductive rates allow for long-term viability without human intervention). Population status will be documented through establishment and implementation of a scientifically acceptable population monitoring program for at least a 15-year period, which is approximately 4 to 5 generations of the California red-legged frog. This 15-year period should coincide with an average precipitation cycle.
3. Populations are geographically distributed in a manner that allows for the continued existence of viable metapopulations despite fluctuations in the status of individual populations (i.e., when populations are stable or increasing at each core area).
4. The species is successfully reestablished in portions of its historical range such that at least one reestablished population is stable or increasing at each core area where California red-legged frog are currently absent.
5. The amount of additional habitat needed for population connectivity, recolonization, and dispersal has been determined, protected, and managed for California red-legged frogs.

The recovery plan identifies eight recovery units based on the assumption that various regional areas of the species' range are essential to its survival and recovery. The recovery status of the California red-legged frog is considered within the smaller scale of recovery units as opposed to the overall range. These recovery units correspond to major watershed boundaries as defined by

U.S. Geological Survey hydrologic units and the limits of the range of the California red-legged frog. The goal of the recovery plan is to protect the long-term viability of all extant populations within each recovery unit.

Within each recovery unit, core areas have been delineated and represent contiguous areas of moderate to high California red-legged frog densities that are relatively free of exotic species such as bullfrogs. The goal of designating core areas is to protect metapopulations that combined with suitable dispersal habitat, will support long-term viability within existing populations. This management strategy allows for the recolonization of habitat within and adjacent to core areas that are naturally subjected to periodic localized extinctions, assuring the long-term survival and recovery of the California red-legged frog.

California Tiger Salamander (*Ambystoma californiense*)

Legal Status

The Service recognizes three distinct population segments (DPS) of the California tiger salamander: one in Sonoma County; one in northern Santa Barbara County; and one in central California. On September 21, 2000, the Service listed the Santa Barbara County distinct population segment of the California tiger salamander as endangered (Service 2000). On March 19, 2003, the Service listed the Sonoma County distinct population segment of the California tiger salamander as endangered (Service 2003). On August 4, 2004, the Service published a final rule listing the California tiger salamander as threatened rangewide, including the previously identified Sonoma and Santa Barbara distinct population segments (Service 2004). On August 19, 2005, U.S. District Judge William Alsup vacated the Service's downlisting of the Sonoma and Santa Barbara populations from endangered to threatened. Therefore, the Sonoma and Santa Barbara populations are listed as endangered, and the central California population is listed as threatened.

Natural History

The California tiger salamander is a large and stocky terrestrial salamander with small eyes and a broad, rounded snout. Adults may reach a total length of 8.2 inches, with males generally averaging about 8 inches total length, and females averaging about 6.8 inches in total length. For both sexes, the average snout-to-vent length is approximately 3.6 inches (Service 2000). The small eyes have black irises and protrude from the head. Coloration consists of white or pale yellow spots or bars on a black background on the back and sides. The belly varies from almost uniform white or pale yellow to a variegated pattern of white or pale yellow and black. Males can be distinguished from females, especially during the breeding season, by their swollen cloacae (a common chamber into which the intestinal, urinary, and reproductive canals discharge), larger tails, and larger overall size (Trenham 1998, p. 74).

California tiger salamanders spend the majority of their lives in upland habitats and cannot persist without them. The upland component of California tiger salamander habitat typically consists of grassland savannah, but also includes scrub or chaparral habitats (Shaffer et al. 1993; Service 2004). Juvenile and adult California tiger salamanders spend the dry summer and fall

months of the year in the burrows of small mammals, such as California ground squirrels (*Otospermophilus beecheyi*) and Botta's pocket gopher (*Thomomys bottae*) (Storer 1925 p. 70; Trenham 1998, p. 46).

Burrow habitat created by ground squirrels and utilized by California tiger salamanders suggests a commensal relationship between the two species (Loredo et al. 1996, p. 284). Movement of California tiger salamanders within and among burrow systems continues for at least several months after juveniles and adults leave the ponds (Trenham 2001, p. 369). California tiger salamanders cannot dig their own burrows, and as a result, their presence is associated with burrowing mammals. Active ground-burrowing rodent populations likely sustain California tiger salamanders because inactive burrow systems become progressively unsuitable over time (Service 2004, p. 32). Loredo et al. (1996, p. 284) found that California ground squirrel burrow systems collapsed within 18 months following abandonment by, or loss of, the mammals.

Adults enter breeding ponds during fall and winter rains, typically from October through February (Trenham et al. 2000 p. 369). Males migrate to the breeding ponds before females (Loredo and Van Vuren 1996, p. 895). Males usually remain in the ponds for an average of about 6 to 8 weeks, while females stay for approximately 1 to 2 weeks. In dry years, both sexes may stay for shorter periods (Loredo and Van Vuren 1996, pp. 897-899).

Females attach their eggs singly or, in rare circumstances, in groups of two to four, to twigs, grass stems, vegetation, or debris in the water (Storer 1925, p. 66; Twitty 1941, pp. 1-4). In ponds with little or no vegetation, females may attach eggs to objects, such as rocks and boards on the bottom. In drought years, the seasonal pools may not form, and the adults may not breed (Barry and Shaffer 1994, pp. 159-164). The eggs hatch in 10 to 14 days with newly hatched salamanders (larvae) ranging in size from 0.5 to 0.6 inch in total length (Service 2000). The larvae are aquatic. Each is yellowish gray in color and has a broad, plump head; large, feathery external gills; and broad dorsal fins that extend well onto its back. The larvae feed on zooplankton, small crustaceans, and aquatic insects for about 6 weeks after hatching, after which they switch to larger prey (Anderson 1968, pp. 273-284). Larger larvae have been known to consume smaller tadpoles of tree frogs (*Pseudacris* spp.) and California red-legged frogs (*Rana draytonii*). California tiger salamander larvae are among the top aquatic predators in seasonal pool ecosystems.

The larval stage of the California tiger salamander usually lasts 3 to 6 months, because most seasonal ponds and pools dry up during the summer (Petranka 1998, p. 48). Amphibian larvae must grow to a critical minimum body size before they can metamorphose to the terrestrial stage (Wilbur and Collins 1973, pp. 1305-1314). Larvae collected near Stockton in the Central Valley during April varied from 1.9 to 2.3 inches in length (Storer 1925, p. 85). Feaver (1971, p. 51) found that larvae metamorphosed and left the breeding pools 60 to 74 days after the eggs had been laid, with larvae developing faster in smaller, more rapidly drying pools. The larvae perish if a site dries before they complete metamorphosis. Pechmann et al. (2001) found a strong positive correlation between inundation period and total number of metamorphosing juvenile amphibians, including tiger salamanders.

Metamorphosed juveniles leave the breeding sites in the late spring or early summer. Like the adults, juveniles may emerge from these retreats to feed during nights of high relative humidity (Shaffer et al. 1993, p. 5) before settling in their selected upland sites for the dry, hot summer months. While most California tiger salamanders rely on rodent burrows for shelter, some individuals may utilize soil crevices as temporary shelter during upland migrations (Loredo et al. 1996, p. 284). Mortality of juveniles during their first summer exceeds 50 percent (Trenham 1998, p. 18). Emergence from upland habitat in hot, dry weather occasionally results in mass mortality of juveniles (Holland 1990, p. 219).

Lifetime reproductive success for California tiger salamanders is typically low. Less than 50 percent breed more than once (Trenham 2000, p. 365). In part, this is due to the extended length of time it takes for California tiger salamanders to reach sexual maturity; most do not breed until 4 or 5 years of age. Combined with low survivorship of metamorphs (in some populations, less than 5 percent of marked juveniles survive to become breeding adults (Trenham 1998, p. iv)), low reproductive success limits California tiger salamander populations. Because of this low recruitment, isolated subpopulations can decline greatly from unusual, randomly occurring natural events as well as from human-caused factors that reduce breeding success and individual survival. Based on metapopulation theory (Hanski and Gilpin 1991), factors that repeatedly lower breeding success in isolated ponds that are too far from other ponds for dispersing individuals to replenish the population further threaten the survival of a local population.

Rangewide Status

The central California tiger salamander is endemic to the grassland community found in California's Central Valley, the surrounding foothills, and coastal valleys (Fisher and Shaffer 1996, p. 1390). The distribution of breeding locations of this species, and the other two distinct populations, does not naturally overlap with that of any other species of tiger salamander (Petranka 1998, p. 47; Stebbins 2003, p. 469).

California tiger salamanders have been found in upland habitats various distances from aquatic breeding habitats. During a mark and recapture study in the Upper Carmel River Valley in Monterey County, Trenham et al. (2000, p. 3526) observed California tiger salamanders dispersing up to 2,200 feet between breeding ponds between years. In research at Olcott Lake in Solano County, Trenham and Shaffer (2005, p. 1160) captured California tiger salamanders in traps installed 1,312 feet from the breeding pond. In a trapping study in Contra Costa County (Orloff 2011, p. 266), most California tiger salamanders were trapped at least 2,600 feet from the nearest breeding pond and some were captured as far as 7,200 feet from the nearest breeding pond.

Historically, natural ephemeral vernal pools were the primary breeding habitats for California tiger salamanders (Trenham 2001, p. 3). However, with the conversion and loss of many vernal pools through farmland conversion and urban and suburban development, ephemeral and permanent ponds created for livestock watering are now frequently used by the species (Robins and Vollmar 2002, p. 406).

The California tiger salamander is threatened primarily by the destruction, degradation, and fragmentation of upland and aquatic habitats, primarily resulting from the conversion of these

habitats by urban, commercial, and intensive agricultural activities. Additional threats to the species include hybridization with introduced nonnative barred tiger salamanders (*A. tigrinum mavortium*), destructive rodent-control techniques (e.g., deep-ripping of burrow areas, use of fumigants), reduced survival due to the presence of mosquitofish (*Gambusia affinis*) (Leyse and Lawler 2000, p. 76), and mortality on roads due to vehicles. Disease, particularly chytridiomycosis and ranaviruses, and the spread of disease by nonnative amphibians, are discussed in the listing rule as additional threats to the species.

We do not have data regarding the absolute number of California tiger salamanders due to the fact that they spend most of their lives underground. Virtually nothing is known about the historical abundance of the species. At one study site in Monterey County, Trenham et al. (2000, p. 369) found the number of breeding adults visiting a pond varied from 57 to 244 individuals. A Contra Costa County breeding site, approximately 124 miles north of the Trenham et al. (2000) study site in Monterey County, showed a similar pattern of variation, suggesting that such fluctuations are typical (Loredo and Van Vuren 1996, p. 896). At the local landscape level, nearby breeding ponds can vary by at least an order of magnitude in the number of individuals visiting a pond, and these differences appear to be stable across years (Trenham et al. 2001).

Recovery

The strategy of the Recovery Plan for the Central California Distinct Population Segment of the California Tiger Salamander (Service 2017, p. iv) focuses on alleviating the threat of habitat loss and fragmentation in order to increase population resiliency (ensure each population is sufficiently large to withstand stochastic events), redundancy (ensure a sufficient number of populations to provide a margin of safety for the species to withstand catastrophic events), and representation (conserve the breadth of the genetic makeup of the species to conserve its adaptive capabilities). Recovery of this species can be achieved by addressing the conservation of remaining aquatic and upland habitat that provides essential connectivity, reduces fragmentation, and sufficiently buffers against encroaching development and intensive agricultural land uses. Appropriate management of these areas will also reduce mortality by addressing non-habitat related threats, including those from non-native and hybrid tiger salamanders, other non-native species, contaminants, disease, and road mortality. Research and monitoring should be undertaken to determine the extent of known threats, identify new threats, and reduce threats to the extent possible.

The recovery strategy is intended to establish healthy, self-sustaining populations of Central California tiger salamanders through the protection and management of upland and aquatic breeding habitat, as well as the restoration of aquatic breeding habitat where necessary. It also ensures habitat management and monitoring and the conducting of research. Due to shifting conditions in the ecosystem (e.g., invasive species, unforeseen disease, climate change, and effects from future development and conversion to agriculture), the Service anticipates the need to adapt actions that implement this strategy over time. The recovery strategy ensures that the genetic diversity of the Central California tiger salamander is preserved throughout the DPS to allow adaptation to local environments, maintenance of evolutionary potential for adaptation to future stresses, and reduction in the potential for genetic drift and inbreeding to result in inbreeding depression.

The range of the Central California tiger salamander has been classified into four recovery units (Service 2017, p. II-1). These recovery units are not regulatory in nature; the boundaries of the recovery units do not identify individual properties that require protection, but they are described solely to facilitate recovery and management decisions. The recovery units represent both the potential extent of Central California tiger salamander habitat within the species' range and the biologically (genetically) distinct areas where recovery actions should take place that will eliminate or ameliorate threats. All recovery units must be recovered to achieve recovery of the DPS.

The four recovery units have been further subdivided into management units. These subdivisions of recovery units are areas that might require different management, that might be managed by different entities, or that might encompass different populations. In the recovery plan, the management units are primarily administrative in that they serve to organize the recovery units into separate and approximately equal areas that will assist in managing the implementation of the recovery actions.

ENVIRONMENTAL BASELINE

The implementing regulations for section 7(a)(2) (50 CFR 402.02) define the environmental baseline as “the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline.”

Action Area

The implementing regulations for section 7(a)(2) of the Act (50 CFR 402.02) define the “action area” as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. The action area for this biological opinion includes all areas where people and equipment would be working, areas downstream that may receive sediment or reduced hydrologic flow, and areas where California red-legged frogs and California tiger salamanders may be relocated. Please refer to EMC correspondence (EMC 2022b, Figures 1-6) for detailed mapping of the action area.

Habitat Characteristics and Existing Conditions of the Action Area

The project falls primarily within roads and road rights-of-way surrounded by residential areas or agricultural lands. Suitable terrestrial habitat for California red-legged frog and California tiger salamander exists sporadically along the project route in the form of drainage ditches and non-native grasslands. Grassland habitat containing small mammal burrows exists in sparse patches adjacent to and throughout the action area, which provide upland habitat for the California tiger

salamander and dispersal habitat for the California red-legged frog. Dry drainage ditches provide upland or dispersal habitat for California red-legged frogs and dispersal habitat for California tiger salamanders. The SJB WWTP ponds, No Name Creek, and drainage ditches provide either breeding or non-breeding aquatic habitat for both species. The water quality of the SJB WWTP ponds is degraded due to the high amounts of nutrients and chemicals from the processing of untreated wastewater.

Previous Consultations in the Action Area

We are unaware of any previous consultations in the action area.

Condition (Status) of the Species in the Action Area

California Red-legged Frog and California Tiger Salamander

Focus surveys for the California red-legged frog and California tiger salamander were not completed for this project. According to the CNDDDB, California red-legged frogs and California tiger salamanders have been observed within dispersal distance of the project site (EMC 2022a). All onsite aquatic features, and several offsite aquatic features that are located within dispersal distance of the project provide potential breeding habitat for the species (EMC 2022a). California red-legged frogs and California tiger salamanders may utilize all undeveloped terrestrial habitats as upland or dispersal habitat, and all aquatic features as breeding or non-breeding habitat within the action area.

Recovery

California Red-legged Frog

The action area is located within the Santa Clara Valley Core Recovery Area (Core Area 17) within the Diablo Range and Salinas Valley Recovery Unit (Recovery Unit 16) for the California red-legged frog (Service 2002). Core areas represent a system of areas that, when protected and managed for California red-legged frogs, will allow for long-term viability of existing populations. Threats to California red-legged frogs in the Diablo Range and Salinas Valley Recovery Unit include agriculture, livestock, mining, non-native species, recreation, urbanization, and water management activities and structures including diversions and reservoirs. Conservation needs for California red-legged frogs in the Santa Clara Valley Core Area include protecting existing populations; controlling non-native predators; studying effects of grazing in riparian corridors, ponds, and uplands; reducing impacts associated with livestock grazing; protecting habitat connectivity; minimizing effects of recreation and off-road vehicle use; avoiding and reducing impacts of urbanization; and protecting habitat buffers from nearby urbanization.

California Tiger Salamander

The action area is located within the Bay Area Recovery Unit and the Southwest Diablo Range Management Unit as described in the recovery plan for the Central California tiger salamander

(Service 2017). This recovery unit has a high degree of habitat protection relative to the other recovery units. However, the majority of populations within this recovery unit have not been monitored for population status, trends, and threats. Hybridization with non-native tiger salamanders is a threat to some populations within this recovery unit (Service 2004). Maintaining the native genetic integrity of Central California tiger salamanders within this recovery unit is a priority.

A principal delisting criterion for the Bay Area Recovery Unit is the protection of sufficient high-quality habitat within all of its constituent management units to ensure sustainable Central California tiger salamander populations (recovery criterion A/3). Specific protection targets for the 551,730-acre Southwest Diablo Range Management Unit are the creation of 5 preserves totaling at least 16,990 acres. Each preserve should encompass a minimum of 3,398 acres, include at least four breeding ponds showing variation in ponding, and include at least one moderately-sized burrowing mammal colony that occurs within the average dispersal distance of the salamander of each breeding pond (Service 2017). Other conservation needs identified for this and other recovery and management units include reducing or eliminating threats posed by disease, predation, road-crossing mortality, contaminants, mosquito control efforts, some livestock grazing practices, and climate change.

EFFECTS OF THE ACTION

The implementing regulations for section 7(a)(2) define effects of the action as “all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action” (50 CFR 402.02).

In conducting this analysis, we have considered factors such as previous consultations; Federal Register rules; 5-year reviews; other Service documents; published scientific studies and literature; professional expertise of Service personnel, particularly dealing with aspects directly related to the sensitive species involved, or other related scientific fields in determining whether effects are reasonably certain to occur. We have also determined that certain consequences are not caused by the proposed action, such as the increase or spread of disease, poaching and collecting, because they are so remote in time, or geographically remote, or separated by a lengthy causal chain, so as to make those consequence not reasonably certain to occur.

Effects of the Proposed Action on the California Red-legged Frog and California Tiger Salamander

Planned construction activities within undeveloped terrestrial habitats are anticipated to temporarily affect 1.8 acres of upland or dispersal habitat for the California red-legged frog and California tiger salamander. The project is anticipated to result in the permanent loss of 0.07 acre of upland or dispersal habitat and 2.4 acres breeding or non-breeding aquatic habitat for both species (EMC 2022a). These habitat impacts would be offset through the purchase of 7.8 acres of dual species conservation credits from Sparling Ranch Conservation Bank.

All California red-legged frogs and California tiger salamanders that occur in the action area could be adversely affected by project activities. Limiting construction work in wetlands and waters to the dry season, April 15 to October 15, would minimize these potential impacts.

Work has been proposed to take place year-round, except for drainage crossing work, which has been proposed to occur during the dry season. California red-legged frogs and California tiger salamanders can be adversely affected by project activities, especially during the wet season, when dispersal and breeding take place. Potential impacts to dispersing or breeding frogs or salamanders would be reduced or avoided by conducting work during the dry season. Even during the dry season, California red-legged frogs and California tiger salamanders can disperse overland in mesic conditions if substantial rainfall (greater than 0.2 inch of rain in a 24-hour period) occurs. Potential impacts to dispersing frogs or salamanders in the event of a substantial rain event would be reduced or avoided by ceasing activities.

Construction activities within the project site could result in mortality or injury to all life stages of the California red-legged frog and California tiger salamander through crushing by equipment or vehicles, construction debris, and worker foot traffic. Individuals in burrows may be killed or injured by project excavation, trenching, grading, or filling activities, or could become trapped and die if their burrow entrance is crushed or covered. California red-legged frogs and California tiger salamanders may experience a disruption of normal behavioral patterns from work activities and their associated noise and vibration. This disturbance and displacement may increase the potential for predation, desiccation, competition for food and shelter, or strike by vehicles on roadways. Pre-construction surveys and the relocation of individuals by a Service-approved biologist would reduce these impacts.

Excavation of the linear sewer force main trench could entrap California red-legged frogs and California tiger salamanders or temporarily interfere with their movements to and from breeding sites. The USDA proposes to include monitoring by a Service-approved biologist, avoid work at night when frogs and salamanders are principally active, and either cover or provide escape ramps for any excavations left open to reduce these effects. Excavation of the trench would temporarily remove a small area of upland habitat, but temporarily disturbed areas will be restored to their preconstruction topography and small mammals are expected to recolonize the area over time.

Capture and relocation of California red-legged frogs and California tiger salamanders could result in injury or death. Although survivorship for translocated California red-legged frogs and California tiger salamanders has not been estimated, survivorship of translocated wildlife in general is reduced due to intraspecific competition, lack of familiarity with the location of potential breeding, feeding, and sheltering habitats, and increased risk of predation. The USDA proposes to reduce this risk by using Service-approved biologists, limiting the duration of handling, and identifying suitable relocation sites in advance of capture.

Observations of diseased and parasite-infected amphibians are now frequently reported. Releasing amphibians following a period of captivity, during which time they can be exposed to infections of disease agents, may cause an increased risk of mortality in wild populations.

Amphibian pathogens and parasites can also be carried between habitats on the hands, footwear, or equipment of fieldworkers, which can spread them to localities containing species that have had little or no prior contact with such pathogens or parasites. Chytrid fungus is a water-borne fungus that can be spread through direct contact between aquatic animals and by a spore that can move short distances through the water. The fungus only attacks the parts of an animal's skin that have keratin (thickened skin), such as the mouthparts of tadpoles and the tougher parts of adults' skin, such as the toes. It can decimate amphibian populations, causing fungal dermatitis, which usually results in death in 1 to 2 weeks. Infected animals may spread the fungal spores to other ponds and streams before they die. Once a pond has become infected with chytrid fungus, the fungus stays in the water for an undetermined amount of time. Relocation of individuals captured from the project area could contribute to the spread of chytrid fungus. In addition, infected equipment or footwear could introduce chytrid fungus into areas where it did not previously occur. The possible spread of chytrid fungus or other amphibian pathogens and parasites would be minimized by following the Declining Amphibian Populations Task Force's Fieldwork Code of Practice (DAPTF 1998).

Trash left during or after project activities could attract predators to work sites, which could, in turn, prey on California red-legged frogs and California tiger salamanders. For example, raccoons (*Procyon lotor*) and feral cats (*Felis catus*) are attracted to trash and also prey opportunistically on the California red-legged frog and California tiger salamander. This potential impact would be reduced or avoided by careful control of waste products at all work sites.

Accidental spills of hazardous materials or careless fueling or oiling of vehicles or equipment could degrade water quality or upland habitat to a degree where California red-legged frogs and California tiger salamanders are adversely affected or killed. The potential for this effect to occur would be reduced by thoroughly informing workers of the importance of preventing hazardous materials from entering the environment, locating equipment and vehicle staging, refueling, and maintenance areas a minimum of 60 feet from riparian areas or other water bodies, and by having an effective spill response plan in place.

Uninformed workers could disturb, injure, or kill California red-legged frogs and California tiger salamanders. The potential for this to occur would be reduced by educating workers as to the presence and protected status of these species and the measures that are being implemented to protect them during project activities.

In summary, the proposed action could adversely affect California red-legged frogs and California tiger salamanders due to the nearby occurrences of the species and the presence of dispersal and breeding habitat; however, the USDA and the City have proposed conservation measures to reduce these impacts and have committed to purchasing 7.8 acres of dual species conservation credits at Sparling Ranch Conservation Bank to conserve habitat that will be preserved and managed for the benefit of California red-legged frog and California tiger salamander in perpetuity. Based on these factors, we anticipate that few California red-legged frogs and California tiger salamanders are likely to be killed or injured during this project.

Effects on Recovery

We anticipate that effects on recovery of the California red-legged frog and California tiger salamander from the proposed project will be minimal with implementation of the conservation measures. The proposed project would permanently impact 0.07 acre of upland or dispersal habitat and 2.4 acres of breeding or non-breeding aquatic habitat, and temporarily impact 1.8 acres of upland habitat for both species. However, these losses would be offset by the City's purchase of 7.8 acres of dual species conservation credits from Sparling Ranch Conservation Bank.

Summary of Effects

California red-legged frogs and California tiger salamanders may be injured or killed due to project activities, such as being crushed by equipment, or injured or killed during capture and relocation. Effects to California red-legged frogs and California tiger salamanders would be offset with the implementation of conservation measures. The effects on recovery of California red-legged frogs and California tiger salamanders are anticipated to be minimal as a result of implementation of the project. Permanent and temporary impacts would be offset with the implementation of conservation measures and the purchase of dual species conservation credits.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. We do not consider future Federal actions that are unrelated to the proposed action in this section because they require separate consultation pursuant to section 7 of the Act. We are not aware of any non-Federal actions that are reasonably certain to occur in the action area.

CONCLUSION

The regulatory definition of "to jeopardize the continued existence of the species" focuses on assessing the effects of the proposed action on the reproduction, numbers, and distribution, and their effect on the survival and recovery of the species being considered in the biological opinion. For that reason, we have used those aspects of the California red-legged frog and California tiger salamander statuses as the basis to assess the overall effect of the proposed action on the species.

Reproduction

We expect no appreciable effects on California red-legged frog or California tiger salamander reproduction. Construction activities would cause temporary and permanent loss of upland and dispersal habitat, generate noise and vibration, and impede movement of individuals to breeding sites, potentially reducing reproduction. Construction activities in upland habitat could injure or kill California red-legged frogs or California tiger salamanders remaining in drainage ditches or burrows or dispersing through the project area. The elimination of discharge to No Name Creek and decommissioning of the SJB WWTP ponds would permanently reduce reproduction if these

aquatic features provide breeding habitat for the species. However, the species have not been observed breeding in No Name Creek or the SJB WWTP ponds. Additionally, the SJB WWTP ponds contain effluent discharge and are less likely to provide breeding habitat for the species. The loss of reproductive California red-legged frogs and California tiger salamanders could temporarily lower the reproductive capacity of the local populations, but the number of individuals affected is expected to be low because burrow availability in the action area is limited and work would not be conducted during rain events that could stimulate frog and salamander movements. The USDA and the City would also implement conservation measures to limit the number of California red-legged frogs and California tiger salamanders that would be harmed by the project, such as using a Service-approved biologist to survey for and relocate frogs and salamanders from work areas. Therefore, we conclude that the proposed action will result in minimal impacts to breeding California red-legged frogs and California tiger salamanders in the action area and will not appreciably reduce the reproduction of the California tiger salamander locally or rangewide.

Numbers

We expect no appreciable effects on California red-legged frog and California tiger salamander numbers. A small number of California red-legged frogs and California tiger salamanders may be injured or killed as a result of construction activities and capture and relocation efforts. Although California red-legged frogs and California tiger salamanders may occur in the action area, the number of frogs and salamanders present in the action area is expected to be low due to limited availability of quality habitat. The conservation measures proposed by the USDA and the City will minimize the number of California red-legged frogs and California tiger salamanders adversely affected by project activities. Therefore, we conclude that the loss of the small number of individuals, if any, which may be present during the proposed project would not appreciably reduce the local or rangewide population of the California red-legged frog or the California tiger salamander.

Distribution

We expect no appreciable effects on California red-legged frog or California tiger salamander distribution. The proposed project could injure, kill, or temporarily displace a small number of California red-legged frogs or California tiger salamanders, but the City has proposed conservation measures to minimize the risk of adverse effects on individuals. Construction activities would permanently remove or degrade a small amount of breeding and upland habitat as well as temporarily remove or degrade a small amount of upland and dispersal habitat, representing a negligible portion of California red-legged frog and California tiger salamander habitat available locally or in the population's relatively large geographic range. Temporarily affected habitats would return to their previous condition after construction, and any frogs or salamanders displaced by project activities are expected to recolonize the action area over time. We do not expect the City's proposed activities to reduce the species distribution because the California red-legged frog and California tiger salamander would continue to occupy its current geographic distribution. Therefore, we conclude that the proposed action would not reduce the distribution of California red-legged frog and California tiger salamander locally or rangewide.

Recovery

As described in the Effects of the Action section, the proposed project has been designed to minimize effects to California red-legged frog and California tiger salamander by implementing a suite of conservation measures, including compensation for the loss of habitat. We have determined that the effects to California red-legged frog and California tiger salamander and their habitat would not be substantial on either a local or rangewide basis. Therefore, the proposed action would not appreciably diminish the species' likelihood of recovery.

After reviewing the current status of the California red-legged frog and California tiger salamander, the environmental baseline for the action area, the effects of the USDA's proposed funding of the San Juan Bautista Sewer Force Main Project and the cumulative effects, it is the Service's biological opinion that the USDA's proposed funding of the project is not likely to jeopardize the continued existence of the California red-legged frog and California tiger salamander because:

1. The project would have a low effect on reproduction of the species, but would not appreciably reduce reproduction of the species rangewide;
2. The project would cause a small decrease in the number of individuals, if any, but would not appreciably reduce numbers of the species rangewide;
3. The project would not reduce the species' distribution rangewide; and
4. The project would not cause any effects that would preclude our ability to recover the species.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened wildlife species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not the purpose of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

AMOUNT OR EXTENT OF TAKE

We anticipate that some California red-legged frogs and California tiger salamanders could be taken as a result of the proposed action. We expect the incidental take to be in the form of capture during relocation activities, and in the form of injury or death as a result of project activities if individuals are accidentally injured or killed during capture and relocation, or are unable to be collected for relocation and remain in active project areas. The probability of these

risks may be increased if substantial rainfall (greater than 0.2 inch of rain in a 24-hour period) occurs, and California red-legged frogs or California tiger salamanders are dispersing through the area during work activities. California red-legged frogs and California tiger salamanders could also be killed or wounded by predators if they abandon habitat within or adjacent to work areas and be subject to desiccation if they leave shelter sites.

We cannot quantify the precise number of California red-legged frogs and California tiger salamanders that may be taken as a result of the action that the USDA has proposed because California red-legged frogs and California tiger salamanders move over time; for example, animals may have entered or departed the action area since the time of pre-construction surveys. Other individuals may not be detected due to their cryptic nature, small size, and low mobility. California red-legged frogs and California tiger salamanders may be difficult to detect due to their small body size and use of aquatic habitats, underground burrows, or dense cover. Animals injured or killed during relocation efforts are likely to be observed; however, mortality from other sources, including the indirect effects of relocation (e.g., inability to find food in a new location) or displacement from the action area, would be difficult to observe. Finding a dead or injured California red-legged frog and California tiger salamander may also be unlikely due to their small size, cryptic coloration and potential to be quickly scavenged. The conservation measures proposed by the USDA and the City are likely to prevent mortality or injury of most individuals. In addition, finding a dead or injured California red-legged frog and California tiger salamander is unlikely.

Consequently, we are unable to reasonably anticipate the actual number of California red-legged frogs and California tiger salamanders that would be taken by the proposed action; however, we must provide a level at which formal consultation would have to be reinitiated. The Environmental Baseline and Effects Analysis sections of this biological opinion indicate that adverse effects to California red-legged frogs and California tiger salamanders would likely be low given the nature of the proposed activities, and we, therefore, anticipate that take of California red-legged frogs and California tiger salamanders would also be low. We also recognize that for every California red-legged frog and California tiger salamander found dead or injured, other individuals may be killed or injured that are not detected, so when we determine an appropriate take level we are anticipating that the actual take would be higher and we set the number below that level.

Similarly, for estimating the number of California red-legged frogs and California tiger salamanders that would be taken by capture, we cannot predict how many may be encountered for reasons stated earlier. While the benefits of relocation (e.g., minimizing mortality) outweigh the risk of capture, we must provide a limit for take by capture at which consultation would be reinitiated because high rates of capture may indicate that some important information about the species in the action area was not apparent (e.g., it is much more abundant than thought). Conversely, because capture can be highly variable, depending upon the species and the timing of the activity, we do not anticipate a number so low that reinitiation would be triggered before the effects of the activity were greater than what we determined in the Effects Analysis.

Therefore, if 6 adult or juvenile, or 100 larval California red-legged frogs, or 6 adult or juvenile, or 100 larval California tiger salamanders are captured and relocated, the USDA must contact

our office immediately to reinitiate formal consultation. Additionally, if 2 adult or juvenile, or 10 larval California red-legged frogs, or 2 adult or juvenile, or 10 larval California tiger salamanders are found dead or wounded, the USDA must contact our office immediately to reinitiate formal consultation. Project activities that are likely to cause additional take should cease during this review period because the exemption provided under section 7(o)(2) would lapse and any additional take would not be exempt from the section 9 prohibitions.

REASONABLE AND PRUDENT MEASURES

The measures described below are non-discretionary, and must be undertaken by the USDA or made binding conditions of any grant or permit issued to the City, as appropriate, for the exemption in section 7(o)(2) to apply. The USDA has a continuing duty to regulate the activity covered by this incidental take statement. If the USDA (1) fails to assume and implement the terms and conditions or (2) fails to require the City to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the USDA or the City must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR 402.14(i)(3)].

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize the impacts of the incidental take of California red-legged frogs and California tiger salamanders:

1. Biologists must be authorized by the Service before they implement conservation measures for the California red-legged frog or California tiger salamander, including but not limited to conducting surveys, excavating burrows, and capturing and relocating individuals.
2. The USDA must provide assurances that impacts to California red-legged frog and California tiger salamander are appropriately offset.
3. The Service must be notified of the initiation of project activities and provided access to the project site upon request.

TERMS AND CONDITIONS

To be exempt from the prohibitions of section 9 of the Act, the USDA must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline reporting and monitoring requirements. These terms and conditions are non-discretionary.

1. The following term and condition implements reasonable and prudent measure 1:
 - a. The USDA or the City must request our approval of any biologists that they or their contractors employ to conduct project activities associated with the

California red-legged frog and California tiger salamander pursuant to this biological opinion. Such requests must be in writing (communication by electronic mail is acceptable) and be received by the Ventura Fish and Wildlife Office at least 30 days prior to any such activities being conducted. Authorization of Service-approved biologists is valid for this project only.

2. The following term and condition implements reasonable and prudent measure 2:
 - a. The USDA or the City must provide receipt of purchase of 7.8 acres of dual species conservation credits from Sparling Ranch Conservation Bank or another Service-approved conservation bank prior to the initiation of ground disturbing activities.
3. The following terms and conditions implement reasonable and prudent measure 3:
 - a. The USDA or the City must provide the Service access to the action area to survey and inspect project activities.
 - b. The USDA or the City must notify the Ventura Fish and Wildlife Office via electronic mail (fw8venturasection7@fws.gov) prior to conducting project activities pursuant to this biological opinion.

REPORTING REQUIREMENTS

Pursuant to 50 CFR 402.14(i)(3), the USDA must report the progress of the action and its impact on the species to the Service as specified in this incidental take statement to the Service's Ventura Fish and Wildlife Office via electronic mail (fw8venturasection7@fws.gov) within 90 days following completion of the proposed project. The report must describe all activities that were conducted under this biological opinion, including activities that were described in the proposed action and required under the terms and conditions, and discuss any problems that were encountered in implementing conservation measures or terms and conditions and any other pertinent information. The report must also include the following information:

The number of California red-legged frogs and California tiger salamanders observed, captured, and relocated from the project area, and killed or injured during project activities; the dates and times of capture, mortality, or injury; specific locations of capture, mortality, or injury; approximate size and life stage of individuals; and a description and map of relocation sites.

Upon completion of the project, the USDA must report all observations of federally listed species to the California Department of Fish and Wildlife for inclusion in the CNDDDB.

DISPOSITION OF DEAD OR INJURED SPECIMENS

As part of this incidental take statement and pursuant to 50 CFR 402.14(i)(1)(v), upon locating a dead or injured California red-legged frog or California tiger salamander, initial notification within 3 working days of its finding must be made via electronic mail

(fw8venturasection7@fws.gov) to the Ventura Fish and Wildlife Office. The report must include the date, time, location of the carcass, a photograph, cause of death or injury, if known, and any other pertinent information.

The USDA or City must take care in handling injured animals to ensure effective treatment and care, and in handling dead specimens to preserve biological material in the best possible state. The USDA or City must transport injured animals to a qualified veterinarian. Should any treated California red-legged frogs or California tiger salamanders survive, the USDA or the City must contact the Service regarding the final disposition of the animal(s).

We recommend that dead California red-legged frogs and California tiger salamanders identified in the action area be placed with the California Academy of Sciences; Contact: Jens Vindum, Collections Manager, California Academy of Sciences Herpetology Department, Golden Gate Park, San Francisco, California 94118, (415) 750-7037.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information and can be used by USDA to fulfill their 7(a)(1) obligations.

1. We recommend that the USDA advise the Service-approved biologist(s) to relocate any other native reptiles or amphibians, if in harm's way, found within work areas to suitable habitat outside of project areas if such actions are in compliance with State laws.
2. We recommend that dead California red-legged frogs and California tiger salamanders identified in the action area be tested for amphibian disease, and that dead California tiger salamanders undergo genetic analysis for the purpose of investigating hybridization.
3. We recommend that the USDA advise the Service-approved biologist(s) to permanently remove any individuals of non-native species, such as bullfrogs (*Rana catesbeiana*), and signal and red swamp crayfish (*Pacifastacus leniusculus*; *Procambarus clarkii*) from the project area, to the maximum extent possible. The Service-approved biologist would be responsible for ensuring his or her activities are in compliance with the California Fish and Game Code.

The Service requests notification of the implementation of any conservation recommendations so we may be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats.

REINITIATION NOTICE

This concludes formal consultation on the action(s) outlined in your May 18, 2022 request. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, the exemption issued pursuant to section 7(o)(2) may have lapsed and any further take could be a violation of section 4(d) or 9. Consequently, we recommend that any operations causing such take cease pending reinitiation.

If you have any questions about this biological opinion, please contact Christine Fox of my staff at (831) 768-6953, or by electronic mail at christine_fox@fws.gov.

Sincerely,

STEPHEN HENRY

Stephen P. Henry
Field Supervisor

Digitally signed by STEPHEN
HENRY
Date: 2022.08.23 17:35:51 -07'00'

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IN LITTERIS

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The Declining Amphibian Populations Task Force Fieldwork Code of Practice

- A. Remove mud, snails, algae, and other debris from nets, traps, boots, vehicle tires, and all other surfaces. Rinse cleaned items with sterilized (e.g., boiled or treated) water before leaving each work site.
- B. Boots, nets, traps, and other types of equipment used in the aquatic environment should then be scrubbed with 70 percent ethanol solution and rinsed clean with sterilized water between study sites. Avoid cleaning equipment in the immediate vicinity of a pond, wetland, or riparian area.
- C. In remote locations, clean all equipment with 70 percent ethanol or a bleach solution, and rinse with sterile water upon return to the lab or "base camp." Elsewhere, when washing-machine facilities are available, remove nets from poles and wash in a protective mesh laundry bag with bleach on the "delicates" cycle.
- D. When working at sites with known or suspected disease problems, or when sampling populations of rare or isolated species, wear disposable gloves¹ and change them between handling each animal. Dedicate sets of nets, boots, traps, and other equipment to each site being visited. Clean them as directed above and store separately at the end of each field day.
- E. When amphibians are collected, ensure that animals from different sites are kept separately and take great care to avoid indirect contact (e.g., via handling, reuse of containers) between them or with other captive animals. Isolation from unsterilized plants or soils which have been taken from other sites is also essential. Always use disinfected and disposable husbandry equipment.
- F. Examine collected amphibians for the presence of diseases and parasites soon after capture. Prior to their release or the release of any progeny, amphibians should be quarantined for a period and thoroughly screened for the presence of any potential disease agents.
- G. Used cleaning materials and fluids should be disposed of safely and, if necessary, taken back to the lab for proper disposal. Used disposable gloves should be retained for safe disposal in sealed bags.

For further information on this Code, or on the Declining Amphibian Populations Task Force, contact John Wilkinson, Biology Department, The Open University, Walton Hall, Milton Keynes, MK7 6AA, UK. E-mail: DAPTF@open.ac.uk Fax: +44 (0) 1908-654167.

¹ Latex gloves should not be used. They are toxic to amphibians. Use vinyl or nitrile disposable gloves instead.

APPENDIX D

Water Quality Certification, San Juan
Bautista to Hollister Sewer Force Main
Project (RWQCB 2022)



Central Coast Regional Water Quality Control Board

November 8, 2022

Don Reynolds
City of San Juan Bautista
P.O. Box 1420
San Juan Bautista, CA 95045
Email: citymanager@san-juan-bautista.ca.us

VIA ELECTRONIC MAIL

Reg. Measure ID: 449658
Place ID: 883892

Dear Don Reynolds:

NOTICE OF APPLICABILITY FOR THE SAN JUAN BAUTISTA TO HOLLISTER SANITARY SEWER FORCE MAIN PROJECT, SAN BENITO COUNTY, PROJECT NO. 33522WQ04

On November 8, 2022, the Central Coast Regional Water Quality Control Board (Central Coast Water Board) received your Notice of Intent (NOI) to enroll the San Juan Bautista to Hollister Sanitary Sewer Force Main Project (Project) under the *Statewide General Waste Discharge Requirements for Dredged or Fill Discharges to Waters Deemed by the U.S. Army Corps of Engineers to be Outside of Federal Jurisdiction, Order No. 2004-0004-DWQ*.

The Project will discharge to No Name Creek and an unnamed drainage. Central Coast Water Board staff understands that the Project includes the following activities:

1. Repurpose San Juan Bautista's existing Wastewater Treatment Plant (WWTP) pump station:
 - a. Construct a new primary pump station to convey wastewater to Hollister Domestic WWTP.
 - b. Repurpose the existing pump station for emergency storage pumps.
 - c. Convert existing San Juan Bautista WWTP ponds to emergency storage basins.
 - d. Decommission the remaining existing facilities (existing pumps, aerators, filters, ultraviolet disinfection equipment).
2. Develop a new 10-inch diameter high-density polyethylene force main to carry sewage from the San Juan Bautista WWTP to a manhole just upstream of the Hollister WWTP influent pump station:
 - a. Construct pipe bridge crossings at jurisdictional areas at No Name Creek at San Juan Highway and an unnamed drainage at Prescott Road.
 - b. Trench primarily within public road rights-of-way and repave the full drive lane over the route.
3. Eliminate WWTP discharge to No Name Creek.

Central Coast Water Board staff has reviewed your NOI for the Project. The Central Coast Water Board Executive Officer is issuing this Notice of Applicability (NOA) authorizing the Project under Order No. 2004-0004-DWQ.

JANE GRAY, CHAIR | MATTHEW T. KEELING, EXECUTIVE OFFICER

Authorized Impacts: Fill activities authorized by this NOA are limited to (1) 0.0003 acres of permanent impacts to wetlands; (2) 0.0005 acres/6 linear feet of permanent impacts to stream bank; (3) 0.001 acres/50 linear feet of temporary impacts to wetland; (4) 0.002 acres/90 linear feet of temporary impacts to stream bank.

Compensatory Mitigation Requirements: Pursuant to Order No. 2004-004-DWQ sections II.C.4 and II.C.9, you must implement compensatory mitigation for impacts to waters of the State as described in your submitted San Juan Bautista to Hollister Force Main Mitigation Monitoring and Reporting Program, and as follows:

1. 0.0003 acres of permanent wetland impacts must be mitigated at a (1:1) ratio through the re-establishment of 0.0003 acres of wetland habitat by channel widening to maintain channel capacity.
2. 0.0005 acres of permanent stream bank impact must be mitigated at a (1:1) ratio through the re-establishment of 0.0005 acres of stream bank habitat by channel widening to maintain channel capacity.
3. 0.001 acres/50 linear feet of temporary wetland impacts must be mitigated at a 1:1 ratio through the rehabilitation of 0.001 acres/50 linear feet of wetland habitat.
4. 0.002 acres/90 linear feet of temporary stream bank impact must be mitigated at a 1:1 ratio through the rehabilitation of 0.002/90 linear feet of stream bank habitat.

Additional Requirements: You must comply with all conditions of Order No. 2004-0004-DWQ, including the following requirements:

1. Pursuant to section II.C.4 of Order No. 2004-0004-DWQ, you must implement the Project in conformance with the information provided in your NOI. Any changes to the Project design as described in the NOI must receive Central Coast Water Board Executive Officer approval before the changes are implemented.
2. Pursuant to section II.C.16 of Order No. 2004-0004-DWQ, you must submit a Notice of Termination to the Central Coast Water Board upon completion of Project activities.
3. Pursuant to sections A.6 and A.11 of Order No. 2004-0004-DWQ, your Project must not cause significant adverse impacts on water quality, beneficial uses of waters of the State, and the environment. In addition, pursuant to section II.C.3 of Order No. 2004-0004-DWQ, your Project must not cause a condition of pollution, contamination, or nuisance. In order for you to comply with these requirements, Central Coast Water Board staff finds you must:
 - a. Conduct bank excavation from outside the stream channels such that only the bucket of the equipment will enter the channel.
 - b. Stabilize portions of the project that occur below top of creek banks or in other waters of the State prior to October 1 of each year, either by completing construction of those portions of the project (including installation of permanent erosion control measures) or by implementing winterization stabilization measures capable of effectively stabilizing the area and preventing erosion under winter rain and flow conditions generated by the 10-year 24-hour storm event. No construction activities shall be conducted below top of creek banks or in other waters of the State during the winter period (October 1 – May 30), unless prior written approval has been obtained from Central Coast Water Board staff. Requests to conduct construction activities below top of creek banks or in other waters of the State during the winter period shall be submitted to Central Coast Water Board staff at least 21 days prior to the planned winter period work date. If approval is obtained, the Discharger shall implement the approved winter work as specified in the Central Coast Water Board staff approval and as described in any documentation submitted by the Permittee while seeking the approval.

Reporting Requirements: Pursuant to section C.26 of Order No. 2004-004-DWQ, you must submit the following reports:

1. Annual Project Status Report – **The Permittee shall submit to the Central Coast Water Board an Annual Project Status Report by May 31 of each year following the issuance of this NOA, regardless of whether Project construction has started or not.** At a minimum, Annual Project Status Reports shall address activities conducted during the prior calendar year. The Discharger shall submit Annual Project Status Reports until the Discharger has conducted all required monitoring, mitigation has achieved all success criteria, and the Discharger has submitted a Notice of Termination. Each Annual Project Status Report shall include at a minimum:
 - a. The status of the Project (e.g., construction not started, construction started, or construction complete).
 - b. The date of construction initiation, if applicable.
 - c. The date of construction completion, if applicable.
 - d. If Project construction is complete:
 - i. A summary of Project activities, monitoring and inspection observations, and problems incurred and actions taken;
 - e. A description of the results of the annual visual inspection of the Project site, areas of waters of the State adjacent to Project impact areas, and mitigation areas, including:
 - i. Erosion conditions;
 - ii. Stream stability conditions;
 - iii. Water quality and beneficial use conditions;
 - iv. Clearly identified photo-documentation of all areas of permanent and temporary impact, prior to and after Project construction; and
 - v. Clearly identified representative photo-documentation of other Project areas, prior to and after Project construction.
 - vi. Confirmation that mitigation was installed according to the requirements of this NOA and as described in the application, and any other associated submittals;
 - vii. Any remedial or maintenance actions taken or needed;
 - viii. Annual photo-documentation representative of all mitigation areas, taken from vantage points from which changes in size and cover of plants are evident. Compare photos of installed mitigation with photos of the mitigation areas prior to installation.
 - f. If the visual inspection monitoring period is over, but water quality problems persist or the mitigation sites have not revegetated to the extent required for soil and bank stability, the Annual Report shall identify corrective measures to be undertaken, including extension of the monitoring period until the Project is no longer causing excessive erosion, stream instability, or other water quality problems.

The total application fee for this project is \$2,417. The remaining application fee payable to the Central Coast Water Board is \$0. Annual fees may apply.

If you have questions, please contact **Kathleen Hicks** at (805) 549-3458 or via email at Kathleen.Hicks@waterboards.ca.gov, or Phil Hammer at (805) 549-3882.

Sincerely,



Digitally signed by Phillip Hammer

Date: 2022.11.08 17:59:08 -08'00'

for
Matthew T. Keeling
Executive Officer

cc:

Janet Walther, EMC Planning Group: walther@emcplanning.com
Linda Connolly, CA Department of Fish and Wildlife: Linda.Connolly@wildlife.ca.gov
CWA Section 401 WQC Program, SWRCB: Stateboard401@waterboards.ca.gov
Jackson Welch, Central Coast Water Board: Jackson.Welch@waterboards.ca.gov
Kathleen Hicks, Central Coast Water Board: Kathleen.Hicks@waterboards.ca.gov
Phil Hammer, Central Coast Water Board: Phillip.Hammer@waterboards.ca.gov
Tamara Anderson, Central Coast Water Board: Tamara.Anderson@waterboards.ca.gov

R:\RB3\Shared\401\General Orders\San Benito\2022\Outside Corps Jurisdiction\33522WQ04_San Juan Bautista to Hollister Sewer Force Main\R3_San Juan Bautista to Hollister Force Main_33522WQ04_NOA.docx

ATTACHMENT 1
TO WQ ORDER NO. 2004-004-DWQ

STATE WATER RESOURCES CONTROL BOARD

NOTICE OF INTENT (NOI)

TO ENROLL UNDER AND COMPLY WITH THE TERMS OF WATER QUALITY ORDER NO. 2004-004 DWQ (GENERAL WDRs), STATEWIDE GENERAL WASTE DISCHARGE REQUIREMENTS FOR DREDGED OR FILL DISCHARGES TO WATERS DEEMED BY THE U.S. ARMY CORPS OF ENGINEERS TO BE OUTSIDE OF FEDERAL JURISDICTION

Mark Only One Item	1. New Discharge <input checked="" type="checkbox"/> 2. Change of Information-WDID # _____
--------------------	---

I. Owner of the Land

City of San Juan Bautista				
P.O. Box 1420				
San Juan Bautista	San Benito	CA	95045	831-623-4661 x14
Don Reynolds, City Manager				

II. Billing Address

City of San Juan Bautista				
P.O. Box 1420				
San Juan Bautista	San Benito	CA	95045	831-623-4661 x14
Don Reynolds, City Manager				

III. Discharger (if different from owner of the land)

Name				
Mailing Address				
City	County	State	Zip	Phone
Contact Person				

STATE USE ONLY

WDID:	Regional Board Office:	Date NOI Received: _____	
		Check #: _____	

IV. Site Location

San Juan Bautista to Hollister	
Third Street, San Juan Bautista Wastewater Treatment Plant to SR 156, Hollister Wastewater Treatment Plant	
County: San Benito	Total Size of Site (acres): 32.2 acres
<p>Latitude/Longitude (Center of Discharge Area) in degrees/minutes/seconds (DMS) to the nearest ½ second or decimal degrees (DD) to four decimals (0.0001 degree)</p> <p>DMS: N. Latitude 36°50'54.4"N W. Longitude 121°32'41.5"W</p> <p>DD: N. Latitude _____ W. Longitude _____</p> <p>Attach a map of at least 1:24000 (1" = 2000') detail of the proposed discharge site (e.g., USGS 7.5 minute</p>	

V. Discharge Information

Subject	Notes
Name(s) and type(s) of receiving waters: No Name Creek, unnamed channelized drainage at intersection of Prescott Road	Receiving water types are: river/streambed, lake/reservoir, ocean/estuary/bay, riparian area, wetland
Eligibility of receiving water. Provide evidence that the water affected by this discharge is deemed to be out side of federal jurisdiction: (see attached)	U.S. Army Corps of Engineers jurisdictional disclaimer letter, or explanation why such a disclaimer is not needed
Identify all regulatory agencies having jurisdiction over this project. Attach copies of all federal and State license/permit applications or issued copies of licenses/permits from government agencies: a. USFWS Biological Opinion b. CDFW 2081 Permit Application c. CDFW Streambed Alteration Agreement Application	For example: Dept. of Fish and Game Streambed Alteration Agreement, Coastal Commission permit
Proposed project start date: 03/01/2023	Expected date of completion: 12/31/2025
Construction in uplands would occur during the wet season, however construction in or near jurisdictional areas would occur outside of the rainy season (also for the protection of listed species).	

Project description:

The project includes repurposing San Juan Bautista's existing Wastewater Treatment Plant (WWTP) influent pump station and development of a new 10-inch diameter high-density polyethylene (HDPE) force main that would carry sewage from the San Juan Bautista WWTP to a manhole just upstream of the Hollister Domestic WWTP influent pump station.

Influent Pump Station and WWTP Storage

The City's current average dry weather flow (ADWF) is approximately 160,000 gpd (gallons per day) with an estimated build-out ADWF of 420,000 gpd. A new primary pump station will be constructed that will house three submersible pumps which will serve as the primary pumps to convey city wastewater to the Hollister Domestic WWTP. The three primary submersible pumps will be nearly capable of conveying peak hour wet weather flows through the intermediate planning horizon (2035). The existing San Juan Bautista WWTP influent pump station will be repurposed to house two submersible pumps which will serve as the emergency storage pumps for peak flow shaving during extreme wet weather events. The existing San Juan Bautista WWTP ponds will be converted to emergency storage basins. The lower pond will be lined in the future to serve as an equalization basin when the build-out peak-hour wet weather flows are realized. Two sump (i.e., drain) pumps will be available to support the storage function of the existing ponds. The remaining existing facilities will be decommissioned (existing pumps, aerators, filters, and ultraviolet disinfection equipment). Attachment 3 of the 401 application, Plan and Profile, 100% Plans, and Attachment 4 of the 401 application, Impact Area Map Book, present the location and components of the improvements.

Force Main

The proposed route runs the new force main inside the existing, unused 18-inch gravity sewer in San Juan Bautista north for about 0.43 miles until it reaches the northwest end of Caetano Place. From there the proposed 10-inch, 6.97-mile main route is along First Street, where it crosses No Name Creek to Prescott Road, where it crosses a drainage near the True Leaf Farms agricultural processing facility and turns east on San Justo Road. At Lucy Brown Road, the route turns south for a short length before running east again on Duncan Road. At Bixby Road the route turns south and then turns east on Freitas Road. The route then turns north on Mitchell Road until it reaches the southeast border of the Hollister Domestic WWTP site. The route then follows the southern border of the Hollister Domestic WWTP percolation ponds until crossing State Route 156, through an existing 42-inch casing pipe under the highway, heading further east until it terminates at the Hollister Domestic WWTP existing influent manhole. The proposed route is almost entirely in public rights-of-way. Attachment 1 of the 401 application, Figure 2, illustrates the proposed route of the sanitary sewer force main.

The area of impact for the force main will include a trench width up to three-feet wide and will be seven to eight feet deep along most of the route, and up to 15-feet deep where it will be placed within the existing 18-inch sewer line. Once the force main has been placed, the full drive lane will be repaved. During construction, it is likely that more than a three-foot wide area would be disturbed, though most of the disturbed area will be in the existing lane and road shoulder. Where the route crosses water features, pipe bridges will be utilized.

The proposed main improvements will be primarily within the County road rights-of-way, which is generally 40 to 60 feet. Agricultural crops or other improvements within the rights-of-way will not be disturbed.

In addition to the impact area, six staging areas have been identified along the route. These staging areas are located on active agricultural fields or equipment storage areas devoid of native vegetation. Staging areas will be a small portion of the overall parcel, as shown on Attachment 1 of the 401 application, Figure 3. Based on field surveys and a review of aerial photographs, the staging areas are not considered potential breeding or upland habitat due to the distance between the staging areas and any known breeding or grassland habitats and ongoing intensive agricultural activities.

Crossings 1 and 2

The crossing of No Name Creek at San Juan Highway will be completed with an 18-inch diameter steel casing pipe with a 10-inch HDPE carrier pipe within. The casing pipe will be mounted on concrete footings located on either side of the canal, above the ordinary high-water level and about 5 feet clear of the canal banks. However, because the 25-year flood elevation is documented to be above the road elevation, and the casing pipe cannot be above the road elevation to avoid impeding traffic, the casing pipe will be in the flood plain high-water level. To mitigate the flood plain flow path area impacted by the casing pipe, the upper banks of the canal, also above the ordinary high-water level, will be widened such that additional flood plain flow area provided is equal to the area taken by casing pipe, resulting in no net change in the canal flow area. The casing pipe footings and upper bank removal will be excavated with a back-hoe or excavator from either side of the canal (outside and above the canal). The cut and fill area will be

approximately 1,042 square feet on the west side and 60 square feet on the east side of the canal. Approximately 25 square feet on the west side of the canal will be graded within the top of bank (Attachment 3 of the 401 application). Two existing trees are proposed for removal at this crossing (Attachment 3 of the 401 application). These trees are Peruvian pepper trees (*Schinus molle*), which are non-native and listed as “limited” by the California Invasive Plant Council, indicating they are locally persistent and problematic. These invasive trees will not be replaced, however disturbed surfaces will be seeded with native grasses.

The canal crossing at Prescott Road will be similar to the San Juan highway crossing. However, the casing pipe will be 24-inch in diameter and will carry the same 10-inch HDPE carrier pipe and a 3” conduit for future fiber-optic cable. The flood plain flow path at this location is controlled by the Prescott Road bridge section at this location and the upper banks of the canal at the casing pipe will be widened to maintain this same flow area, resulting in no net change in the canal flow area. The casing pipe footings and upper bank removal will be excavated with a back-hoe or excavator from either side of the canal (outside and above the canal), similar to the San Juan Road canal crossing. The cut and fill area will be approximately 168 square feet on the west side and 179 square feet on the east side of the canal. No trees are present within or adjacent to the impact area. Approximately 13 square feet on both sides of the canal will be graded within the top of bank, for a total of 26 square feet (Attachment 3 of the 401 application). The disturbed surfaces will be seeded with native grasses.

A back-hoe or excavator will be used for material removal and equipment placement, as well as a dump truck for material delivery and pick-up trucks for personnel and tools. A concrete truck or mixer will be used to deliver concrete for the footings. No equipment will enter the canal. Excavator or back-hoe work to remove the upper banks of the canal will be operated from above and outside the canal. Only the bucket of the equipment will enter the space of the canal and only to the limits of the upper banks. Compaction around footings will likely be done using the same equipment used for excavation – either a backhoe or excavator to place and compact material. A handheld whacker may also be used for compaction, especially in tight places.

San Juan Bautista WWTP Decommissioning

The City of San Juan Bautista ultimately plans to decommission the WWTP and to instead operate the existing ponds as emergency storage when needed and eventually as equalization when build-out flows are realized. Upon completion of the proposed project, the ponds will no longer be configured for treatment.

A survey to assess and map the extent of potential aquatic habitat from the discharge point along No Name Creek to the San Benito River was conducted on July 20, 2022. The following observations were made:

- Riparian habitat upstream of the SJB WWTP was present at the time of the survey, indicating it is maintained year-round by winter flows from the upstream watershed.
- Natural riparian habitat only occurs along No Name Creek until the first undercrossing on San Juan Highway (approximately 5,030 feet downstream from the SJB WWTP) (Attachment 1 of the 401 application, Figure 4). At this point, the stream is on the east side of the highway within highly managed agricultural fields. Riparian vegetation is absent here and appears to be actively removed by agricultural operations.

Although the loss of wastewater treatment plant discharge is significant, it would not result in the total loss of riparian or wetland vegetation along No Name Creek. The historically ephemeral creek is significantly supplied by winter storm runoff in its upstream watershed and by a network of stormwater drains in the adjoining neighborhood. Although hydrologic data is sparse for this part of the watershed, it is anticipated that these inputs would sustain riparian and wetland vegetation through the rainy season, typical of the ephemeral habitats upstream from the WWTP.

<p>Purpose of the entire activity: The purpose of the project is to eliminate out-of-compliance discharge from the San Juan Bautista Wastewater Treatment Plant to No Name Creek.</p>	<p>For example: Stream-bank erosion control; flood management; residential development</p>
<p>Characterization of discharges: Discharges include minor sedimentation from grading activities within the top of bank, above the OHWM, and installation of the pipeline within the top of bank.</p>	<p>What types of constituents will be discharged? Is the sediment contaminated?</p>

Fill and Excavation Discharges: For each water body type listed below indicate in ACRES the area of the proposed discharge to waters of the state, and identify the impacts(s) as permanent and/or temporary. For linear discharges to drainage features and shorelines, e.g., bank stabilization, revetment, and channelization projects, ALSO specify the length of the proposed discharge to waters of the state IN FEET.¹

Water Body Type	Permanent Impact		Temporary Impact	
	Acres	Linear Feet	Acres	Linear Feet
Wetland	0.0003 (pipeline casing)		0.001	50
Streambed	0.0003+0.0002 = 0.0005 (pipeline casing)	2+4=6	0.001+0.001=0.002	50+40=90
Lake/Reservoir				
Ocean/Estuary/Bay				
Riparian				

Dredging Discharges: Volume (cubic yards) of dredged material to be discharged into waters of the United States. 0. No dredged material will be discharged into waters of the US.

¹ For guidance in determining the extent of impacted waters, see General WDRs, section II.A.4

VI. California Environmental Quality Act

Will an environmental impact report or a negative declaration be adopted for this project or has one been adopted?

YES NO

If yes, what is the current status of the environmental impact report or negative declaration?

- Not yet issued for public review.
- In public review.
- Adopted.

Name of lead agency City of San Juan Bautista

If an environmental impact report or a negative declaration is in public review or has been adopted, enclose the document with this NOI. Attached.

Will the discharge occur in, or in immediate proximity to, an area covered by a U.S. Fish and Wildlife Service (USFWS) Habitat Conservation Plan (HCP) or a Department of Fish and Game Natural Community Conservation Plan (NCCP)?

YES NO

Will the discharge occur in, or in immediate proximity to, any habitat of a plant or animal species that has been classified by the Department of Fish and Game, the U.S. Fish and Wildlife Service, or the National Marine Fisheries Service as candidate, sensitive, endangered, rare, or threatened?

YES NO

Will the discharge occur in, or in immediate proximity to, a significant historical or archeological resource, a unique paleontological resource or site, a unique geologic feature, or any human remains?

YES NO

Will the discharge occur in, or in immediate proximity to, land under existing zoning for agricultural use or under a Williamson Act contract?

YES NO

Will the discharge, as mitigated, cause any other significant adverse environmental impact?

YES NO

If you answered "yes" to any of the previous five questions, provide a detailed explanation demonstrating why the discharge is eligible to be enrolled under the General WDRs.

Construction activities at crossings 1 and 2 would impact habitat for the federally listed threatened and state listed species of concern California red-legged frog (*Rana draytonii*) and federally and state listed threatened California tiger salamander (*Ambystoma californiense*). A biological opinion has been obtained from the US Fish and Wildlife Service and a Section 2081 Incidental Take Permit application has been submitted to the California Department of Fish and Wildlife. Copies of the Biological Opinion and the 2081 permit application are included in the Attachments.

VII. Additional Submittals. In accordance with provisions of State Water Resources Control Board (SWRCB) Water Quality Order No. 2004-0004 DWQ, please submit the following with this NOI to the appropriate


Regional Water Quality Control Board or, for multi-Region projects, to the SWRCB.

- a. A fee pursuant to California Code of Regulations, Title 23 Section 2200.
- b. A Mitigation Plan, as described in the General WDRs.

Mitigation Plan

The proposed crossings will impact a very small amount of mixed non-native and native vegetation. Both ditches are managed for vegetation as part of ongoing adjacent agricultural operations, however for stabilization once construction has been completed, bare areas will be revegetated with a mix of native grass seeds. It is assumed that the combination of seeding and natural succession of vegetation currently in the area will revegetate the bare areas. To assess the success of revegetation efforts, a site visit will occur the spring after reseeding has occurred. If areas are not revegetated to the extent required for soil/bank stability, the City of San Juan Bautista will undertake a second reseeding and monitoring effort. Results of the seeding and monitoring efforts will be reported to the RWQCB.

VIII. CERTIFICATION

"I certify under penalty of law that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. In addition, I certify that the provisions of these General WDRs will be complied with."	
Signature of Discharger 	Title <i>City Manager</i>
Don Reynolds, San Juan Bautista City Manager	Date <i>10-21-22</i>

IX. ATTACHMENTS

1. 401 Application with Comments
2. USACE No Permit Required Email (Letter in Progress)
3. USGS Map
4. Permits/Permit Applications
 - a. USFWS Biological Opinion
 - b. CDFW 2081 Permit Application
 - c. CDFW Streambed Alteration Agreement Application
5. CEQA Document

Please note: Due to large file sizes, these attachments are available via Dropbox:

<https://www.dropbox.com/sh/1c7qkpw41nzud2f/AADOLR0Ds99avaCbrYnqVreka?dl=0>

If you need assistance, please contact Janet Walther, EMC Planning Group at walther@emcplanning.com.

APPENDIX E

Section 2081 Incidental Take Permit, San
Juan Bautista to Hollister Sewer Force
Main Project (2081-2022-033-04)
(CDFW)



State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Central Region
1234 East Shaw Avenue
Fresno, California 93710
(559) 243-4005
www.wildlife.ca.gov

GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director



February 9, 2023

Don Reynolds, City Manager
City of San Juan Bautista
311 Second Street
Post Office Box 1420
San Juan Bautista, California 95045

Subject: Incidental Take Permit for San Juan Bautista to Hollister Sewer Force Main (2081-2022-033-04)

Dear Don Reynolds:

Enclosed you will find an electronic copy of the incidental take permit for the above referenced Project, which has been digitally signed by the California Department of Fish and Wildlife (CDFW). Please read the permit carefully, sign the acknowledgement, and return the original **no later than 30 days from CDFW signature**, and prior to initiation of ground-disturbing activities. You may return a hard copy of the permit via mail to:

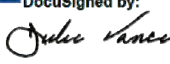
California Department of Fish and Wildlife
Habitat Conservation Planning Branch, CESA Permitting
Post Office Box 944209
Sacramento, California 94244-2090

Alternatively, you may return an electronic copy of the permit with digital signature to CESA@wildlife.ca.gov. Digital signatures shall comply with Government Code section 16.5. Digital signatures facilitated by CDFW will be automatically returned.

You are advised to keep the permit in a secure location and distribute copies to appropriate project staff responsible for ensuring compliance with the conditions of approval of the permit. Note that you are required to comply with certain conditions of approval prior to initiation of ground-disturbing activities. Additionally, a copy of the permit must be maintained at the project work site and made available for inspection by CDFW staff when requested.

The permit will not take effect until the signed acknowledgement is received by CDFW. If you wish to discuss these instructions or have questions regarding the permit, please contact Stephanie Manzo, Environmental Scientist, at stephanie.manzo@wildlife.ca.gov.

Sincerely,

DocuSigned by:

FA83F09FE08945A...

Julie A. Vance, Regional Manager
Central Region
California Department of Fish and Wildlife

Enclosure

Conserving California's Wildlife Since 1870



**California Department of Fish and Wildlife
Central Region
1234 EAST SHAW AVENUE
FRESNO, CALIFORNIA 93710**

California Endangered Species Act
Incidental Take Permit No. 2081-2022-033-04

SAN JUAN BAUTISTA TO HOLLISTER SEWER FORCE MAIN

I. Authority:

This California Endangered Species Act (CESA) incidental take permit (ITP) is issued by the California Department of Fish and Wildlife (CDFW) pursuant to Fish and Game Code section 2081, subdivisions (b) and (c), and California Code of Regulations, Title 14, section 783.0 et seq. CESA prohibits the take¹ of any species of wildlife designated by the California Fish and Game Commission as an endangered, threatened, or candidate species.² However, CDFW may authorize the take of any such species by permit pursuant to the conditions set forth in Fish and Game Code section 2081, subdivisions (b) and (c). (See Cal. Code Regs., tit. 14, § 783.4).

Permittee:	City of San Juan Bautista
Principal Officer:	Don Reynolds, City Manager
Contact Person:	Don Reynolds, 831-623-4661
Mailing Address:	311 Second Street Post Office Box 1420 San Juan Bautista, California 95045

II. Effective Date and Expiration Date of this ITP:

This ITP shall become effective when signed by all parties and received by CDFW as described in the Notices section of this ITP. Unless renewed by CDFW, this ITP and its authorization to take the Covered Species shall expire on **December 31, 2025**.

Notwithstanding the expiration date on the take authorization provided by this ITP, Permittee's obligations pursuant to this ITP do not end until CDFW accepts as complete the Permittee's Final Mitigation Report required by Condition of Approval 7.11 of this ITP.

¹Pursuant to Fish and Game Code section 86, "'take' means hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." (See also *Environmental Protection Information Center v. California Department of Forestry and Fire Protection* (2008) 44 Cal.4th 459, 507 [for purposes of incidental take permitting under Fish and Game Code section 2081, subdivision (b), "'take' ... means to catch, capture or kill".])

²The definition of an endangered, threatened, and candidate species for purposes of CESA are found in Fish and Game Code sections 2062, 2067, and 2068, respectively.

III. Project Location:

The San Juan Bautista to Hollister Sewer Force Main (Project) route begins at the existing City of San Juan Bautista Wastewater Treatment Plant (WWTP) on Third Street in San Juan Bautista, San Benito County, at approximately 36.84911, -121.5447 within Assessor's Parcel Numbers (APNs) 002-220-0030 and 002-220-0070. The Project route terminates at the City of Hollister Domestic WWTP at the intersection of State Route 156 and San Juan Hollister Road, within the City of Hollister, San Benito County, at approximately 36.85286, -121.4457 within APNs 052-100-0070, 052-100-0010, and 018-110-0400. The Project location is depicted in Figure 1. Construction staging areas will be located at the San Juan Bautista WWTP, the Hollister Domestic WWTP, a 0.8-acre staging area on Lucy Brown Road within APNs 018-070-0040 and 018-070-0080, and within paved roadways along the Project route (Figure 2). Most of the Project route is on existing road rights-of-way within farmland.

IV. Project Description:

The Project includes repurposing San Juan Bautista's existing WWTP influent pump station, constructing a new primary pump station at the San Juan Bautista WWTP, and constructing a 10-inch diameter, high-density polyethylene (HDPE) force main that will carry sewage from the San Juan Bautista WWTP to the Hollister Domestic WWTP existing influent manhole. The purpose of the Project is to eliminate the discharge from the San Juan Bautista WWTP to No Name Creek. Project construction is anticipated to begin in 2023 and will be completed by December of 2025, for a duration of up to 26 months. The Project site spans 35.11 acres in total. Of this, 32.5 acres currently exist as previously developed paved roadways and paved WWTP facilities.

San Juan Bautista WWTP Influent Pump Station and Storage

A new primary pump station with three submersible pumps will be constructed at the San Juan Bautista WWTP and will serve as the primary pumps to convey wastewater to the Hollister Domestic WWTP. The new primary pump station will result in the permanent development of 0.05 acres of undeveloped land (Figure 3). The existing San Juan Bautista WWTP influent pump station will be repurposed to house two submersible pumps which will serve as emergency storage pumps for peak flows during extreme wet weather events. The remaining existing facilities will be decommissioned (aerators, filters, and ultraviolet disinfection equipment). Project activities include demolition and equipment removal, shrub and weed removal, grading, paving, and installation of new equipment. Temporary disturbance associated with the modification of the existing San Juan Bautista WWTP site, as well as staging, will occur near the existing influent pump station, within 0.2 acres of undeveloped land.

There are two existing San Juan Bautista WWTP ponds that will be converted to emergency storage basins and will no longer be configured for treatment. The upper pond is 0.6 acres, and the lower pond is 1.1 acres. If there is an emergency (e.g., equipment failure), sewage will be transferred into the ponds and two sump pumps will be available to return the sewage for treatment. Under non-emergency conditions, the ponds will not be filled with sewage. It is anticipated the ponds will remain empty under normal conditions except for seasonal rainfall.

Due to the anticipated impermeable nature of the ponds, stormwater will remain ponded until it can evaporate, like other vernal or ephemeral pools in the region.

Force Main Route

The proposed route of the new force main is illustrated in Figure 4. The 10-inch force main will begin at the San Juan Bautista WWTP and run north inside the existing, unused 18-inch gravity sewer for about 0.43 miles along residential streets, and east to First Street. From there, the proposed 10-inch, 6.97-mile main route will cross a streambed channel with broadleaf cattail (*Typha latifolia*) habitat towards First Street (Crossing 1). Construction at Crossing 1 will result in the temporary disturbance of 0.03 acres of habitat and the permanent development of 0.0026 acres of habitat within the upper banks of the channel. Construction activities at Crossing 1 include the removal of shrubs and up to two trees, excavation of a 375-square foot portion of the upper bank, and pipeline installation including pipe bridges. The route will then run north along First Street to Prescott Road, bordered by open pastureland to the west and plowed agricultural fields to the east. The route turns northeast onto Prescott Road, where the main will cross a drainage ditch near the True Leaf Farms agricultural processing facility (Crossing 2), then turn east on San Justo Road. Construction at Crossing 2 will result in the temporary disturbance of 0.02 acres of habitat and the permanent development of 0.0079 acres of habitat within the upper banks of the channel. Construction activities include excavation of a 93-square-foot portion and a 110-square-foot portion of the upper banks and pipeline installation including pipe bridges. From this point on, the main route to Hollister is bounded on both sides by agricultural fields, agricultural processing facilities, orchards, farms, and rural residences. From San Justo Road, the route turns south on Lucy Brown Road. At this point along the main route, temporary disturbance associated with staging will occur within a 0.8-acre disturbed dirt lot along Lucy Brown Road (Figure 2). From Lucy Brown Road, the main route turns east on Duncan Avenue, south on Bixby Road, east on Freitas Road, and north on Mitchell Road until it reaches the Hollister Domestic WWTP. The sewer route parallels a WWTP access road, then crosses under State Route 156 and through an area with mature coast live oak (*Quercus agrifolia*), blue gum eucalyptus (*Eucalyptus globulus*), pine (*Pinus* sp.), acacia (*Acacia* sp.), and several small coast redwood (*Sequoia sempervirens*) trees and nonnative grasses before ending at a concrete pad within the Hollister Domestic WWTP facility. At the Hollister Domestic WWTP, construction will result in the temporary disturbance of 1.5 acres of habitat and the removal of up to eight trees (Figure 5). Staging will also occur within a 0.3-acre paved portion of the Hollister domestic WWTP site (Figure 2).

Project activities include trench digging with widths up to three feet wide and seven to eight feet deep along most of the route, and up to 15 feet deep where the force main will be placed within the existing 18-inch sewer line. During construction, it is likely that more than a three-foot-wide area would be disturbed, though most of the disturbed area will be in the existing paved lanes. The proposed main improvements will be primarily within the county road rights-of-way, which are generally 40 to 60 feet wide. Agricultural crops or other improvements within the rights-of-way will not be disturbed. Approximately 200 to 600 feet of pipeline will be installed per day. Excavation, pipe installation, and backfilling will occur simultaneously and in sequence. Once the force main has been placed, the full drive lane will be repaved. Pipe

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bridges will be installed at Crossing 1 and Crossing 2. No heavy equipment will operate within the channels.

Equipment

To construct the pipeline, required equipment will include a backhoe or excavator for trench digging, dump trucks or flatbed trucks for material delivery, pick-up trucks, paving machines and rollers, a loader, and a striping truck. For construction at the drainage channel crossings, equipment will include a backhoe or excavator for material removal and equipment placement, a dump truck for material delivery, pick-up trucks, and a concrete truck or mixer to deliver concrete for the pipe bridge footings.

V. Covered Species Subject to Take Authorization Provided by this ITP:

This ITP covers the following species:

<u>Name</u>	<u>CESA Status</u> ³
1. California tiger salamander (<i>Ambystoma californiense</i>)	Threatened ⁴

This species and only this species is the “Covered Species” for the purposes of this ITP.

VI. Impacts of the Taking on Covered Species:

Project activities and their resulting impacts are expected to result in the incidental take of individuals of the Covered Species. The activities described above expected to result in incidental take of individuals of the Covered Species include: removing vegetation and trees; demolition and equipment removal; grading; equipment installation; excavating; soil stockpiling; materials and equipment staging and laydown; transporting materials and other Project-related traffic; movement of heavy equipment; trench digging, pipeline installation, backfilling, and paving; and other related activities described in the Project Description section of this ITP (Covered Activities).

Incidental take of individuals of the Covered Species in the form of mortality (“kill”) may occur as a result of Covered Activities such as construction vehicle/equipment strikes; burrow collapse associated with grubbing, grading, excavating, and vegetation and topsoil removal; crushing or suffocation by heavy equipment or laydown of equipment and materials; entombment from deposition of soil over occupied burrows; and entrapment and desiccation within trenches, open pipelines, and uncovered excavations. Incidental take of individuals of the Covered Species may also occur from the Covered Activities in the form of pursue, catch, capture, or attempt to do so of the Covered Species from uncovering through the excavation of burrow systems, corralling into a confined area when barrier fencing is erected around the Project site, and when individuals of the Covered Species are salvaged, collected, and relocated or translocated out of harm’s way as required by this ITP. Take of the Covered Species is only authorized and expected to occur in the Project site and only as a result of Covered Activities. The areas where authorized take of the Covered Species is expected to

³ Under CESA, a species may be on the list of endangered species, the list of threatened species, or the list of candidate species.

⁴See Cal. Code Regs. tit. 14 § 670.5, subd. (b)(3)(G).

occur include: permanent and temporary impact areas associated with the construction and modification of the San Juan Bautista WWTP; temporary and permanent impact areas associated with Crossings 1 and 2; temporary impact areas associated with the pipeline at the Hollister Domestic WWTP; temporary impact areas associated with staging areas at the San Juan Bautista WWTP, the Hollister Domestic WWTP, and along Lucy Brown Road; and temporary impact areas associated with the pipeline within existing paved roadways and WWTP facilities (collectively, the Project Area).

The Project is expected to cause the permanent loss of 0.06 acres of upland grassland habitat for the Covered Species, temporary loss of 1.75 acres of upland grassland habitat for the Covered Species, and temporary impacts to 33.3 acres of low-quality dispersal habitat for the Covered Species consisting of 32.5 acres of previously developed paved roadways and WWTP facilities, and a 0.8-acre disturbed dirt lot. Impacts of the authorized taking also include adverse impacts to the Covered Species related to temporal losses, increased habitat fragmentation and edge effects, and the Project's incremental contribution to cumulative impacts (indirect impacts). These impacts include introduction or spread of invasive species; increased risk of exposure and desiccation along wildlife exclusion fencing; stress resulting from noise, vibrations, capture, and relocation; displacement from preferred habitat; loss of burrowing habitat used for shelter and cover; increased competition for food and space; and increased vulnerability to predation. In addition, individuals displaced due to habitat loss and degradation may be unable to survive in adjacent areas if these areas are at carrying capacity or are unsuitable for colonization.

Upon completion of the Project, the San Juan Bautista WWTP ponds will be converted to emergency storage basins and will no longer be configured for treatment. Conversion of the San Juan Bautista WWTP ponds to emergency storage basins is not expected to cause an impact to breeding habitat for the Covered Species. The ponds are used for the storage of untreated sewage and effluent. The 0.6-acre upper pond is a mix of raw sewage and concentrated mixed liquor (i.e., bacteria and microorganisms). The upper pond contains surface aerators that agitate and mix the entire basin contents in a process called Sequencing Batch Reactor. The basin operates according to the following sequence in perpetuity: approximately 30 minutes of aeration and mixing, 30 minutes of sludge settling, followed by 30 minutes of decanting of partially treated sewage to the lower pond for additional settling. When mixed, the mixed liquor concentration in the upper pond can be near 3,000 mg/l of biological solids. Storage and final treatment of wastewater prior to discharge occurs in the 1.1-acre lower pond. According to the City of San Juan Bautista, the San Juan Bautista WWTP has been unable to comply with its National Pollutant Discharge Elimination System (NPDES) permit since 2009 due to multiple water quality factors (Table 1). The effluent also has ongoing discharge violations to No Name Creek for biological oxygen demand, total suspended solids, ammonia, and coliform. Additionally, the hardness of the water ranges from 330 to 370 mg/l as calcium carbonate. Due to the poor water quality in both ponds and the ongoing cycle of intense agitation in the upper pond, impacts to Covered Species breeding habitat are not expected.

Table 1. San Juan Bautista Wastewater Treatment Plant Water Quality

Constituent	Historic Average Annual (mg/l)	Max Sample (mg/l)	Current NPDES Limit (mg/l)	Anticipated New NPDES Limit (mg/l)
TDS (Total Dissolved Salts)	1,800	2,700	1,400	1,200
Chloride	600	1,200	200	150
Sodium	300	550	250	200

The San Juan Bautista WWTP is currently discharging non-compliant effluent to No Name Creek. Once the pipeline is operational, the proposed Project will eliminate approximately 180,000 gallons of effluent per day (0.3 cubic feet per second) currently discharged from the San Juan Bautista WWTP to No Name Creek. Downstream of the San Bautista WWTP discharge point, natural riparian habitat along No Name Creek only occurs until the first undercrossing on San Juan Highway (approximately 5,030 feet downstream from the San Juan Bautista WWTP), as depicted in Figure 6. Beyond this point, the creek is within highly managed agricultural fields where riparian vegetation is absent and presumably actively removed by agricultural operations. Other sources of water that flow to No Name Creek include stormwater runoff from the upstream watershed and a network of stormwater drains in the adjoining neighborhood. Elimination of discharge from the San Juan Bautista WWTP will reduce ponding in the summer months within No Name Creek and in a nearby 0.1-acre stormwater collection pond. Although the loss of effluent will reduce the amount of aquatic habitat available during the summer months, stormwater inputs to No Name Creek are expected to continue to provide potential breeding habitat for the Covered Species throughout the breeding season, and the reduction of contaminants will improve water quality in No Name Creek. Therefore, impacts to breeding habitat for the Covered Species are not expected.

VII. Incidental Take Authorization of Covered Species:

This ITP authorizes incidental take of the Covered Species and only the Covered Species. With respect to incidental take of the Covered Species, CDFW authorizes the Permittee, its employees, contractors, and agents to take Covered Species incidentally in carrying out the Covered Activities, subject to the limitations described in this section and the Conditions of Approval identified below. This ITP does not authorize take of Covered Species from activities outside the scope of the Covered Activities, take of Covered Species outside of the Project Area, take of Covered Species resulting from violation of this ITP, or intentional take of Covered Species except for capture and relocation of Covered Species as authorized by this ITP.

VIII. Conditions of Approval:

Unless specified otherwise, the following measures apply to all Covered Activities within the Project Area, including areas used for vehicular ingress and egress, staging and parking, and noise and vibration generating activities that may/will cause take. CDFW's issuance of this ITP and Permittee's authorization to take the Covered Species are subject to Permittee's compliance with and implementation of the following Conditions of Approval:

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No. 2081-2022-033-04
CITY OF SAN JUAN BAUTISTA

SAN JUAN BAUTISTA TO HOLLISTER SEWER FORCE MAIN

1. **Legal Compliance:** Permittee shall comply with all applicable federal, state, and local laws in existence on the effective date of this ITP or adopted thereafter.
2. **California Environmental Quality Act (CEQA) Compliance:** Permittee shall implement and adhere to the mitigation measures related to the Covered Species in the Biological Resources section of the San Juan Bautista to Hollister Sanitary Sewer Force Main Mitigated Negative Declaration (SCH No.: 2021110032) adopted by City of San Juan Bautista on December 15, 2021, as lead agency for the Project pursuant to CEQA (Pub. Resources Code, § 21000 et seq.).
3. **Lake and Streambed Alteration (LSA) Agreement Compliance:** Permittee shall implement and adhere to the mitigation measures and conditions related to the Covered Species in the LSA Agreement (Notification No. SBO-29921-R4) for the Project executed by CDFW pursuant to Fish and Game Code section 1600 et seq.
4. **Endangered Species Act (ESA) Compliance:** Permittee shall implement and adhere to the terms and conditions related to the Covered Species in the Biological Opinion for the San Juan Bautista to Hollister Sewer Force Main Project, San Benito County, California (2022-0031493) for the Project pursuant to the Federal ESA. For purposes of this ITP, where the terms and conditions for the Covered Species in the federal authorization are less protective of the Covered Species or otherwise conflict with this ITP, the conditions of approval set forth in this ITP shall control.
5. **ITP Time Frame Compliance:** Permittee shall fully implement and adhere to the conditions of this ITP within the time frames set forth below and as set forth in the Mitigation Monitoring and Reporting Program (MMRP), which is included as Attachment 1 to this ITP.
6. **General Provisions:**
 - 6.1. Designated Representative. Before starting Covered Activities, Permittee shall designate a representative (Designated Representative) responsible for communications with CDFW and overseeing compliance with this ITP. Permittee shall notify CDFW in writing before starting Covered Activities of the Designated Representative's name, business address, and contact information, and shall notify CDFW in writing if a substitute Designated Representative is selected or identified at any time during the term of this ITP.
 - 6.2. Designated Biologist(s) and/or Designated Monitor(s). Permittee shall submit to CDFW in writing the name, qualifications, business address, contact information, and references with contact information of Designated Biologist(s) and Designated Monitor(s) using the Biologist Resume Example (Attachment 2) or another format containing the same information. This information shall be submitted for CDFW review and approval at least 30 days before starting Covered Activities. The Designated Biologist(s) shall be responsible for monitoring Covered Activities to

help minimize and fully mitigate or avoid the incidental take of the Covered Species and to minimize disturbance of Covered Species' habitat. The Designated Monitor(s) shall assist the Designated Biologist(s) in compliance monitoring under direction/supervision of the Designated Biologist(s). Designated Monitor responsibilities will be restricted to a specific set of Conditions of Approval, specified by the Permittee or Designated Representative at the time their qualifications are submitted for review. Permittee shall ensure that the Designated Biologist(s) and Designated Monitor(s) are knowledgeable and experienced in the Covered Species' biology, natural history, collecting and handling, as well as excavating burrows/crevices to minimize mortality and monitoring construction activities following the Conditions of Approval of an ITP for the Covered Species. The Designated Biologist(s) and Designated Monitor(s) shall be responsible for monitoring Covered Activities to help minimize and fully mitigate or avoid the incidental take of individual Covered Species and to minimize disturbance of Covered Species' habitat. Permittee shall obtain CDFW approval of the Designated Biologist(s) and Designated Monitor(s) in writing before starting Covered Activities and shall also obtain approval in advance, in writing, if the Designated Biologist(s) or Designated Monitor(s) must be changed.

- 6.3.** Designated Biologist/Designated Monitor Authority. To ensure compliance with the Conditions of Approval of this ITP, the Designated Biologist and/or Designated Monitor shall be given the authority to immediately stop any activity that does not comply with this ITP and/or order any reasonable measure to avoid the unauthorized take of an individual of the Covered Species. Permittee shall provide unfettered access to the Project Area and otherwise facilitate the Designated Biologist and/or Designated Monitor in the performance of their duties. If the Designated Biologist and/or Designated Monitor is unable to comply with the ITP, then the Designated Biologist and/or Designated Monitor shall notify the CDFW Regional Representative (detailed in the Notices section below) immediately. Permittee shall not enter into any agreement or contract of any kind, including but not limited to non-disclosure agreements and confidentiality agreements, with its contractors and/or the Designated Biologist/Designated Monitor that prohibit or impede open communication with CDFW, including but not limited to providing CDFW staff with the results of any surveys, reports, or studies or notifying CDFW of any non-compliance or take. Failure to notify CDFW of any non-compliance or take or injury of a Covered Species as a result of such agreement or contract may result in CDFW taking actions to prevent or remedy a violation of this ITP.
- 6.4.** Education Program. Permittee shall conduct an education program for all persons employed or otherwise working in the Project Area before they can perform any work within the Project Area. The program shall consist of a presentation from the Designated Biologist that includes a discussion of the biology and general behavior of the Covered Species, information about the distribution and habitat needs of the Covered Species, sensitivity of the Covered Species to human activities, its status pursuant to CESA including legal protection, recovery efforts, penalties for

violations, and Project-specific protective measures described in this ITP. Permittee shall prepare and distribute wallet-sized cards or a fact sheet handout containing this information for workers to carry in the Project Area. Permittee shall provide interpretation for all non-English speaking workers, and the same instruction shall be provided to any new workers before they are authorized to perform work in the Project Area. Upon completion of the program, employees shall sign a form stating they attended the program and understand all protection measures. This training shall be repeated at least once annually for long-term and/or permanent employees that will be conducting work in the Project Area.

- 6.5.** Construction Monitoring Documentation. The Designated Biologist(s) and Designated Monitor(s) shall maintain construction-monitoring documentation onsite in either hard copy or digital format throughout the construction period, which shall include a copy of this ITP with attachments and a list of signatures of all personnel who have successfully completed the education program. Permittee shall ensure a copy of the construction-monitoring documentation is available for review at the Project Area upon request by CDFW.
- 6.6.** Trash Abatement. Permittee shall initiate a trash abatement program before starting Covered Activities and shall continue the program for the duration of the Project. Permittee shall ensure that trash and food items are contained in animal-proof containers and removed, ideally at daily intervals but at least once a week, to avoid attracting opportunistic predators such as ravens, coyotes, and feral dogs.
- 6.7.** Dust Control. Permittee shall implement dust control measures during Covered Activities to facilitate visibility for monitoring of the Covered Species by the Designated Biologist. Permittee shall keep the amount of water used to the minimum amount needed and shall not allow water to form puddles.
- 6.8.** Erosion Control Materials. Permittee shall prohibit use of erosion control materials potentially harmful to Covered Species and other species, such as monofilament netting (erosion control matting) or similar material, in potential Covered Species habitat.
- 6.9.** Delineation of Property Boundaries. Before starting Covered Activities along each part of the route in active construction, Permittee shall clearly delineate the boundaries of the Project Area with fencing, stakes, or flags. Permittee shall restrict all Covered Activities to within the fenced, staked, or flagged areas. Permittee shall maintain all fencing, stakes, and flags until the completion of Covered Activities in that area.
- 6.10.** Delineation of Habitat. Permittee shall clearly delineate habitat of the Covered Species within the Project Area with posted signs, posting stakes, flags, and/or rope or cord, and place fencing as necessary to minimize the disturbance of Covered Species habitat. Permittee shall maintain all signs, stakes, flags, rope,

cord, and fencing until the completion of Covered Activities in that area, at which time they should be removed.

- 6.11. Project Access.** Project-related personnel shall access the Project Area using existing routes and shall not cross Covered Species habitat outside of or en-route to the Project Area. Permittee shall restrict Project-related vehicle traffic to established roads, staging, and parking areas. Permittee shall ensure that vehicle speeds do not exceed 20 miles per hour to avoid Covered Species on or traversing the roads. If Permittee determines construction of routes for travel are necessary outside of the Project Area, the Designated Representative shall contact CDFW for written approval before carrying out such an activity. CDFW may require an amendment to this ITP, among other reasons, if additional take of Covered Species will occur as a result of the Project modification.
- 6.12. Staging Areas.** Permittee shall confine all Project-related parking, storage areas, laydown sites, equipment storage, and any other surface-disturbing activities to the Project Area using, to the extent possible, previously disturbed areas. Additionally, Permittee shall not use or cross Covered Species habitat outside of the marked Project Area unless provided for as described in Condition of Approval 6.11 of this ITP.
- 6.13. Hazardous Waste.** Permittee shall immediately stop and, pursuant to pertinent state and federal statutes and regulations, arrange for repair and clean up by qualified individuals of any fuel or hazardous waste leaks or spills at the time of occurrence, or as soon as it is safe to do so. Permittee shall exclude the storage and handling of hazardous materials from the Project Area and shall properly contain and dispose of any unused or leftover hazardous products off-site.
- 6.14. CDFW Access.** Permittee shall provide CDFW staff with reasonable access to the Project and shall otherwise fully cooperate with CDFW efforts to verify compliance with or effectiveness of mitigation measures set forth in this ITP.
- 6.15. Refuse Removal.** Upon completion of Covered Activities, Permittee shall remove from the Project Area and properly dispose of all temporary fill and construction refuse, including, but not limited to, broken equipment parts, wrapping material, cords, cables, wire, rope, strapping, twine, buckets, metal or plastic containers, and boxes.

7. Monitoring, Notification, and Reporting Provisions:

- 7.1. Notification Before Commencement.** The Designated Representative shall notify CDFW 14 calendar days before starting Covered Activities and shall document

compliance with all pre-Project Conditions of Approval before starting Covered Activities.

- 7.2. Notification of Non-compliance.** The Designated Representative and/or the Designated Biologist shall immediately notify CDFW if the Permittee is not in compliance with any Condition of Approval of this ITP, including but not limited to any actual or anticipated failure to implement measures within the time periods indicated in this ITP and/or the MMRP. The Designated Representative and/or the Designated Biologist shall follow notification with a written report to CDFW within 24 hours describing, in detail, any non-compliance with this ITP and suggested measures to remedy the situation.
- 7.3. Covered Species Mortality Reduction and Relocation Plan.** The Designated Biologist shall prepare a Covered Species Mortality Reduction and Relocation Plan and submit it to CDFW for review and approval a minimum of 30 days prior to the beginning of Covered Activities. The Covered Species Mortality Reduction and Relocation Plan shall include, but not be limited to, a discussion and map of the portion of the Project Area which represents potential upland habitat; identification of the area within 1.3 miles of known or potential breeding habitat for Covered Species; detailed survey, capture, handling, and relocation methods; identification of relocation areas; and identification of a wildlife rehabilitation center or veterinary facility capable of treating injured wild amphibians. Covered Activities may not proceed until the Covered Species Mortality Reduction and Relocation Plan is approved in writing by CDFW. Designated Monitors are prohibited from capturing and handling the Covered Species unless specifically approved in writing by CDFW and under the direct supervision of the Designated Biologist(s). Any proposed changes to the CDFW-approved Covered Species Mortality Reduction and Relocation Plan shall be submitted in writing to CDFW and approved by CDFW in writing prior to implementation of any proposed Covered Species Mortality Reduction and Relocation Plan modifications.
- 7.4. Habitat Restoration Plan.** Permittee shall prepare a Habitat Restoration Plan to facilitate revegetation of the 1.75 acres of upland habitat that will be temporarily disturbed by the Project at the San Juan Bautista WWTP (0.2 acres), Crossing 1 (0.03 acres), Crossing 2 (0.02 acres), and the Hollister Domestic WWTP (1.5 acres). Permittee shall restore the soil and vegetation to a condition conducive for Covered Species recolonization and shall ensure the restoration is successfully implemented. Permittee shall submit the Habitat and Restoration Plan to CDFW for review and approval a minimum of 30 days prior to implementing revegetation activities. At a minimum, the Plan shall include the following information: (1) a map that identifies the location of the areas to be revegetated; (2) a description of the existing physical and biological conditions of the areas prior to commencement of any restoration or enhancement activities; (3) a plan for initial removal of nonnative plant species, trash, and debris; (4) a California native plant palette and seed sources; (5) a planting plan, including seed application method; (6) the time of year

seeding will occur to ensure adequate growth without supplemental watering or describe the methods of supplemental water delivery; (7) procedures to ensure that nonnative plants are not introduced or allowed to sustain within the revegetation areas and an annual nonnative removal plan; (8) monitoring and maintenance measures and a timeline when these will occur; (9) proposed success criteria and contingency measures if the first application is unsuccessful; (10) the timeframe for which the revegetation areas must sustain themselves without supplemental watering and meet the identified success criteria; and (11) a funding source to cover the total costs of restoration.

7.5. Geographic Information Systems Data Files. Before starting Covered Activities, the Permittee shall provide CDFW with separate Geographic Information Systems (GIS) data files for the temporary and permanent habitat impact areas authorized under this ITP for the Project Area. If habitat for a Covered Species will be both temporarily and permanently impacted, the Permittee shall provide one set of GIS data files for each impact type. The Permittee shall provide any additional GIS data files for the Project or related Covered Species features within 30 days of CDFW's request. All GIS data files shall be provided in a format acceptable to CDFW.

7.6. Compliance Monitoring. The Designated Biologist shall be on site for the duration of the day when Covered Activities occur and conduct at least daily compliance inspections. The Designated Biologist shall conduct compliance inspections a minimum of weekly during periods of inactivity and after clearing, grubbing, and grading are completed. The Designated Biologist shall conduct compliance inspections to:

- (1) minimize incidental take of the Covered Species;
- (2) prevent unlawful take of species;
- (3) check for compliance with all measures of this ITP;
- (4) check all exclusion zones; and
- (5) ensure that signs, stakes, and fencing are intact, and that Covered Activities are only occurring in the Project Area.

The Designated Representative or Designated Biologist shall prepare daily written observation and inspection records summarizing oversight activities and compliance inspections, observations of Covered Species and their sign, survey results, and monitoring activities required by this ITP.

7.7. Record of Covered Species Relocation. The Designated Biologist shall maintain a record of Covered Species handled and all documented observations of Covered Species. This information shall include for each animal: (1) date, time, and location (Global Positioning System (GPS) coordinates and maps) and capture and/or observation as well as release, if applicable; (2) the name of the party that identified the Covered Species; (3) circumstances of the incident; (4) the general

condition and health, noting all visible conditions including gait and behavior, ectoparasites, injuries, etc.; (5) any diagnostic markings, sex, age (juvenile or adult); (6) actions undertaken; (7) habitat description; and (8) ambient temperature when handled and released or observed. The Designated Biologist shall also submit this information to the CNDDDB as per Condition of Approval 7.10 below. The Designated Biologist shall prepare a Relocation Summary and include it in the Quarterly Compliance and Annual Status Reports described in Conditions of Approval 7.8 and 7.9, respectively, below.

- 7.8. Quarterly Compliance Report.** The Designated Representative or Designated Biologist shall compile the observation and inspection records identified in Conditions of Approval 7.6 and 7.7 into a Quarterly Compliance Report and submit it to CDFW along with a copy of the MMRP table with notes showing the current implementation status of each mitigation measure. Quarterly Compliance Reports shall also include an accounting of the number of acres that have been permanently and temporarily disturbed by the Project within the Project Area, both for the prior quarter, and the total since ITP issuance, if applicable; the number of acres of habitat disturbance anticipated to occur in the Project Area during the coming quarter, if applicable; a summary of all pre-activity surveys and compliance monitoring conducted during the previous quarter; and the activities authorized under the Covered Activities which occurred during the previous quarter. Quarterly Compliance Reports shall be due by January 15, April 15, July 15, and October 15. Quarterly Compliance Reports shall be submitted via email to the CDFW Regional Representative, as well as the Regional and Headquarters offices and personnel listed in the Notices section of this ITP. CDFW may at any time increase the timing and number of compliance inspections and reports required under this provision depending upon the results of previous compliance inspections. If CDFW determines the reporting schedule must be changed, CDFW will notify Permittee in writing of the new reporting schedule.
- 7.9. Annual Status Report.** Permittee shall provide CDFW with an Annual Status Report (ASR) no later than January 31 of every year beginning with issuance of this ITP and continuing until CDFW accepts the Final Mitigation Report identified below. Each ASR shall include, at a minimum: (1) a summary of all Quarterly Compliance Reports for that year identified in Condition of Approval 7.8; (2) a general description of the status of the Project Area and Covered Activities, including actual or projected completion dates, if known; (3) a copy of the table in the MMRP with notes showing the current implementation status of each mitigation measure; (4) an assessment of the effectiveness of each completed or partially completed mitigation measure in avoiding, minimizing and mitigating Project impacts; (5) all available information about Project-related incidental take of the Covered Species; and (6) information about other Project impacts on the Covered Species. ASRs shall be submitted to CDFW following the directions provided in Condition of Approval 7.8 above.

- 7.10. CNDDDB Observations.** The Designated Biologist shall submit all observations of Covered Species to CDFW's California Natural Diversity Database (CNDDDB) within 60 calendar days of the observation and the Designated Biologist shall include copies of the submitted forms with the next Quarterly Compliance Report or ASR, whichever is submitted first relative to the observation.
- 7.11. Final Mitigation Report.** No later than 45 days after completion of all mitigation measures, Permittee shall provide CDFW with a Final Mitigation Report following the directions provided in Condition of Approval 7.8 above. The Designated Representative or Designated Biologist shall prepare the Final Mitigation Report which shall include, at a minimum: (1) a summary of all Quarterly Compliance Reports and all ASRs; (2) a copy of the table in the MMRP with notes showing when each of the mitigation measures was implemented; (3) all available information about Project-related incidental take of the Covered Species; (4) information about other Project impacts on the Covered Species; (5) beginning and ending dates of Covered Activities; (6) an assessment of the effectiveness of this ITP's Conditions of Approval in minimizing and fully mitigating Project impacts of the taking on Covered Species; (7) recommendations on how mitigation measures might be changed to more effectively minimize take and mitigate the impacts of future projects on the Covered Species; and (8) any other pertinent information.
- 7.12. Notification of Take or Injury.** Permittee shall immediately notify the Designated Biologist if a Covered Species is taken or injured by a Project-related activity, or if a Covered Species is otherwise found dead or injured within the vicinity of the Project Area. The Designated Biologist or Designated Representative shall provide initial notification to CDFW by calling the Regional Office at (559) 243-4005 and by email to the CDFW Regional Representative. The initial notification to CDFW shall include information regarding the location, species, and number of animals taken or injured and the ITP Number. Following initial notification, Permittee shall send CDFW a written report within two calendar days. The report shall include the date and time of the finding or incident, location of the animal or carcass, an explanation as to cause of take or injury, photograph(s), if possible, and any other pertinent information.

8. Take Minimization Measures: The following requirements are intended to ensure the minimization of incidental take of Covered Species in the Project Area during Covered Activities. Permittee shall implement and adhere to the following conditions to minimize take of Covered Species:

- 8.1. Pre-Activity Clearance Survey and Reporting.** No more than 14 calendar days prior to initiating Covered Activities within the Project Area, the Designated Biologist shall survey the Project Area for individuals of the Covered Species. These surveys shall provide 100 percent visual coverage (including burrow and crevice openings) within the Project Area as well as a 50-foot buffer zone around the Project Area,

with the exception that areas outside of the Permittee's access and/or control need not be surveyed. If individuals of the Covered Species are found, the Designated Biologist(s) shall relocate them in accordance with the CDFW-approved Covered Species Mortality Reduction and Relocation Plan (Condition of Approval 7.3). The Permittee shall provide the survey results to CDFW in a written report prior to the beginning of Covered Activities.

- 8.2. Flag Burrows/Crevices.** During Pre-Activity Clearance Surveys (conducted as detailed in Condition of Approval 8.1), the Designated Biologist shall flag all animal burrows and crevices suitable for Covered Species occupancy within the Project Area and a 50-foot buffer outside the Project Area. An avoidance buffer of 50 feet or greater around animal burrows/crevices shall be maintained regardless of whether the burrow/crevice is in the Project Area or solely within the Project Area's 50-foot buffer zone. Flagged burrows/crevices which occur within 630 meters of known or potential breeding habitat and which cannot be avoided by at least 50 feet shall be fully excavated in accordance with Condition of Approval 8.3 below.
- 8.3. Burrow/Crevice Excavation.** Prior to initiating ground-disturbing Covered Activities within the Project Area, animal burrows and crevices identified during the Pre-Activity Clearance Surveys (Condition of Approval 8.1) and flagged (Condition of Approval 8.2) within 630 meters of known or potential Covered Species breeding habitat as identified in the Covered Species Mortality Reduction and Relocation Plan (Condition of Approval 7.3), and which cannot be fully avoided by at least 50 feet, shall be fully excavated. Applicable burrows/crevices may be excavated by hand or in a manner otherwise approved by CDFW in accordance with the CDFW-approved Covered Species Mortality Reduction and Relocation Plan (Condition of Approval 7.3). Burrow/crevice excavation shall occur under the direct supervision of the Designated Biologist(s).

Animal burrows and crevices identified outside of the Project Area, but within the Project Area's 50-foot buffer zone, shall be similarly excavated if they lie within 50 feet of ground-disturbing Covered Activities occurring within the Project Area. Burrows/crevices outside of the Permittee's access and/or control do not need to be excavated. The Designated Biologist(s) shall relocate any live Covered Species discovered during burrow/crevice excavation in accordance with the Covered Species Mortality Reduction and Relocation Plan required in Condition of Approval 7.3 above. Excavation shall occur no more than 14 days after the completion of the Pre-Activity Clearance Surveys as described in Condition of Approval 8.1.

- 8.4. Exclusion Fencing.** Prior to initiation of Covered Activities and following surveying, flagging, and excavating burrows/crevices in accordance with Conditions of Approval 8.1, 8.2, and 8.3 above, Permittee shall install exclusion fencing around the perimeter of the Project Area to prevent Covered Species from migrating into the cleared Project Area.

For linear portions of the Project Area (e.g., force main route), Permittee shall install temporary exclusion fencing prior to ground-disturbing activities in a sequential manner that corresponds to the progression of active construction on the route. For example, temporary fencing shall be installed along the portions of the route under active construction and shall be removed immediately upon completion of Covered Activities in each segment to minimize fragmentation of habitat. In other words, at any given time, exclusion fencing shall not be installed along the entire length of the force main route. Exclusion fencing is not required along the route when used solely for ingress/egress to other portions of the Project Area.

Permittee shall submit an Exclusion Fencing Plan to CDFW for review and approval a minimum of 30 days prior to commencing Covered Activities. Installation of exclusion fencing, and initiation of Covered Activities shall not proceed until the Exclusion Fencing Plan has been approved in writing by CDFW. The Exclusion Fencing Plan shall include:

- (1) fencing materials;
- (2) fencing design, layout (including maps), and installation methods;
- (3) earthen one-way exit ramps to avoid entrapment of Covered Species (include design, number of exit ramps/spacing, and locations);
- (4) cover boards along both sides of the fence to provide refuge areas for Covered Species (include number of cover boards/spacing, material of cover boards, size of individual cover boards, and locations);
- (5) access gate design and location;
- (6) specification of the maximum continuous linear length of fencing to be installed at any given time along linear portions of the Project Area; and
- (7) inspection, maintenance, repair, and replacement methods and intervals.

8.5. Exclusion Fence Installation. The exclusion fence shall be installed under the direct supervision of the Designated Biologist and begin no later than 48 hours after the burrow/crevice excavation and relocation activities per Condition of Approval 8.3, where applicable, are complete.

The Permittee shall also avoid animal burrows and crevices to the maximum extent possible during the installation of the exclusion fence, in accordance with Conditions of Approval 8.2 and 8.3 above. The exclusion fence shall be supported sufficiently to maintain its integrity under all conditions, such as wind and heavy rain, for the duration that it is in place. Permittee shall remove exclusion fencing immediately upon completion of Covered Activities in the fenced Project Area.

- 8.6.** Covered Species Refuge Areas/Cover Boards. The Designated Biologist shall inspect refuge areas (i.e., cover boards) each morning as well as during and after rain events. Covered Species within the interior fence should be given the ability to leave on their own accord before active relocation is attempted in accordance with the Covered Species Mortality Reduction and Relocation Plan (Condition of Approval 7.3)
- 8.7.** Fieldwork Code of Practice. To ensure that the Designated Biologist(s) or Designated Monitors(s) do not convey disease between the Project Area and areas outside of the Project Area, the Fieldwork Code of Practice developed by the Declining Amphibian Populations Task Force (see Attachment 3) shall be followed at all times. The Designated Biologist(s) or Designated Monitor(s) may substitute a bleach solution (0.5 to 1.0 cup of bleach to 1.0 gallon of water) for the ethanol solution. Care shall be taken so that all traces of the disinfectant are removed before entering the next aquatic habitat.
- 8.8.** Rain Forecast. The Designated Biologist and Permittee shall monitor the National Weather Service 72-hour forecast for the Project Area. During rainfall events and/or when a 50 percent or greater chance of rainfall is predicted within 72 hours, the Permittee shall cease all Covered Activities in the Project Area where initial ground disturbance (vegetation removal, grading, grubbing, and excavation) has yet to occur until the rainfall ceases and a zero percent chance of rain is forecast. Covered Activities may continue during rainfall events and/or when a 50 percent or greater chance of rain is forecast within portions of the Project Area that have already been cleared of Covered Species (in accordance with Conditions of Approval 8.1, 8.2, and 8.3) and which are surrounded by exclusion fence that has been properly maintained and is in good repair, in accordance with the Project's CDFW-approved Exclusion Fencing Plan (as detailed in Condition of Approval 8.4).
- 8.9.** Soil and Materials Stockpiles. Permittee shall ensure that soil stockpiles are placed where soil will not pass into the potential Covered Species breeding habitat, or into any other "Waters of the State," in accordance with Fish and Game Code section 5650. Permittee shall appropriately protect stockpiles to prevent soil erosion. Permittee shall stockpile and stage all materials and equipment in a manner that discourages Covered Species use. In all locations, Permittee shall not place bundled or loose materials directly on the ground. These materials shall be elevated to discourage use by Covered Species. Permittee shall not place materials outside of exclusion fencing.
- 8.10.** Open Excavations. Designated Biologist(s) shall inspect all open holes, sumps, and trenches within the Project Area at the beginning and end of each workday (including once daily on any other non-workdays) for trapped Covered Species. To prevent inadvertent entrapment of Covered Species, all open trenches, holes, sumps, and other excavations with sidewalls steeper than a 1:1 (45 degree) slope shall have an escape ramp of earth or a non-slip material with a less than

1:1 (45 degree) slope. At the end of each workday, Project worker(s) shall ensure all trenches, holes, sumps, or other excavations with sidewalls steeper than a 1:1 (45 degree) slope of any depth are covered with barrier material (e.g., hardware cloth) such that animals are unable to dig or squeeze under the barrier and become entrapped. The outer two feet of excavation cover shall conform to solid ground so that gaps do not occur between the cover and the ground, and the excavation cover shall be secured with soil staples or by similar means to prevent gaps. Project worker(s) shall also thoroughly inspect all open trenches, holes, sumps, or other excavations for Covered Species (or other wildlife) before they are backfilled. If any worker discovers that Covered Species have become trapped, Permittee shall cease all Covered Activities in the vicinity and notify the Designated Biologist(s) immediately. Project workers and the Designated Biologist(s) shall allow Covered Species to escape unimpeded, if possible, before Covered Activities are allowed to continue, or the Designated Biologist(s) may capture and relocate the Covered Species as per the Covered Species Mortality Reduction and Relocation Plan required in Condition of Approval 7.3 above.

- 8.11. Vehicle and Equipment Inspection.** Within the Project Area, workers shall inspect under vehicles and equipment for Covered Species before the vehicles and equipment are moved. If a Covered Species is present, the worker shall notify the Designated Biologist(s) and wait for the Covered Species to move unimpeded to a safe location. Alternatively, the Designated Biologist(s) may move the Covered Species out of harm's way outside of the Project Area in compliance with the approved Covered Species Mortality Reduction and Relocation Plan required in Condition of Approval 7.3.
- 8.12. Pipes and other Structures Entrapment Prevention.** Permittee shall ensure that all pipes, hoses, conduit, culverts, or similar materials stockpiled or installed in the Project Area are capped or otherwise enclosed at the ends to prevent entry by Covered Species. Workers shall thoroughly inspect all construction pipe, culverts, or other similar structures with a diameter of one inch or greater that are stored for one or more overnight periods for the Covered Species before the object is subsequently moved, buried, or capped. If an individual of the Covered Species is discovered inside a pipe, culvert, or similar structure during inspection, the worker shall notify the Designated Biologist(s) and wait for the Covered Species to move unimpeded to a safe location. Alternatively, the Designated Biologist(s) may move the Covered Species out of harm's way outside of the Project Area in compliance with the approved Covered Species Mortality Reduction and Relocation Plan required in Condition of Approval 7.3.
- 8.13. Covered Species Observations.** During all Covered Activities within the Project Areas, all workers shall inform the Designated Biologist(s) if a Covered Species is observed within or near the Project Area. All work in the vicinity of the observed Covered Species, which could injure or kill the animal, shall cease immediately until it moves from the Project Area of its own accord, or the Designated

Biologist(s) relocates the Covered Species following the CDFW-approved Covered Species Mortality Reduction and Relocation Plan specified in Condition of Approval 7.3 above.

- 8.14. Covered Species Injury.** If a Covered Species is injured because of Project-related activities, the Designated Biologist shall immediately take it to a CDFW-approved wildlife rehabilitation or veterinary facility. Permittee shall identify the facility before starting Covered Activities. Permittee shall bear any costs associated with the care or treatment of such injured Covered Species. The Permittee shall notify CDFW of the injury to the Covered Species immediately by telephone and e-mail followed by a written incident report as described in Condition of Approval 7.12. Notification shall include the name of the facility where the animal was taken.

- 9. Habitat Management Land Acquisition and Restoration:** CDFW has determined that permanent protection and perpetual management of compensatory habitat is necessary and required pursuant to CESA to fully mitigate Project-related impacts of the taking on the Covered Species that will result from implementation of the Covered Activities. This determination is based on factors including an assessment of the importance of the habitat in the Project Area, the extent to which the Covered Activities will impact the habitat, and CDFW's estimate of the protected acreage required to provide for adequate compensation.

To meet this requirement, the Permittee shall purchase 2.1 acres of upland habitat Covered Species credits from a CDFW-approved mitigation or conservation bank pursuant to Condition of Approval 9.1 below. Purchase of Covered Species credits must be complete before starting Covered Activities. The Permittee shall also restore on-site 1.75 acres of temporarily impacted Covered Species upland habitat pursuant to Condition of Approval 9.2 below.

- 9.1. Covered Species Credits.** Permittee shall purchase 2.1 acres of upland habitat Covered Species credits from a CDFW-approved mitigation or conservation bank prior to initiating Covered Activities. Prior to purchase of Covered Species credits, Permittee shall obtain CDFW approval to ensure the mitigation or conservation bank is appropriate to compensate for the impacts of the Project. Permittee shall submit to CDFW a copy of the Bill of Sale(s) and Payment Receipt prior to initiating Covered Activities.
- 9.2. Habitat Restoration.** Permittee shall restore on-site the 1.75 acres of Covered Species upland habitat that will be temporarily disturbed by the Project following the approved Habitat Restoration Plan as required by Condition of Approval 7.4. Permittee shall restore the soil and vegetation to a condition conducive for Covered Species recolonization and shall ensure the restoration is successfully implemented by the contractor. Monitoring and maintenance of the revegetation areas shall be conducted annually for a minimum of (2) years or until CDFW determines that the restoration/enhancement effort is successful.

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SAN JUAN BAUTISTA TO HOLLISTER SEWER FORCE MAIN

IX. Amendment:

This ITP may be amended as provided by California Code of Regulations, Title 14, section 783.6, subdivision (c), and other applicable law. This ITP may be amended without the concurrence of the Permittee as required by law, including if CDFW determines that continued implementation of the Project as authorized under this ITP would jeopardize the continued existence of the Covered Species or where Project changes or changed biological conditions necessitate an ITP amendment to ensure that all Project-related impacts of the taking to the Covered Species are minimized and fully mitigated.

X. Stop-Work Order:

If CDFW determines the Permittee has violated any term or condition of this ITP or has engaged in unlawful take, CDFW may issue Permittee a written stop-work order instructing the Permittee to suspend any Covered Activity for an initial period of up to 30 days or risk suspension or revocation of this ITP. CDFW can issue a stop-work order to prevent or remedy a violation of this ITP, including but not limited to the failure to comply with reporting or monitoring obligations, or to prevent the unauthorized take of any CESA endangered, threatened, or candidate species, regardless of whether that species is a Covered Species under this ITP. Permittee shall stop work immediately as directed by CDFW upon receipt of any such stop-work order. Upon written notice to Permittee, CDFW may extend any stop-work order issued to Permittee for a period not to exceed 30 additional days.

If Permittee fails to remedy the violation or to comply with a stop-work order, CDFW may proceed with suspension and revocation of this ITP. Suspension and revocation of this ITP shall be governed by California Code of Regulations, Title 14, section 783.7, and any other applicable law. Neither the Designated Biologist nor CDFW shall be liable for any costs incurred in complying with stop-work orders.

XI. Compliance with Other Laws:

This ITP sets forth CDFW's requirements for the Permittee to implement the Project pursuant to CESA. This ITP does not necessarily create an entitlement to proceed with the Project. Permittee is responsible for complying with all other applicable federal, state, and local law.

XII. Notices:

The Permittee shall sign and return this ITP to CDFW. A manual or digital signature is acceptable, provided a digital signature complies with Government Code section 16.5. Digital signatures facilitated by CDFW will be automatically returned. Manual (wet) signatures on duplicate original paper copies shall be returned by the Permittee via registered first-class mail or overnight delivery to the following address:

Habitat Conservation Planning Branch
California Department of Fish and Wildlife
Attention: CESA Permitting Program
Post Office Box 944209
Sacramento, California 94244-2090

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Written notices, reports and other communications relating to this ITP shall be delivered to CDFW by email or registered first class mail at the following address, or at addresses CDFW may subsequently provide the Permittee. Notices, reports, and other communications shall reference the Project name, Permittee, and ITP Number (2081-2022-033-04) in a cover letter and on any other associated documents.

Original cover with attachment(s) to:

Julie A. Vance, Regional Manager
California Department of Fish and Wildlife
1234 East Shaw Avenue
Fresno, California 93710
Telephone (559) 243-4005
R4CESA@wildlife.ca.gov

and a copy to:

Habitat Conservation Planning Branch
California Department of Fish and Wildlife
Attention: CESA Permitting Program
Post Office Box 944209
Sacramento, California 94244-2090
CESA@wildlife.ca.gov

Unless Permittee is notified otherwise, CDFW's Regional Representative for purposes of addressing issues that arise during implementation of this ITP is:

Stephanie Manzo
California Department of Fish and Wildlife
1234 East Shaw Avenue
Fresno, California 93710
(559) 578-0409
Stephanie.Manzo@wildlife.ca.gov

XIII. Compliance with the CEQA:

CDFW's issuance of this ITP is subject to CEQA. CDFW is a responsible agency pursuant to CEQA with respect to this ITP because of prior environmental review of the Project by the lead agency, City of San Juan Bautista. (See generally Pub. Resources Code, §§ 21067, 21069.) The lead agency's prior environmental review of the Project is set forth in the San Juan Bautista to Hollister Sanitary Sewer Force Main Mitigated Negative Declaration, (SCH No.: 2021110032) dated December 14, 2021, that City of San Juan Bautista adopted for the San Juan Bautista to Hollister Sewer Force Main Project on December 15, 2021. At the time the lead agency adopted the Mitigated Negative Declaration and approved the Project it also adopted various mitigation measures for the Covered Species as conditions of Project approval.

This ITP, along with CDFW's related CEQA findings, which are available as a separate document, provide evidence of CDFW's consideration of the lead agency's Mitigated Negative Declaration for the Project and the environmental effects related to issuance of this ITP (CEQA Guidelines, § 15096, subd. (f)). CDFW finds that issuance of this ITP will not result in any previously undisclosed potentially significant effects on the environment or a substantial increase in the severity of any potentially significant environmental effects previously disclosed by the lead agency. Furthermore, to the extent the potential for such effects exists, CDFW finds adherence to and implementation of the Conditions of Project Approval adopted by the lead agency, and that adherence to and implementation of the Conditions of Approval imposed by CDFW through the issuance of this ITP, will avoid or reduce to below a level of significance any such potential effects. CDFW consequently finds that issuance of this ITP will not result in any significant, adverse impacts on the environment.

XIV. Findings Pursuant to CESA:

These findings are intended to document CDFW's compliance with the specific findings requirements set forth in CESA and related regulations. (Fish & G. Code § 2081, subs. (b)-(c); Cal. Code Regs., tit. 14, §§ 783.4, subds, (a)-(b), 783.5, subd. (c)(2).)

CDFW finds based on substantial evidence in the ITP application, San Juan Bautista to Hollister Sanitary Sewer Force Main Mitigated Negative Declaration, the results of consultations, and the administrative record of proceedings, that issuance of this ITP complies and is consistent with the criteria governing the issuance of ITPs pursuant to CESA:

- (1) Take of Covered Species as defined in this ITP will be incidental to the otherwise lawful activities covered under this ITP;
- (2) Impacts of the taking on Covered Species will be minimized and fully mitigated through the implementation of measures required by this ITP and as described in the MMRP. Measures include: (1) permanent habitat protection through the purchase of covered species credits from a CDFW approved mitigation or conservation bank; (2) establishment of avoidance zones; (3) worker education; and (4) Quarterly Compliance Reports. CDFW evaluated factors including an assessment of the importance of the habitat in the Project Area, the extent to which the Covered Activities will impact the habitat, and CDFW's estimate of the acreage required to provide for adequate compensation. Based on this evaluation, CDFW determined that the purchase of 2.1 acres of upland habitat Covered Species credits from a CDFW-approved mitigation or conservation bank in advance of initiating Covered Activities, along with the minimization, monitoring, reporting, and funding requirements of this ITP minimizes and fully mitigates the impacts of the taking caused by the Project;
- (3) The take avoidance and mitigation measures required pursuant to the conditions of this ITP and its attachments are roughly proportional in extent to the impacts of the taking authorized by this ITP;

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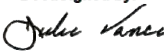
- (4) The measures required by this ITP maintain Permittee’s objectives to the greatest extent possible;
- (5) All required measures are capable of successful implementation;
- (6) This ITP is consistent with any regulations adopted pursuant to Fish and Game Code sections 2112 and 2114;
- (7) Permittee has ensured adequate funding to implement the measures required by this ITP as well as for monitoring compliance with, and the effectiveness of, those measures for the Project; and
- (8) Issuance of this ITP will not jeopardize the continued existence of the Covered Species based on the best scientific and other information reasonably available, and this finding includes consideration of the species’ capability to survive and reproduce, and any adverse impacts of the taking on those abilities in light of (1) known population trends; (2) known threats to the species; and (3) reasonably foreseeable impacts on the species from other related projects and activities. Moreover, CDFW’s finding is based, in part, on CDFW’s express authority to amend the terms and conditions of this ITP without concurrence of the Permittee as necessary to avoid jeopardy and as required by law.

XV. Attachments:

FIGURE 1	Project Location Map
FIGURE 2	Staging Areas
FIGURE 3	Impacts at the San Juan Bautista WWTP
FIGURE 4	Force Main Route and Crossings
FIGURE 5	Temporary Impacts at the Hollister Domestic WWTP
FIGURE 6	Aquatic Habitat Along No Name Creek
ATTACHMENT 1	Mitigation Monitoring and Reporting Program
ATTACHMENT 2	Biologist Resume Form
ATTACHMENT 3	Fieldwork Code of Practice

ISSUED BY THE CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

ON 2/13/2023


DocuSigned by:

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Julie A. Vance, Regional Manager
CENTRAL REGION

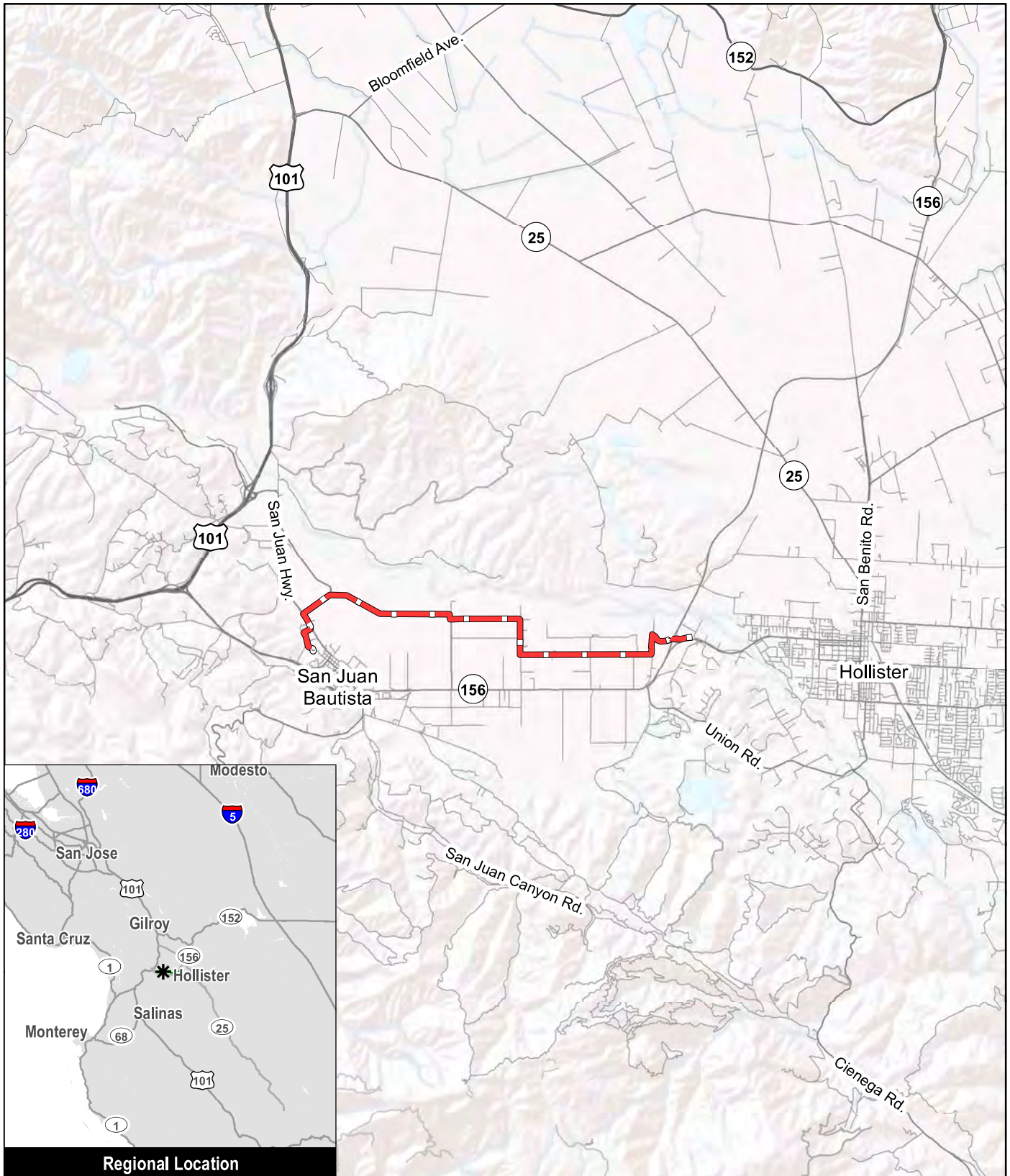
Incidental Take Permit
 No. 2081-2022-033-04
 CITY OF SAN JUAN BAUTISTA
 SAN JUAN BAUTISTA TO HOLLISTER SEWER FORCE MAIN

ACKNOWLEDGMENT

The undersigned: (1) warrants that they are acting as a duly authorized representative of the Permittee, (2) acknowledges receipt of this ITP, and (3) agrees on behalf of the Permittee to comply with all terms and conditions.

By:  Date: 2/14/2023
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Printed Name: Don Reynolds Title: City Manager

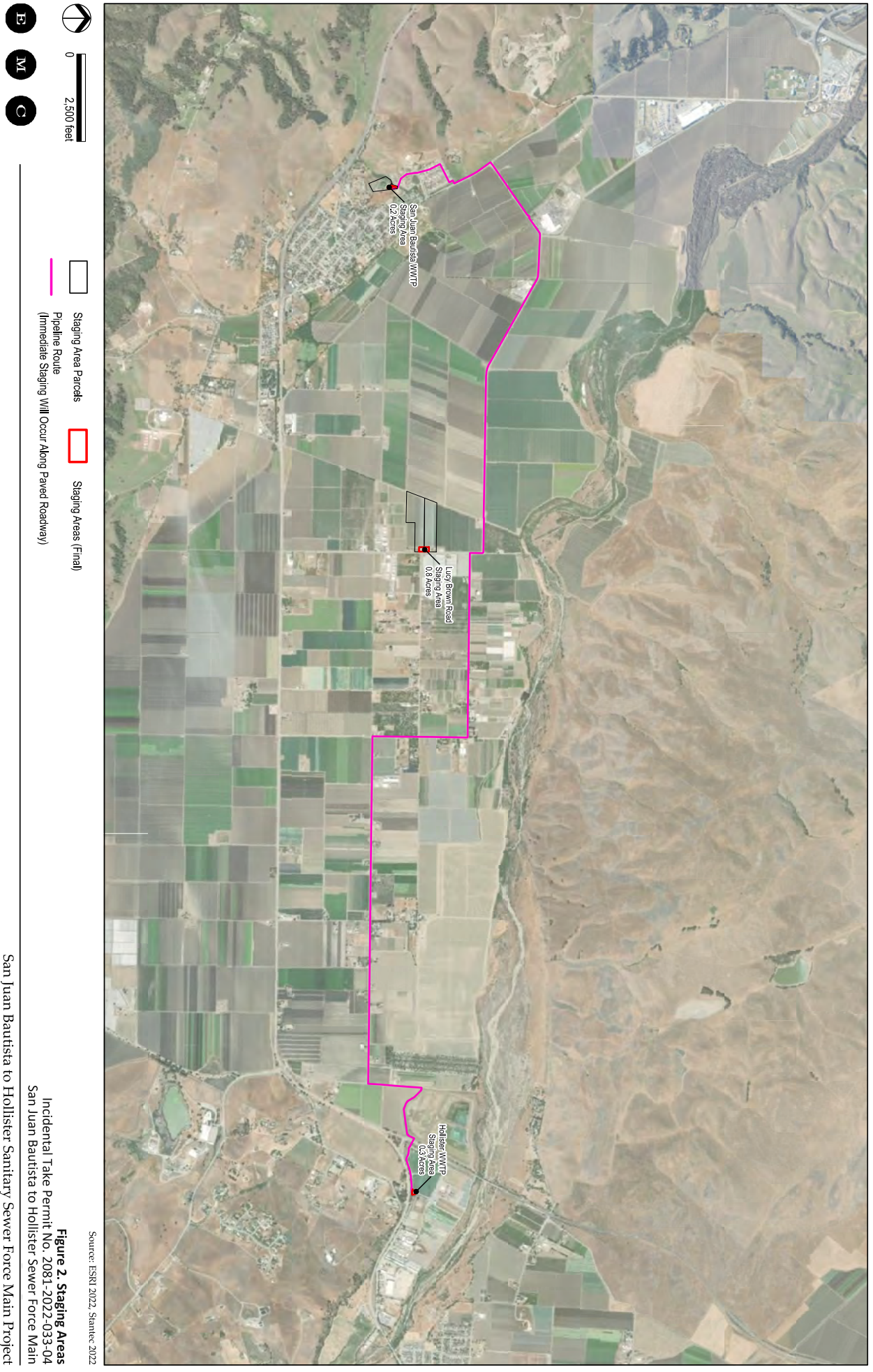


Source: ESRI 2019



Figure 1. Project Location Map
Incidental Take Permit No. 2081-2022-033-04
San Juan Bautista to Hollister Sewer Force Main





Source: ESRI 2022, Stantec 2022

Figure 2. Staging Areas
Incidental Take Permit No. 2081-2022-033-04
San Juan Bautista to Hollister Sewer Force Main
San Juan Bautista to Hollister Sanitary Sewer Force Main Project



Pipeline Route



Permanent Impacts

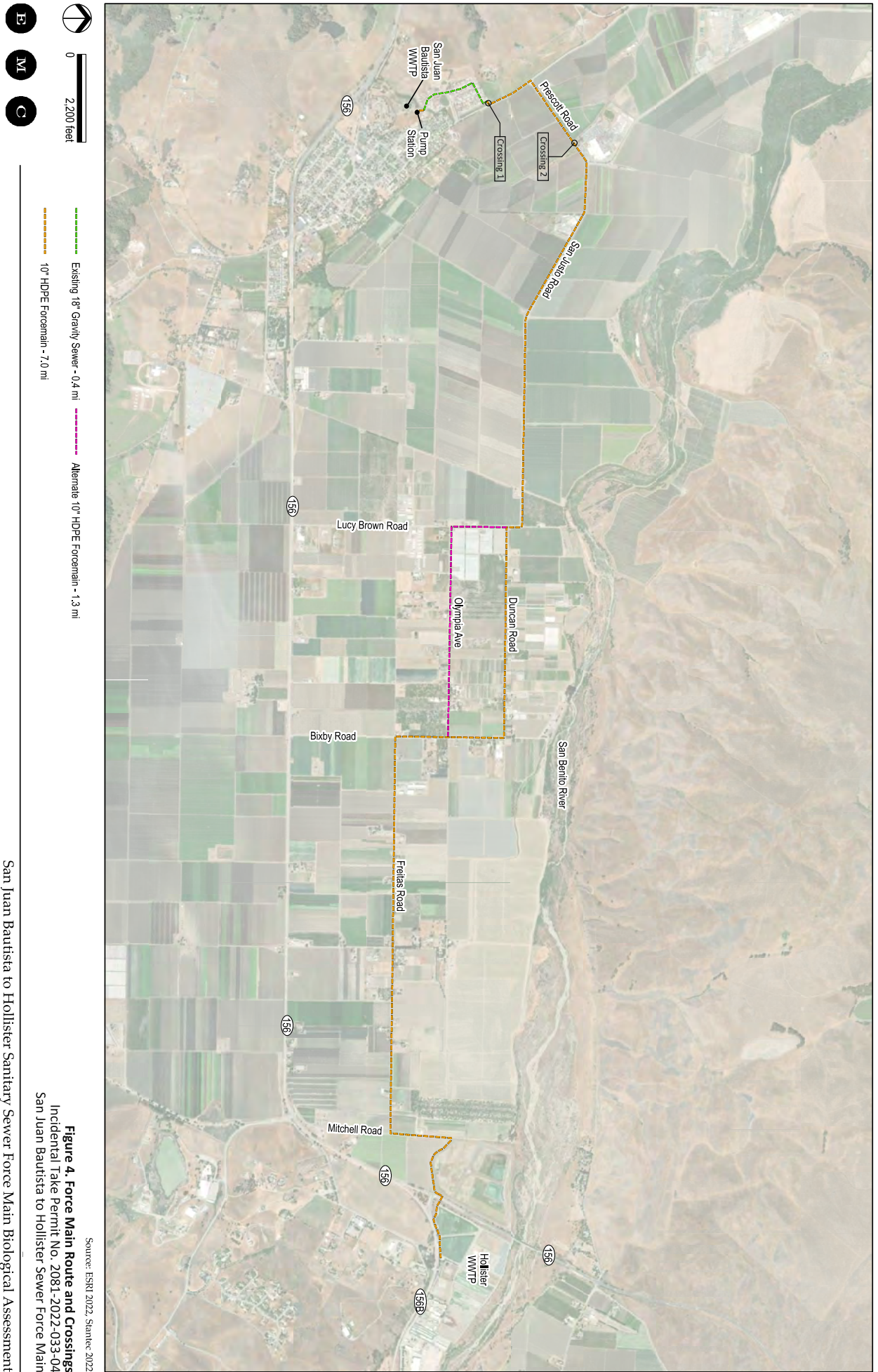


Temporary Impacts

Source: ESRI 2022, San Benito County 2022

Figure 3. Impacts at the San Juan Bautista Wastewater Treatment Plant
Incidental Take Permit No. 2081-2022-033-04
San Juan Bautista to Hollister Sewer Force Main





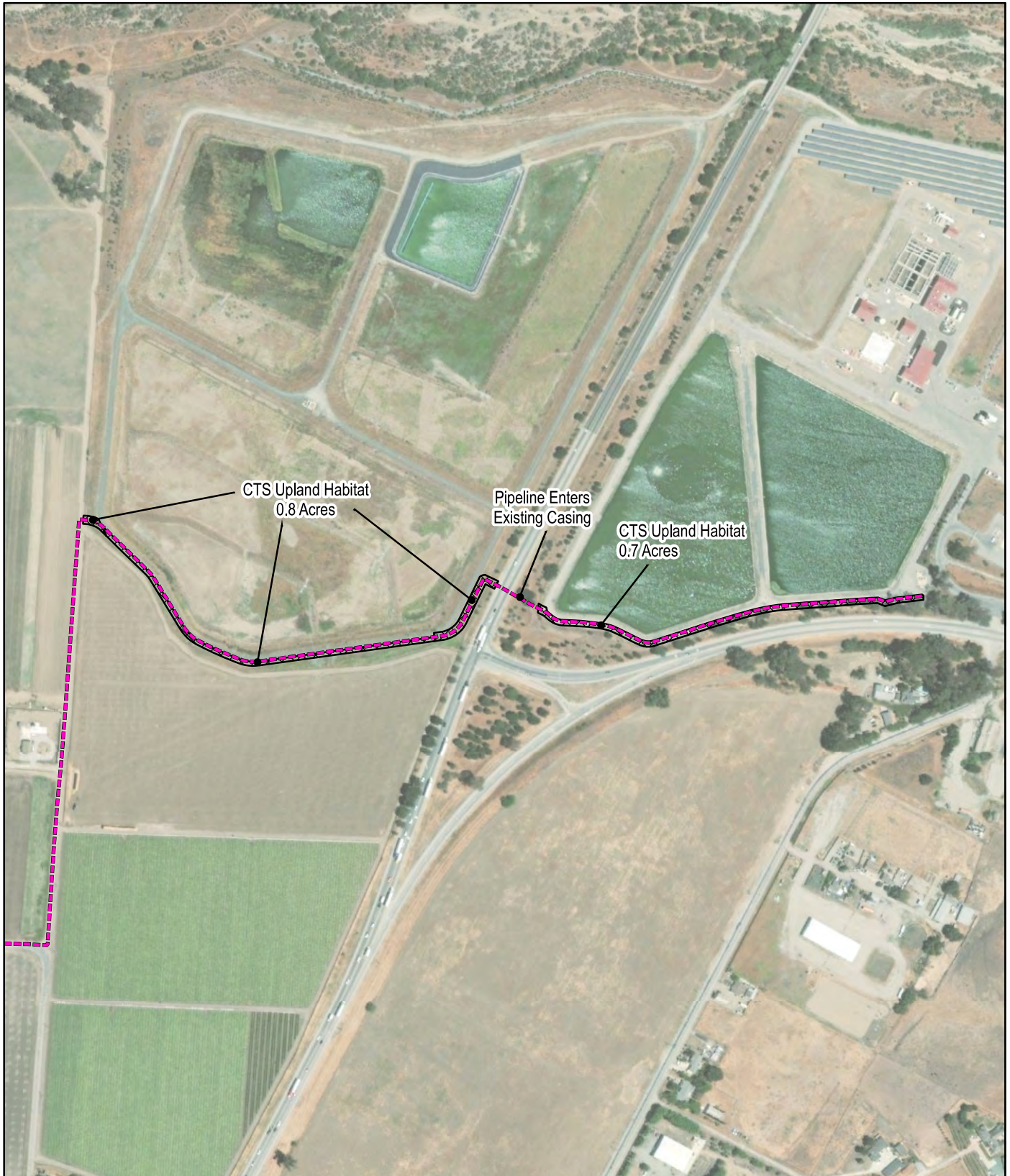
San Juan Bautista to Hollister Sanitary Sewer Force Main Biological Assessment

Figure 4. Force Main Route and Crossings
Incidental Take Permit No. 2081-2022-033-04
San Juan Bautista to Hollister Sewer Force Main

Source: ESRI 2022, Starline 2022

0 2,200 feet

B M C



Source: ESRI 2022, San Benito County 2022



Figure 5. Temporary Impacts at the Hollister Domestic Wastewater Treatment Plant
Incidental Take Permit No. 2081-2022-033-04
San Juan Bautista to Hollister Sewer Force Main





Source: ESRI 2022, San Benito County 2022



0 600 feet

--- No Name Creek --- Aquatic Habitat

Figure 6. Aquatic Habitat Along No Name Creek
Incidental Take Permit No. 2081-2022-033-04
San Juan Bautista to Hollister Sewer Force Main



San Juan Bautista to Hollister Sewer Force Main

Attachment 1

**CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE
MITIGATION MONITORING AND REPORTING PROGRAM (MMRP)
CALIFORNIA ENDANGERED SPECIES ACT**

INCIDENTAL TAKE PERMIT NO. 2081-2022-033-04

PERMITTEE: City of San Juan Bautista

PROJECT: San Juan Bautista to Hollister Sewer Force Main

PURPOSE OF THE MMRP

The purpose of the MMRP is to ensure that the impact minimization and mitigation measures required by the Department of Fish and Wildlife (CDFW) for the above-referenced Project are properly implemented, and thereby to ensure compliance with section 2081(b) of the Fish and Game Code and section 21081.6 of the Public Resources Code. A table summarizing the mitigation measures required by CDFW is attached. This table is a tool for use in monitoring and reporting on implementation of mitigation measures, but the descriptions in the table do not supersede the mitigation measures set forth in the California Incidental Take Permit (ITP) and in attachments to the ITP, and the omission of a permit requirement from the attached table does not relieve the Permittee of the obligation to ensure the requirement is performed.

OBLIGATIONS OF PERMITTEE

Mitigation measures must be implemented within the time periods indicated in the table that appears below. Permittee has the primary responsibility for monitoring compliance with all mitigation measures and for reporting to CDFW on the progress in implementing those measures. These monitoring and reporting requirements are set forth in the ITP itself and are summarized at the front of the attached table.

VERIFICATION OF COMPLIANCE, EFFECTIVENESS

CDFW may, at its sole discretion, verify compliance with any mitigation measure or independently assess the effectiveness of any mitigation measure.

TABLE OF MITIGATION MEASURES

The following items are identified for each mitigation measure: Mitigation Measure, Source, Implementation Schedule, Responsible Party, and Status/Date/Initials. The Mitigation Measure column summarizes the mitigation requirements of the ITP. The Source column identifies the ITP condition that sets forth the mitigation measure. The Implementation Schedule column shows the date or phase when each mitigation measure will be implemented. The Responsible Party column identifies the person or agency that is primarily responsible for implementing the mitigation measure. The Status/Date/Initials column shall be completed by the Permittee during preparation of each Status Report and the Final Mitigation Report, and must identify the implementation status of each mitigation measure, the date that status was determined, and the initials of the person determining the status.

Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
<p>BEFORE DISTURBING SOIL OR VEGETATION</p> <p>1 <u>Designated Representative</u>: Before starting Covered Activities, Permittee shall designate a representative (Designated Representative) responsible for communications with CDFW and overseeing compliance with the ITP. Permittee shall notify CDFW in writing before starting Covered Activities of the Designated Representative's name, business address, and contact information, and shall notify CDFW in writing if a substitute Designated Representative is selected or identified at any time during the term of the ITP.</p>	<p>ITP Condition # 6.1</p>	<p>Before commencing ground- or vegetation-disturbing activities/ Entire Project</p>	<p>Permittee</p>	
<p>2 <u>Designated Biologist(s) and/or Designated Monitor(s)</u>: Permittee shall submit to CDFW in writing the name, qualifications, business address, contact information, and references with contact information of Designated Biologist(s) and Designated Monitor(s) using the Biologist Resume Example (Attachment 2) or another format containing the same information. This information shall be submitted for CDFW review and approval at least 30 days before starting Covered Activities. The Designated Biologist(s) shall be responsible for monitoring Covered Activities to help minimize and fully mitigate or avoid the incidental take of the Covered Species and to minimize disturbance of Covered Species' habitat. The Designated Monitor(s) shall assist the Designated Biologist(s) in compliance monitoring under direction/supervision of the Designated Biologist(s). Designated Monitor responsibilities will be restricted to a specific set of Conditions of Approval, specified by the Permittee or Designated Representative at the time their qualifications are submitted for review. Permittee shall ensure that the Designated Biologist(s) and Designated Monitor(s) are knowledgeable and experienced in the Covered Species' biology, natural history, collecting and handling, as well as excavating burrows/crevices to minimize mortality and monitoring construction activities following the Conditions of Approval of an ITP for the Covered Species. The Designated Biologist(s) and Designated Monitor(s) shall be responsible for monitoring Covered Activities to help minimize and fully mitigate or avoid the incidental take of individual Covered Species and to minimize disturbance of Covered Species' habitat. Permittee shall obtain CDFW approval of the Designated Biologist(s) and Designated Monitor(s) in writing before starting Covered Activities and shall also obtain approval in advance, in writing, if the Designated Biologist(s) or Designated Monitor(s) must be changed.</p>	<p>ITP Condition # 6.2</p>	<p>Before commencing ground- or vegetation-disturbing activities</p>	<p>Permittee</p>	
<p>3 <u>Education Program</u>: Permittee shall conduct an education program for all persons employed or otherwise working in the Project Area before they can perform any work within the Project Area. The program shall consist of a presentation from the Designated Biologist that includes a discussion of the biology and general behavior of the Covered Species, information about the distribution and habitat needs of the Covered Species, sensitivity of the Covered Species to human activities, its status pursuant to CESA including legal protection, recovery efforts, penalties for violations, and Project-specific protective measures described in the ITP. Permittee shall prepare and distribute wallet-sized cards or a fact sheet handout containing this information for workers to carry in the Project Area. Permittee shall provide interpretation for all non-English speaking workers, and the same instruction shall be provided to any new workers before they are authorized to perform work in the Project Area. Upon completion of the program, employees shall sign a form stating they attended the program and understand all protection measures. This training shall be repeated at least once annually for long-term and/or permanent employees that will be conducting work in the Project Area.</p>	<p>ITP Condition # 6.4</p>	<p>Before commencing ground- or vegetation-disturbing activities / Entire Project</p>	<p>Permittee</p>	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
4	<p>Trash Abatement. Permittee shall initiate a trash abatement program before starting Covered Activities and shall continue the program for the duration of the Project. Permittee shall ensure that trash and food items are contained in animal-proof containers and removed, ideally at daily intervals but at least once a week, to avoid attracting opportunistic predators such as ravens, coyotes, and feral dogs.</p>	<p>I TP Condition # 6.6</p>	<p>Before commencing ground- or vegetation-disturbing activities / Entire Project</p>	<p>Permittee</p>	
5	<p>Dust Control. Permittee shall implement dust control measures during Covered Activities to facilitate visibility for monitoring of the Covered Species by the Designated Biologist. Permittee shall keep the amount of water used to the minimum amount needed and shall not allow water to form puddles.</p>	<p>I TP Condition # 6.7</p>	<p>Before commencing ground- or vegetation-disturbing activities/ Entire Project</p>	<p>Permittee</p>	
6	<p>Delineation of Property Boundaries. Before starting Covered Activities along each part of the route in active construction, Permittee shall clearly delineate the boundaries of the Project Area with fencing, stakes, or flags. Permittee shall restrict all Covered Activities to within the fenced, staked, or flagged areas. Permittee shall maintain all fencing, stakes, and flags until the completion of Covered Activities in that area.</p>	<p>I TP Condition # 6.9</p>	<p>Before commencing ground- or vegetation-disturbing activities / Entire Project</p>	<p>Permittee</p>	
7	<p>Delineation of Habitat. Permittee shall clearly delineate habitat of the Covered Species within the Project Area with posted signs, posting stakes, flags, and/or rope or cord, and place fencing as necessary to minimize the disturbance of Covered Species habitat. Permittee shall maintain all signs, stakes, flags, rope, cord, and fencing until the completion of Covered Activities in that area, at which time they should be removed.</p>	<p>I TP Condition # 6.10</p>	<p>Before commencing ground- or vegetation-disturbing activities / Entire Project</p>	<p>Permittee</p>	
8	<p>Notification Before Commencement. The Designated Representative shall notify CDFW 14 calendar days before starting Covered Activities and shall document compliance with all pre-Project Conditions of Approval before starting Covered Activities.</p>	<p>I TP Condition # 7.1</p>	<p>Before commencing ground- or vegetation-disturbing activities</p>	<p>Permittee</p>	
9	<p>Covered Species Mortality Reduction and Relocation Plan. The Designated Biologist shall prepare a Covered Species Mortality Reduction and Relocation Plan and submit it to CDFW for review and approval a minimum of 30 days prior to the beginning of Covered Activities. The Covered Species Mortality Reduction and Relocation Plan shall include, but not be limited to, a discussion and map of the portion of the Project Area which represents potential upland habitat; identification of the area within 1.3 miles of known or potential breeding habitat for Covered Species; detailed survey, capture, handling, and relocation methods; identification of relocation areas; and identification of a wildlife rehabilitation center or veterinary facility capable of treating injured wild amphibians. Covered Activities may not proceed until the Covered Species Mortality Reduction and Relocation Plan is approved in writing by CDFW. Designated Monitors are prohibited from capturing and handling the Covered Species unless specifically approved in writing by CDFW and under the direct supervision of the Designated Biologist(s). Any proposed changes to the CDFW-approved Covered Species Mortality Reduction and Relocation Plan shall be submitted in writing to CDFW and approved by CDFW in writing prior to implementation of any proposed Covered Species Mortality Reduction and Relocation Plan modifications.</p>	<p>I TP Condition # 7.3</p>	<p>Before commencing ground- or vegetation-disturbing activities</p>	<p>Permittee</p>	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
10	<p>Geographic Information Systems Data Files. Before starting Covered Activities, the Permittee shall provide CDFW with separate Geographic Information Systems (GIS) data files for the temporary and permanent habitat impact areas authorized under the ITP for the Project Area. If habitat for a Covered Species will be both temporarily and permanently impacted, the Permittee shall provide one set of GIS data files for each impact type. The Permittee shall provide any additional GIS data files for the Project or related Covered Species features within 30 days of CDFW's request. All GIS data files shall be provided in a format acceptable to CDFW.</p>	ITP Condition # 7.5	Before commencing ground- or vegetation-disturbing activities / Entire Project	Permittee	
11	<p><u>Record of Covered Species Relocation.</u> The Designated Biologist shall maintain a record of Covered Species handled and all documented observations of Covered Species. This information shall include for each animal: (1) date, time, and location (Global Positioning System (GPS) coordinates and maps) and capture and/or observation as well as release, if applicable; (2) the name of the party that identified the Covered Species; (3) circumstances of the incident; (4) the general condition and health, noting all visible conditions including gait and behavior, ectoparasites, injuries, etc.; (5) any diagnostic markings, sex, age (juvenile or adult); (6) actions undertaken; (7) habitat description; and (8) ambient temperature when handled and released or observed. The Designated Biologist shall also submit this information to the CNDDB as per Condition of Approval 7.10 below. The Designated Biologist shall prepare a Relocation Summary and include it in the Quarterly Compliance and Annual Status Reports described in Conditions of Approval 7.8 and 7.9, respectively, below.</p>	ITP Condition # 7.7	Before commencing ground- or vegetation-disturbing activities / Entire Project	Designated Biologist	
12	<p><u>Pre-Activity Clearance Survey and Reporting.</u> No more than 14 calendar days prior to initiating Covered Activities within the Project Area, the Designated Biologist shall survey the Project Area for individuals of the Covered Species. These surveys shall provide 100 percent visual coverage (including burrow and crevice openings) within the Project Area as well as a 50-foot buffer zone around the Project Area, with the exception that areas outside of the Permittee's access and/or control need not be surveyed. If individuals of the Covered Species are found, the Designated Biologist(s) shall relocate them in accordance with the CDFW-approved Covered Species Mortality Reduction and Relocation Plan (Condition of Approval 7.3). The Permittee shall provide the survey results to CDFW in a written report prior to the beginning of Covered Activities.</p>	ITP Condition # 8.1	Before commencing ground- or vegetation-disturbing activities / Entire Project	Designated Biologist	
13	<p><u>Flag Burrows/Crevices.</u> During Pre-Activity Clearance Surveys (conducted as detailed in Condition of Approval 8.1), the Designated Biologist shall flag all animal burrows and crevices suitable for Covered Species occupancy within the Project Area and a 50-foot buffer outside the Project Area. An avoidance buffer of 50 feet or greater around animal burrows/crevices shall be maintained regardless of whether the burrow/crevice is in the Project Area or solely within the Project Area's 50-foot buffer zone. Flagged burrows/crevices which occur within 630 meters of known or potential breeding habitat and which cannot be avoided by at least 50 feet shall be fully excavated in accordance with Condition of Approval 8.3 below.</p>	ITP Condition # 8.2	Before commencing ground- or vegetation-disturbing activities / Entire Project	Designated Biologist	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
14	<p>Burrow/Crevice Excavation. Prior to initiating ground-disturbing Covered Activities within the Project Area, animal burrows and crevices identified during the Pre-Activity Clearance Surveys (Condition of Approval 8.1) and flagged (Condition of Approval 8.2) within 630 meters of known or potential Covered Species breeding habitat as identified in the Covered Species Mortality Reduction and Relocation Plan (Condition of Approval 7.3), and which cannot be fully avoided by at least 50 feet, shall be fully excavated. Applicable burrows/crevices may be excavated by hand or in a manner otherwise approved by CDFW in accordance with the CDFW-approved Covered Species Mortality Reduction and Relocation Plan (Condition of Approval 7.3). Burrow/crevice excavation shall occur under the direct supervision of the Designated Biologist(s).</p> <p>Animal burrows and crevices identified outside of the Project Area, but within the Project Area's 50-foot buffer zone, shall be similarly excavated if they lie within 50 feet of ground-disturbing Covered Activities occurring within the Project Area. Burrows/crevices outside of the Permittee's access and/or control do not need to be excavated. The Designated Biologist(s) shall relocate any live Covered Species discovered during burrow/crevice excavation in accordance with the Covered Species Mortality Reduction and Relocation Plan required in Condition of Approval 7.3 above. Excavation shall occur no more than 14 days after the completion of the Pre-Activity Clearance Surveys as described in Condition of Approval 8.1.</p>	TTP Condition # 8.3	Before commencing ground- or vegetation-disturbing activities / Entire Project	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
15	<p>Exclusion Fencing. Prior to initiation of Covered Activities and following surveying, flagging, and excavating burrows/crevices in accordance with Conditions of Approval 8.1, 8.2, and 8.3 above, Permittee shall install exclusion fencing around the perimeter of the Project Area to prevent Covered Species from migrating into the cleared Project Area.</p> <p>For linear portions of the Project Area (e.g., force main route), Permittee shall install temporary exclusion fencing prior to ground-disturbing activities in a sequential manner that corresponds to the progression of active construction on the route. For example, temporary fencing shall be installed along the portions of the route under active construction and shall be removed immediately upon completion of Covered Activities in each segment to minimize fragmentation of habitat. In other words, at any given time, exclusion fencing shall not be installed along the entire length of the force main route. Exclusion fencing is not required along the route when used solely for ingress/egress to other portions of the Project Area.</p> <p>Permittee shall submit an Exclusion Fencing Plan to CDFW for review and approval a minimum of 30 days prior to commencing Covered Activities. Installation of exclusion fencing, and initiation of Covered Activities shall not proceed until the Exclusion Fencing Plan has been approved in writing by CDFW. The Exclusion Fencing Plan shall include:</p> <ul style="list-style-type: none"> (1) fencing materials; (2) fencing design, layout (including maps), and installation methods; (3) earthen one-way exit ramps to avoid entrapment of Covered Species (include design, number of exit ramps/spacing, and locations); (4) cover boards along both sides of the fence to provide refuge areas for Covered Species (include number of cover boards/spacing, material of cover boards, size of individual cover boards, and locations); (5) access gate design and location; (6) specification of the maximum continuous linear length of fencing to be installed at any given time along linear portions of the Project Area; and (7) inspection, maintenance, repair, and replacement methods and intervals. 	TTP Condition # 8.4	Before commencing ground- or vegetation-disturbing activities	Permittee	
16	<p>Exclusion Fence Installation. The exclusion fence shall be installed under the direct supervision of the Designated Biologist and begin no later than 48 hours after the burrow/crevice excavation and relocation activities per Condition of Approval 8.3, where applicable, are complete.</p> <p>The Permittee shall also avoid animal burrows and crevices to the maximum extent possible during the installation of the exclusion fence, in accordance with Conditions of Approval 8.2 and 8.3 above. The exclusion fence shall be supported sufficiently to maintain its integrity under all conditions, such as wind and heavy rain, for the duration that it is in place. Permittee shall remove exclusion fencing immediately upon completion of Covered Activities in the fenced Project Area.</p>	TTP Condition # 8.5	Before commencing ground- or vegetation-disturbing activities / Entire Project	Permittee	
17	<p>Covered Species Credits. Permittee shall purchase 2.1 acres of upland habitat Covered Species credits from a CDFW-approved mitigation or conservation bank prior to initiating Covered Activities. Prior to purchase of Covered Species credits, Permittee shall obtain CDFW approval to ensure the mitigation or conservation bank is appropriate to compensate for the impacts of the Project. Permittee shall submit to CDFW a copy of the Bill of Sale(s) and Payment Receipt prior to initiating Covered Activities.</p>	TTP Condition # 9.1	Before commencing ground- or vegetation-disturbing activities	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
DURING CONSTRUCTION					
18	<p><u>Designated Biologist/Designated Monitor Authority.</u> To ensure compliance with the Conditions of Approval of the ITP, the Designated Biologist and/or Designated Monitor shall be given the authority to immediately stop any activity that does not comply with the ITP and/or order any reasonable measure to avoid the unauthorized take of an individual of the Covered Species. Permittee shall provide unfettered access to the Project Area and otherwise facilitate the Designated Biologist and/or Designated Monitor in the performance of their duties. If the Designated Biologist and/or Designated Monitor is unable to comply with the ITP, then the Designated Biologist and/or Designated Monitor shall notify the CDFW Regional Representative (detailed in the Notices section below) immediately. Permittee shall not enter into any agreement or contract of any kind, including but not limited to non-disclosure agreements and confidentiality agreements, with its contractors and/or the Designated Biologist/Designated Monitor that prohibit or impede open communication with CDFW, including but not limited to providing CDFW staff with the results of any surveys, reports, or studies or notifying CDFW of any non-compliance or take. Failure to notify CDFW of any non-compliance or take or injury of a Covered Species as a result of such agreement or contract may result in CDFW taking actions to prevent or remedy a violation of the ITP.</p>	ITP Condition # 6.3	Entire Project	Designated Biologist / Permittee	
19	<p><u>Construction Monitoring Documentation.</u> The Designated Biologist(s) and Designated Monitor(s) shall maintain construction-monitoring documentation onsite in either hard copy or digital format throughout the construction period, which shall include a copy of the ITP with attachments and a list of signatures of all personnel who have successfully completed the education program. Permittee shall ensure a copy of the construction-monitoring documentation is available for review at the Project sites upon request by CDFW.</p>	ITP Condition # 6.5	Entire Project	Designated Biologist / Permittee	
20	<p><u>Compliance Monitoring.</u> The Designated Biologist shall be on site for the duration of the day when Covered Activities occur and conduct at least daily compliance inspections. The Designated Biologist shall conduct compliance inspections a minimum of weekly during periods of inactivity and after clearing, grubbing, and grading are completed. The Designated Biologist shall conduct compliance inspections to:</p> <ol style="list-style-type: none"> (1) minimize incidental take of the Covered Species; (2) prevent unlawful take of species; (3) check for compliance with all measures of the ITP; (4) check all exclusion zones; and (5) ensure that signs, stakes, and fencing are intact, and that Covered Activities are only occurring in the Project Area. <p>The Designated Representative or Designated Biologist shall prepare daily written observation and inspection records summarizing oversight activities and compliance inspections, observations of Covered Species and their sign, survey results, and monitoring activities required by the ITP.</p>	ITP Condition # 7.6	Entire Project	Designated Biologist / Permittee	
21	<p><u>Notification of Non-compliance.</u> The Designated Representative and/or the Designated Biologist shall immediately notify CDFW if the Permittee is not in compliance with any Condition of Approval of the ITP, including but not limited to any actual or anticipated failure to implement measures within the time periods indicated in the ITP and/or this MMRP. The Designated Representative and/or the Designated Biologist shall follow notification with a written report to CDFW within 24 hours describing, in detail, any non-compliance with the ITP and suggested measures to remedy the situation.</p>	ITP Condition # 7.2	Entire Project	Designated Biologist / Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
22	<p>Quarterly Compliance Report. The Designated Representative or Designated Biologist shall complete the observation and inspection records identified in Conditions of Approval 7.6 and 7.7 into a Quarterly Compliance Report and submit it to CDFW along with a copy of the MMRP table with notes showing the current implementation status of each mitigation measure. Quarterly Compliance Reports shall also include an accounting of the number of acres that have been permanently and temporarily disturbed by the Project within the Project Area, both for the prior quarter, and the total since ITP issuance, if applicable; the number of acres of habitat disturbance anticipated to occur in the Project Area during the coming quarter, if applicable; a summary of all pre-activity surveys and compliance monitoring conducted during the previous quarter; and the activities authorized under the Covered Activities which occurred during the previous quarter. Quarterly Compliance Reports shall be due by January 15, April 15, July 15, and October 15. Quarterly Compliance Reports shall be submitted via email to the CDFW Regional Representative, as well as the Regional and Headquarters offices and personnel listed in the Notices section of the ITP. CDFW may at any time increase the timing and number of compliance inspections and reports required under this provision depending upon the results of previous compliance inspections. If CDFW determines the reporting schedule must be changed, CDFW will notify Permittee in writing of the new reporting schedule.</p>	ITP Condition # 7.8	Entire Project	Designated Biologist / Permittee	
23	<p>Annual Status Report. Permittee shall provide CDFW with an Annual Status Report (ASR) no later than January 31 of every year beginning with issuance of the ITP and continuing until CDFW accepts the Final Mitigation Report identified below. Each ASR shall include, at a minimum: (1) a summary of all Quarterly Compliance Reports for that year identified in Condition of Approval 7.8; (2) a general description of the status of the Project Area and Covered Activities, including actual or projected completion dates, if known; (3) a copy of the table in this MMRP with notes showing the current implementation status of each mitigation measure; (4) an assessment of the effectiveness of each completed or partially completed mitigation measure in avoiding, minimizing and mitigating Project impacts; (5) all available information about Project-related incidental take of the Covered Species; and (6) information about other Project impacts on the Covered Species. ASRs shall be submitted to CDFW following the directions provided in Condition of Approval 7.8 above.</p>	ITP Condition # 7.9	Entire Project	Permittee	
24	<p>CNDDDB Observations. The Designated Biologist shall submit all observations of Covered Species to CDFW's California Natural Diversity Database (CNDDDB) within 60 calendar days of the observation and the Designated Biologist shall include copies of the submitted forms with the next Quarterly Compliance Report or ASR, whichever is submitted first relative to the observation.</p>	ITP Condition # 7.10	Entire Project	Designated Biologist / Permittee	
25	<p>Notification of Take or Injury. Permittee shall immediately notify the Designated Biologist if a Covered Species is taken or injured by a Project-related activity, or if a Covered Species is otherwise found dead or injured within the vicinity of the Project Area. The Designated Biologist or Designated Representative shall provide initial notification to CDFW by calling the Regional Office at (559) 243-4005 and by email to the CDFW Regional Representative. The initial notification to CDFW shall include information regarding the location, species, and number of animals taken or injured and the ITP Number. Following initial notification, Permittee shall send CDFW a written report within two calendar days. The report shall include the date and time of the finding or incident, location of the animal or carcass, an explanation as to cause of take or injury, photograph(s), if possible, and any other pertinent information.</p>	ITP Condition # 7.12	Entire Project	Designated Biologist / Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
26	Erosion Control Materials. Permittee shall prohibit use of erosion control materials potentially harmful to Covered Species and other species, such as monofilament netting (erosion control matting) or similar material, in potential Covered Species habitat.	ITP Condition # 6.8	Entire Project	Permittee	
27	Project Access. Project-related personnel shall access the Project Area using existing routes and shall not cross Covered Species habitat outside of or en route to the Project Area. Permittee shall restrict Project-related vehicle traffic to established roads, staging, and parking areas. Permittee shall ensure that vehicle speeds do not exceed 20 miles per hour to avoid Covered Species on or traversing the roads. If Permittee determines construction of routes for travel are necessary outside of the Project Area, the Designated Representative shall contact CDFW for written approval before carrying out such an activity. CDFW may require an amendment to the ITP, among other reasons, if additional take of Covered Species will occur as a result of the Project modification.	ITP Condition # 6.11	Entire Project	Permittee	
28	Staging Areas. Permittee shall confine all Project-related parking, storage areas, laydown sites, equipment storage, and any other surface-disturbing activities to the Project Area using, to the extent possible, previously disturbed areas. Additionally, Permittee shall not use or cross Covered Species habitat outside of the marked Project Area unless provided for as described in Condition of Approval 6.11 of the ITP.	ITP Condition # 6.12	Entire Project	Permittee	
29	Hazardous Waste. Permittee shall immediately stop and, pursuant to pertinent state and federal statutes and regulations, arrange for repair and clean up by qualified individuals of any fuel or hazardous waste leaks or spills at the time of occurrence, or as soon as it is safe to do so. Permittee shall exclude the storage and handling of hazardous materials from the Project Area and shall properly contain and dispose of any unused or leftover hazardous products off-site.	ITP Condition # 6.13	Entire Project	Permittee	
30	Covered Species Refuge Areas/Cover Boards. The Designated Biologist shall inspect refuge areas (i.e., cover boards) each morning as well as during and after rain events. Covered Species within the interior fence should be given the ability to leave on their own accord before active relocation is attempted in accordance with the Covered Species Mortality Reduction and Relocation Plan (Condition of Approval 7.3)	ITP Condition # 8.6	Entire Project	Designated Biologist / Permittee	
31	Fieldwork Code of Practice. To ensure that the Designated Biologist(s) or Designated Monitor(s) do not convey disease between the Project Area and areas outside of the Project Area, the Fieldwork Code of Practice developed by the Declining Amphibian Populations Task Force (see Attachment 3) shall be followed at all times. The Designated Biologist(s) or Designated Monitor(s) may substitute a bleach solution (0.5 to 1.0 cup of bleach to 1.0 gallon of water) for the ethanol solution. Care shall be taken so that all traces of the disinfectant are removed before entering the next aquatic habitat.	ITP Condition # 8.7	Entire Project	Designated Biologist / Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
32	<p>Rain Forecast. The Designated Biologist and Permittee shall monitor the National Weather Service 72-hour forecast for the Project Area. During rainfall events and/or when a 50 percent or greater chance of rainfall is predicted within 72 hours, the Permittee shall cease all Covered Activities in the Project Area where initial ground disturbance (vegetation removal, grading, grubbing, and excavation) has yet to occur until the rainfall ceases and a zero percent chance of rain is forecast. Covered Activities may continue during rainfall events and/or when a 50 percent or greater chance of rain is forecast within portions of the Project Area that have already been cleared of Covered Species (in accordance with Conditions of Approval 8.1, 8.2, and 8.3) and which are surrounded by exclusion fence that has been properly maintained and is in good repair, in accordance with the Project's CDFW-approved Exclusion Fencing Plan (as detailed in Condition of Approval 8.4).</p>	TTP Condition # 8.8	Entire Project	Designated Biologist / Permittee	
33	<p>Soil and Materials Stockpiles. Permittee shall ensure that soil stockpiles are placed where soil will not pass into the potential Covered Species breeding habitat, or into any other "Waters of the State," in accordance with Fish and Game Code section 5650. Permittee shall appropriately protect stockpiles to prevent soil erosion. Permittee shall stockpile and stage all materials and equipment in a manner that discourages Covered Species use. In all locations, Permittee shall not place bundled or loose materials directly on the ground. These materials shall be elevated to discourage use by Covered Species. Permittee shall not place materials outside of exclusion fencing.</p>	TTP Condition # 8.9	Entire Project	Permittee	
34	<p>Open Excavations. Designated Biologist(s) shall inspect all open holes, sumps, and trenches within the Project Area at the beginning and end of each workday (including once daily on any other non-workdays) for trapped Covered Species. To prevent inadvertent entrapment of Covered Species, all open trenches, holes, sumps, and other excavations with sidewalls steeper than a 1:1 (45 degree) slope shall have an escape ramp of earth or a non-slip material with a less than 1:1 (45 degree) slope. At the end of each workday, Project worker(s) shall ensure all trenches, holes, sumps, or other excavations with sidewalls steeper than a 1:1 (45 degree) slope of any depth are covered with barrier material (e.g., hardware cloth) such that animals are unable to dig or squeeze under the barrier and become entrapped. The outer two feet of excavation cover shall conform to solid ground so that gaps do not occur between the cover and the ground, and the excavation cover shall be secured with soil staples or by similar means to prevent gaps. Project worker(s) shall also thoroughly inspect all open trenches, holes, sumps, or other excavations for Covered Species (or other wildlife) before they are backfilled. If any worker discovers that Covered Species have become trapped, Permittee shall cease all Covered Activities in the vicinity and notify the Designated Biologist(s) immediately. Project workers and the Designated Biologist(s) shall allow Covered Species to escape unimpeded, if possible, before Covered Activities are allowed to continue, or the Designated Biologist(s) may capture and relocate the Covered Species as per the Covered Species Mortality Reduction and Relocation Plan required in Condition of Approval 7.3 above.</p>	TTP Condition # 8.10	Entire Project	Designated Biologist / Permittee	
35	<p>Vehicle and Equipment Inspection. Within the Project Area, workers shall inspect under vehicles and equipment for Covered Species before the vehicles and equipment are moved. If a Covered Species is present, the worker shall notify the Designated Biologist(s) and wait for the Covered Species to move unimpeded to a safe location. Alternatively, the Designated Biologist(s) may move the Covered Species out of harm's way outside of the Project Area in compliance with the approved Covered Species Mortality Reduction and Relocation Plan required in Condition of Approval 7.3.</p>	TTP Condition # 8.11	Entire Project	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
36	Pipes and other Structures Entrapment Prevention. Permittee shall ensure that all pipes, hoses, conduit, culverts, or similar materials stockpiled or installed in the Project Area are capped or otherwise enclosed at the ends to prevent entry by Covered Species. Workers shall thoroughly inspect all construction pipe, culverts, or other similar structures with a diameter of one inch or greater that are stored for one or more overnight periods for the Covered Species before the object is subsequently moved, buried, or capped. If an individual of the Covered Species is discovered inside a pipe, culvert, or similar structure during inspection, the worker shall notify the Designated Biologist(s) and wait for the Covered Species to move unimpeded to a safe location. Alternatively, the Designated Biologist(s) may move the Covered Species out of harm's way outside of the Project Area in compliance with the approved Covered Species Mortality Reduction and Relocation Plan required in Condition of Approval 7.3.	TTP Condition # 8.12	Entire Project	Permittee	
37	<u>Covered Species Observations.</u> During all Covered Activities within the Project Areas, all workers shall inform the Designated Biologist(s) if a Covered Species is observed within or near the Project Area. All work in the vicinity of the observed Covered Species, which could injure or kill the animal, shall cease immediately until it moves from the Project Area of its own accord, or the Designated Biologist(s) relocates the Covered Species following the CDFW-approved Covered Species Mortality Reduction and Relocation Plan specified in Condition of Approval 7.3 above.	TTP Condition # 8.13	Entire Project	Permittee	
38	<u>Covered Species Injury.</u> If a Covered Species is injured because of Project-related activities, the Designated Biologist shall immediately take it to a CDFW-approved wildlife rehabilitation or veterinary facility. Permittee shall identify the facility before starting Covered Activities. Permittee shall bear any costs associated with the care or treatment of such Injured Covered Species. The Permittee shall notify CDFW of the injury to the Covered Species immediately by telephone and e-mail followed by a written incident report as described in Condition of Approval 7.12. Notification shall include the name of the facility where the animal was taken.	TTP Condition # 8.14	Entire Project	Permittee	
39	CDFW Access. Permittee shall provide CDFW staff with reasonable access to the Project and shall otherwise fully cooperate with CDFW efforts to verify compliance with or effectiveness of mitigation measures set forth in the ITP.	TTP Condition # 6.14	Entire Project	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
40	<p>Habitat Restoration Plan. Permittee shall prepare a Habitat Restoration Plan to facilitate revegetation of the 1.75 acres of upland habitat that will be temporarily disturbed by the Project at the San Juan Bautista WWTP (0.2 acres), Crossing 1 (0.03 acres), Crossing 2 (0.02 acres), and the Hollister Domestic WWTP (1.5 acres). Permittee shall restore the soil and vegetation to a condition conducive for Covered Species recolonization and shall ensure the restoration is successfully implemented. Permittee shall submit the Habitat and Restoration Plan to CDFW for review and approval a minimum of 30 days prior to implementing revegetation activities. At a minimum, the Plan shall include the following information: (1) a map that identifies the location of the areas to be revegetated; (2) a description of the existing physical and biological conditions of the areas prior to commencement of any restoration or enhancement activities; (3) a plan for initial removal of nonnative plant species, trash, and debris; (4) a California native plant palette and seed sources; (5) a planting plan, including seed application method; (6) the time of year seeding will occur to ensure adequate growth without supplemental watering or describe the methods of supplemental water delivery; (7) procedures to ensure that nonnative plants are not introduced or allowed to sustain within the revegetation areas and an annual nonnative removal plan; (8) monitoring and maintenance measures and a timeline when these will occur; (9) proposed success criteria and contingency measures if the first application is unsuccessful; (10) the timeframe for which the revegetation areas must sustain themselves without supplemental watering and meet the identified success criteria; and (11) a funding source to cover the total costs of restoration.</p>	TTP Condition # 7.4	Entire Project	Permittee	
41	<p><u>Habitat Restoration.</u> Permittee shall restore on-site the 1.75 acres of Covered Species upland habitat that will be temporarily disturbed by the Project following the approved Habitat Restoration Plan as required by Condition of Approval 7.4. Permittee shall restore the soil and vegetation to a condition conducive for Covered Species recolonization and shall ensure the restoration is successfully implemented by the contractor. Monitoring and maintenance of the revegetation areas shall be conducted annually for a minimum of (2) years or until CDFW determines that the restoration/enhancement effort is successful.</p>	TTP Condition # 9.2	Entire Project	Permittee	
POST-CONSTRUCTION					
42	<p><u>Refuse Removal.</u> Upon completion of Covered Activities, Permittee shall remove from the Project Area and properly dispose of all temporary fill and construction refuse, including, but not limited to, broken equipment parts, wrapping material, cords, cables, wire, rope, strapping, twine, buckets, metal or plastic containers, and boxes.</p>	TTP Condition # 6.15	Post-construction	Permittee	
43	<p><u>Final Mitigation Report.</u> No later than 45 days after completion of all mitigation measures, Permittee shall provide CDFW with a Final Mitigation Report following the directions provided in Condition of Approval 7.8 above. The Designated Representative or Designated Biologist shall prepare the Final Mitigation Report which shall include, at a minimum: (1) a summary of all Quarterly Compliance Reports and all ASRs; (2) a copy of the table in this MMRP with notes showing when each of the mitigation measures was implemented; (3) all available information about Project-related incidental take of the Covered Species; (4) information about other Project impacts on the Covered Species; (5) beginning and ending dates of Covered Activities; (6) an assessment of the effectiveness of the ITP's Conditions of Approval in minimizing and fully mitigating Project impacts of the taking on Covered Species; (7) recommendations on how mitigation measures might be changed to more effectively minimize take and mitigate the impacts of future projects on the Covered Species; and (8) any other pertinent information.</p>	TTP Condition # 7.11	Post-construction and after completion of mitigation	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status / Date / Initials
44	CDFW accepts the Final Mitigation Report as complete.	ITP Condition # 7.11	Post-construction	CDFW	

Attachment 2

***** Please Note: While use of this form is not mandatory, CDFW strongly recommends completing this form as it will ensure the receipt of adequate information and expedite CDFW review of biologist's qualifications. *****

Name of Biologist & Contact Information

Education: (include year graduated)

Training/Workshops: (be prepared to provide copies of certificates upon request; these should be related to the Covered Species (or similar species) in the Incidental Take Permit)

Certifications: (please provide any copies of a CDFW Scientific Collecting Permit, MOU, or USFWS 10(a)(1)(A)) permit; these should be related to the Covered Species (or similar species) in the Incidental Take Permit)

Species Name #1: (Example: California Tiger Salamander)

Project Name #1 (list the information below for all projects (separately) where biologist worked with this species; projects may be listed more than once under each separate species and please only include projects on the resume that demonstrate experience with the Covered Species (or similar species) in the ITP)

Location:

Project date completed: To and from date (month and year)

Incidental Take Permit (ITP) # (and Other Agency Permits):

Lead biologist Information: Name and contact information (phone number and email address)

Reference: Name and contact information, if different from above (phone number and email address)

Work description:

Estimated Survey Hours:

Estimated Monitoring Hours:

Individuals Observed: # of adults and # of juveniles

Individuals Handled: # of adults and # of juveniles

Burrows excavated:

Project Name #2

Location:

Project date completed: To and from date

Incidental Take Permit # (and Other Agency Permits):

Lead biologist Information: Name and contact information (phone number and email address)

Reference: Name and contact information, if different from above (phone number and email address)

Work description:

Estimated Survey Hours:

Estimated Monitoring Hours:

Individuals Observed: # of adults and # of juveniles

Individuals Handled: # of adults and # of juveniles

Burrows excavated:

Project Name #3 ...

Species Name #2: (Example: Similar or related species to CTS)

Project Name #1 (list the information below for all projects (separately) where the biologist worked with this species)

Location:

Project date completed: To and from date

Incidental Take Permit # (and Other Agency Permits):

Lead biologist Information: Name and contact information (phone number and email address)

Reference: Name and contact information, if different from above (phone number and email address)

Work description:

Estimated Survey Hours:

Estimated Monitoring Hours:

Individuals Observed: # of adults and # of juveniles

Individuals Handled: # of adults and # of juveniles

Burrows excavated:

Project Name #2

Location:

Project date completed: To and from date

Incidental Take Permit # (and Other Agency Permits):

Lead biologist Information: Name and contact information (phone number and email address)

Reference: Name and contact information, if different from above (phone number and email address)

Work description:

Estimated Survey Hours:

Estimated Monitoring Hours:

Individuals Observed: # of adults and # of juveniles

Individuals Handled: # of adults and # of juveniles

Burrows excavated:

Project Name #3 ...

Include any other relevant information to the Covered Species or implementation of Conditions of Approval in the ITP

Attachment 3

The Declining Amphibian Task Force Fieldwork Code of Practice

A code of practice, prepared by the Declining Amphibian Task Force (DAPTF) to provide guidelines for use by anyone conducting field work at amphibian breeding sites or in other aquatic habitats. Observations of diseased and parasite-infected amphibians are now being frequently reported from sites all over the world. This has given rise to concerns that releasing amphibians following a period of captivity, during which time they can pick up unapparent infections of novel disease agents, may cause an increased risk of mortality in wild populations. Amphibian pathogens and parasites can also be carried in a variety of ways between habitats on the hands, footwear, or equipment of fieldworkers, which can spread them to novel localities containing species which have had little or no prior contact with such pathogens or parasites. Such occurrences may be implicated in some instances where amphibian populations have declined. Therefore, it is vitally important for those involved in amphibian research (and other wetland/pond studies including those on fish, invertebrates and plants) to take steps to minimize the spread of disease and parasites between study sites.

1. Remove mud, snails, algae, and other debris from nets, traps, boots, vehicle tires and all other surfaces. Rinse cleaned items with sterilized (e.g. boiled or treated) water before leaving each study site.
2. Boots, nets, traps, etc., should then be scrubbed with 70% ethanol solution (or sodium hypochlorite 3 to 6%) and rinsed clean with sterilized water between study sites. Avoid cleaning equipment in the immediate vicinity of a pond or wetland.
3. In remote locations, clean all equipment as described above upon return to the lab or "base camp". Elsewhere, when washing machine facilities are available, remove nets from poles and wash with bleach on a "delicates" cycle, contained in a protective mesh laundry bag.
4. When working at sites with known or suspected disease problems, or when sampling populations of rare or isolates species, wear disposable gloves and change them between handling each animal. Dedicate sets of nets, boots, traps, and other equipment to each site being visited. Clean and store them separately and the end of each field day.
5. When amphibians are collected, ensure the separation of animals from different sites and take great care to avoid indirect contact between them (e.g. via handling, reuse of containers) or with other captive animals. Isolation from un-sterilized plants or soils which have been taken from other sites is also essential. Always use disinfected/disposable husbandry equipment.
6. Examine collected amphibians for the presence of diseases and parasites soon after capture. Prior to their release or the release of any progeny, amphibians should be quarantined for a period and thoroughly screened for the presence of any potential disease agents.
7. Used cleaning materials (liquids, etc.) should be disposed of safely and if necessary taken back to the lab for proper disposal. Used disposable gloves should be retained for safe disposal in sealed bags.

APPENDIX F

Streambed Alteration Agreement, San
Juan Bautista to Hollister Sewer Force
Main Project (EPIMS Notification No.
SBO-29921) (CDFW)



State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Central Region
1234 East Shaw Avenue
Fresno, California 93710
(559) 243-4593
www.wildlife.ca.gov

GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director



February 2, 2023

Donald Reynolds
City of San Juan Bautista
Post Office Box 1420
San Juan Bautista, California 95045

Subject: Notification of Lake or Streambed Alteration No. EPIMS-SBO-29921-R4
San Juan Bautista to Hollister Sewer Force Main project
Unnamed Stream – San Benito County

Dear Donald Reynolds:

As the California Department of Fish and Wildlife (CDFW) explained in a previous letter to you dated September 29, 2022, CDFW had until November 15, 2022, to submit a draft Lake or Streambed Alteration Agreement (Agreement) to you or inform you that an Agreement is not required. CDFW did not meet that date. As a result, by law, you may now complete the project described in your Notification without an Agreement.

Please note that pursuant to Fish and Game Code section 1602, subdivision (a)(4)(D), if you proceed with this project, it must be the same as described and conducted in the same manner as specified in the Notification and any modifications to that Notification received by CDFW in writing prior to November 15, 2022. This includes completing the project within the proposed term and seasonal work period and implementing all avoidance and mitigation measures to protect fish and wildlife resources specified in the Notification and all attachments to the Notification. If the term proposed in your Notification will expire, authorization by operation of law without an Agreement will no longer be possible, because an operation of law authorization may not be extended. Beginning or completing a project that differs in any way from the one described in the Notification may constitute a violation of Fish and Game Code section 1602.

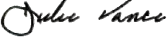
Also note that while you are entitled to complete the project without an Agreement, you are still responsible for complying with other applicable local, State, and federal laws. These include, but are not limited to, Fish and Game Code sections 2080 *et seq.* (species listed as threatened or endangered, or a candidate for listing under the California Endangered Species Act); section 1908 (rare native plants); sections 3511, 4700, 5050, and 5515 (fully protected species); section 3503 (bird nests and eggs); section 3503.5 (birds of prey); section 5650 (water pollution); section 5652 (refuse disposal into water); section 5901 (fish passage); section 5937 (sufficient water for fish); and section 5948 (obstruction of stream).

Donald Reynolds
EPIMS-SBO-29921-R4
February 2, 2023
Page 2 of 2

Finally, if you decide to proceed with your project without an Agreement, you must have a copy of this letter and your Notification with all attachments available at all times at the work site.

If you have any questions regarding this matter, you may contact the CDFW Central Region Lake and Streambed Alteration Program at (559) 243-4593 or by email at R4LSA@wildlife.ca.gov.

Sincerely,

DocuSigned by:

FA83F09FE08945A...

Julie A. Vance
Regional Manager

APPENDIX G

County of San Benito Encroachment
Permit Application

S.O. # _____
W.O. # _____
Util Co Ref # _____



Permit # _____
(County use only)

San Benito County Public Works Department
Application for Encroachment Permit

The undersigned hereby applies for permission to excavate, construct and/or otherwise encroach on a County road right of way by performing the work described herein:

State accurately the location of the work, giving the County road name and location. Applicant hereby agrees to perform the work in accordance with San Benito County Codes and any other applicable regulations and terms of approval.

Describe proposed project

Provide sketch below. Submit detailed plans if available.

On the following County road: _____

A FEE OF \$ _____ IS REQUIRED FOR THIS PERMIT
(Fee to be determined based on application)

All work performed under this permit must be completed on or before the expiration date of _____. Applicant(s)' signature below will indemnify and hold harmless the County of San Benito and all officers and employees thereof in connection with this work.

Applicant Name (print or type)

Address, city, state, zip

Phone

Applicant Signature (must be signed by applicant or authorized agent)

In compliance with your request and subject to all terms, conditions, and restrictions written above, and the general provisions attached and made a part of this permit by reference, this permit is approved

BY: _____ Date: _____
San Benito County authorized representative



**SAN BENITO COUNTY
PUBLIC WORKS DEPARTMENT**

**Certificate of Compliance with California Labor Code
Section 3800 for use with Encroachment Permits**

One of the mandatory conditions for the issuance of any permit from the San Benito County Public Works Department for the construction, alteration, improvement, demolition or repair of any road or structure in the County right of way requires completion of the following certificate of compliance with the California Labor Code Section 3800.

INSTRUCTIONS: Complete either Section 1 or Section 2, as appropriate, and sign the certificate at the bottom of the page.

Section 1 (Check if applicable)

_____ I certify that in the performance of the work for which this permit is issued, I shall not employ any person in any manner so as to become subject to the workman's compensation laws of California.

Section 2 (Check and complete either A, B, or C, THEN check and complete either D or E).

A _____ I certify that I am contracting with a licensed contractor to construct the project, said contractor being: (Name) _____

B _____ I, as owner of the property, certify that I will be employing persons to perform the work for which this permit is issued and am subject to the workman's compensation laws of California.

C _____ I certify that I am licensed under the provisions of the Contractor's License Laws and further that my License Number _____ in Classification _____ is in full force and effect.

D _____ A certificate of consent to self-insure issued by the Director of Industrial Relations, or an exact copy or duplicate thereof certified by the Director is (___ hereby furnished to) (___ on file with) the San Benito County Public Works Department.

E _____ A certificate of workman's compensation insurance issued by an admitted insurer or an exact copy or duplicate thereof certified by the insurer, is (___ hereby furnished to) (___ on file with) the San Benito County Public Works Department.
Company Name: _____

- (1) Policy number: _____ Expiration date: _____
- (2) Indicates San Benito County as certificate holder for the insurer
- (3) States coverage is provided for construction permits in accordance with the California Labor Code Section 3800
- (4) And states that the insurer shall give San Benito County 30 days advance notice of the cancellation of the policy.

WARNING

If, after making the above certification, the applicant should become subject to the workman's compensation provision of the California Labor Code, the applicant shall forthwith comply with the provision of the California Code, Section 3700 and file a certificate with the San Benito County Public Works Department or this permit shall be deemed revoked.

Signature: _____ Date: _____

ENCROACHMENT PERMIT GENERAL PROVISIONS

The Department of Public Works shall receive notice at least forty-eight (48) hours prior to beginning any work within the County right of way. All work performed under this permit shall conform to the rules and regulations pertaining to safety established by the California Division of Industrial Safety and Cal-OSHA.

The job site shall be kept in a safe condition at all times by the daily removal of any excess dirt or debris which might be a hazard to either pedestrian or automobile traffic. All necessary traffic convenience and warning devices and personnel shall be provided, placed and maintained by and at the sole expense of the Permittee in accordance with the latest edition of the CalTrans Manual of Traffic Control.

After completion of the work permitted herein, all debris, lumber, barricades, or any excess material shall be removed and the job site left in a neat professional manner.

It is understood and agreed by the Permittee that the performance of any work under this permit shall constitute an acceptance of all the provisions contained herein and failure on the Permittee's part to comply with any provision will be cause for revocation of this permit. Except as otherwise provided for public agencies and franchise holders, this permit is revocable on five (5) days' notice. No material shall be stacked within eight (8) feet of the edge of the pavement or traveled way unless otherwise provided for herein.

The Permittee agrees by the acceptance of this permit to properly maintain any encroachment structure placed by the Permittee on any part of the County road and to immediately repair any injury to any portion of the roadway which occurs as a result of the maintenance of the encroachment structure, until such time as the Permittee may be relieved of the responsibility of such maintenance of the encroachment structure by the Public Works Department.

The Permittee also agrees by the acceptance of this permit to make, at his own expense, such repairs as may be deemed necessary by the Public Works Administrator or his representative.

It is further agreed by the Permittee that whenever construction, reconstruction, or maintenance work upon the road may require, the installation provided for herein shall, upon request of the Public Works Department, be immediately moved by and at the sole expense of the Permittee.

All backfill material is to be moistened as necessary and thoroughly compacted by mechanical means. If required by the Public Works Administrator, such backfill shall consist of gravel or crushed rock. The Permittee shall maintain the surface over structures placed hereunder as may be necessary to ensure the return of the roadway to a completely stable condition and until relieved of such responsibility by the Public Works Department. Wherever a gravel, crushed rock, or asphalt surface is cut or damaged in the work of placing an encroachment structure, such material shall either be separately stored and replaced in the roadway as nearly as possible to its original

state or shall be replaced in kind, and the roadway shall be left in at least as good a condition as it was before the commencement of operations of placing the encroachment structure.

Whenever necessary to secure permission from abutting property owners, such authority must be secured by the Permittee prior to starting work.

SITE DISCOVERED BY EXCAVATION OR CONSTRUCTION UNDER ENCROACHMENT PERMIT

Presence of Artifacts and/or Human Remains: Any holder of an encroachment permit who, at any time in the preparation for or process of excavating or otherwise disturbing the ground, discovers any human remains of any age, or any significant artifact or other evidence of an archaeological site, shall:

1. Cease and desist from all further excavations and disturbances within 200 feet of the discovery or in any nearby area reasonably suspected to overlie adjacent remains.
2. Arrange for staking completely around the area of discovery by visible stakes no more than 10 feet apart, forming a circle having a radius no less than 100 feet from the point of discovery; provided, however, that such staking need not take place on adjoining property unless the owner of the adjoining property authorizes such staking. Staking shall not include flags or other devices which may attract vandals.
3. Notify the Sheriff-Coroner of the discovery if human and/or questionable remains have been discovered. The Planning Director and the Public Works Administrator shall be notified also.
4. Subject to the legal process, grant all duly authorized representatives of the Coroner, Planning Director, and Public Works Administrator permission to enter onto the property and to take all actions consistent with the County Archaeological Ordinance and consistent with Section 7050.5 of the Health and Safety Code and Chapter 10 (commencing with Section 27460) of Part 3 of Division 2 to Title 3 of the Government Code.

Applicant Signature

Date



Prepared by:
Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765
916.773.8100
www.stantec.com

