Olivehurst Public Utility District

Agenda Item Staff Report

Meeting Date: 06/15/23

Item description/summary:

Consider RFB for Plumas Lake WTP Manganese Filter Expansion Project.

Olivehurst Public Utility District (OPUD) released request for Bid for Plumas Lake WTP Filter Pre-Purchase Project Bids back in June. OPUD received bid on 07/15/2022 by 2'o clock of which 1 bid was submitted. "Loprest, a Division of WRT" Bid was within the budgeted amount for this project. They most recently completed the first phase of this project which was construction of the pre-fabricated tanks which are now ready to be installed at the plant. This bid is to complete the installation (which includes putting together the filters in series and doing necessary electric work to put the new filters in operation).

Fiscal Analysis:

Employee Feedback

n/a

Sample Motion:

Move forward for bid proposal

Prepared by: Swarnjit Boyal, Public Work Engineer

ADVERTISEMENT FOR BIDS

Olivehurst Public Utility District
1970 9th Avenue
P.O. Box 670
Olivehurst, CA 95961

Sealed BIDS for **PLUMAS LAKE WTP MANGANESE FILTERS EXPANSION PROJECT BID**

Can be submitted at OPUD & will be accepted by the **Olivehurst Public Utility District** at the office of the District until 2:00 P.M., July 14th , 2023, and then publicly opened and read aloud shortly after 2:30 P.M. on the same business day at the **Olivehurst Public Utility District Office** at 1970 9th Avenue.

The CONTRACT DOCUMENTS may be examined at the following location:

Olivehurst Public Utility District
1970 9th Avenue
Olivehurst, CA 95961
Phone (530) 743-4657

Copies of the CONTRACT DOCUMENTS may be obtained from **Olivehurst Public Utility District**, upon the non-refundable payment of $ **100** for each set.

In accordance with the provisions of Section 1773.2 of the California Labor Code, this project is subject to the provisions of California's Prevailing Wage Laws and copies of the prevailing rate of per diem wages are on file at the office of Olivehurst Public Utility District, 1970 9th Avenue, Olivehurst, California 95961.

Prospective BIDDERS shall be licensed CONTRACTORS in the State of California and shall be skilled and regularly engaged in the general class or type of WORK called for under the CONTRACT. Each BIDDER submitting a bid shall have California Contractor's license appropriate for this type of work. A mandatory site walk will be scheduled at the districts convenience.

06/23/2023
Date

Swarnjit Boyal
Swarnjit Boyal, Public Works Engineer

OLIVEHURST PUBLIC UTILITY DISTRICT

Our mission is to provide high quality services to enhance our community's quality of life.

BOARD OF DIRECTORS

Dennise Burbank John Floe Mary Jane Griego Lacy Nelson Marc Perrault

GENERAL MANAGER

John Tillotson, P.E.

June 23, 2023

To: All Bidders
From: Swarnjit Boyal, MS, Public Works Engineer, OPUD
RE: RFP for Plumas Lake WTP Manganese Filters Expansion Project Bid

All,

The Olivehurst Public Utility District will be accepting bids for the construction and installation of the following equipment:

BID PROPOSAL REQUEST – PLUMAS LAKE WTP MANGANESE FILTERS EXPANSION PROJECT BID			
Item No.	Est. Qty	Cost Type	Description
1	1	L.S.	Mobilization/demobilization
2	1	L.S.	Insurance and bonds
3	1	L.S.	Demolition of 6, 12 & 14-inch piping including the surface wash pump
4	1	L.S.	10 & 12-inch filter piping, valves, MOVs, valves & meters
5	1	L.S.	16-inch MOV, vault & piping
6	1	L.S.	16-inch filter piping and fittings
7	1	L.S.	24-inch filter piping and fittings
8	1	L.S.	Concrete pad, filter footings, and asphalt repair
9	1	L.S.	Instrumentation
10	1	L.S.	Factory and field testing, and startup
11	1	L.S.	Control Panels
12	1	L.S.	Electrical – conduit, wire, and appurtenances

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Olivehurst, CA 95961

Phone (530) 682-0736
sboyal@opud.org

13	1	L.S.	Disinfection and pressure Testing
14	1	L.S.	Operational testing and commissioning
15	1	L.S.	Training
16	1	L.S.	Full Turnkey System with Installation

L.S. = Lump Sum

Bids will be accepted up through 2:00 pm on July, 14th 2023 at which time bidding will close. Bid will be opened right after the same day.
Thank you very much for your interest in the project.

Project Background:

Olivehurst Public Utility District (OPUD) provides treated water throughout Olivehurst and Plumas Lake. The Plumas Lake Treatment Plant (WTP) contains wells #31 & 32 which currently has 2 filters in operation with a 2.5 MG Storage Tank. Due to the high demand in development within the area, this treatment plant is reaching its capacity for water demand. In order to increase demand in order to service additional residence, OPUD looked at various options of providing these services. For the time being, it was deemed to increase capacity at a cost-effective method, three (3) additional filters would be the best option. Since Inception of this project beginning with Bids in order to produce the three necessary filter back in July of 2022, Loprest – Division of WRT was awarded the construction of the three (3) additional filter fabrication necessary at the facility. In May of 2023 the three (3) filters were fabricated and second phase of the project was ready to commence. This bid is for the second phase of the project which includes the installation and instrumentation to put the three (3) filters online which includes, but not limited to, equipment mentioned above.

General Scope:

Each prospective contractor will submit a proposal for installing and having the system filters running at the existing WTP in the RFP and to include but not be limited to:
Construction and installation of equipment as specified and listed above with a full turnkey system. The proposal will be **awarded to lowest responsible bidder** that meets all the qualifications and requirements listed in technical specifications.
We highly encourage prospective bidder to fully go through the plans and specifications for what is required on this project.

General Provisions/Requirements:

- This will be a prevailing wage project. Bidders cost shall include sales tax.
- **NOTE: Mandatory Site visit will be conducted on Thursday, June 29, 2023 at 10 AM.** no make-up dates will be provided and all bidders must be present at the meeting to be considered for the job.
- Contractor will be required to sign an OPUD standard contract (attached).
- Contractor qualifications: Company specializing in performing this type of work with a minimum of three (3) years' experience of similar project with product being supplied. Contractor will be

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sboyal@opud.org

required to supply contact information for a minimum of 3 of those entities having previously contracted with contractor for similar projects.

- Client should be factory certified and be able to provide start up services and training to the owner/client without added expense of factory start up services.
- *Products requiring electrical connection*: Listed and classified by Underwriters' laboratories (UL) suitable for the purpose specified and indicated.
- Contractor to furnish any required equipment not listed in the equipment lists provided above, transportation, and special or occasional services as required to effect a complete delivery as shown on the Drawings and described in this RFP and as specified and required by the manufacturer.
- Equipment not listed with these specifications or on drawings as furnished by the equipment supplier, but required for the complete purchase and delivery of the filter feature mechanical or electrical systems shall be furnished by the contractor.
- Deliver all equipment in accordance with manufacturer's instructions and recommendations unless otherwise noted. If specified delivery is contrary to manufacturer's instructions, cease delivery of affected components or systems. Notify District Engineer and do not resume delivery without clear instructions.
- General: The bid awardee shall test equipment delivered by him/her/they to show that it complies with specified requirements. Testing shall be done in a manner approved by the District Engineer.
- Contractor shall, at his expense, make the filter operational and make test adjustments, and corrections, until it is shown to be in proper operation condition.

Equipment List and Location for Plumas Lake Water Treatment Plant

The WTP is located at 1074 Algodon Rd, Olivehurst, CA 95961. For equipment list see attached equipment list above and drawings in technical specifications attached. A representative from the OPUD will be available to inspect the layout of the equipment prior to the placement.

Please contact Swarnjit Boyal at 530-682-0736 - sboyal@opud.org or Jim Carson 916-613-7582 – jcarson@affinityengineering.com with any questions.

Sincerely,

Swarnjit Boyal

Swarnjit Boyal, MS, Public Works Engineer
Olivehurst Public Utility District
530-743-8573 - Office
530-682-0736 - Cell
sboyal@opud.org - Email

1970 9TH Avenue
Olivehurst, CA 95961

Phone (530) 682-0736
sboyal@opud.org

PROPOSAL (BID)

OLIVEHURST PUBLIC UTILITY DISTRICT

Name of BIDDER _____

Business Address _____

_____

_____

The undersigned, as BIDDER, declares that the only persons or parties interested in this proposal as principals are those named herein; that this proposal is made without collusion with any other person, firm or corporation; that he has carefully examined the location of the work, the annexed proposal form of agreement, and the plans and specifications therein referred to; and he proposes and agrees, if this proposal is accepted, that he will contract with the owner in the form of the copy of the agreement annexed hereto, to provide all necessary machinery, tools, apparatus and other means of construction, and to do all the work and furnish all materials specified, in the manner and time prescribed, and according to the requirements of the owner as set forth, and that he will take in full payment therefore the following lump sum for the complete work, based on the attached hereto estimated quantities, to wit:

Contractor agrees to supply and/or to perform all the work described below and as instructed by the District Engineer in a good workman like manner for the following Lump Sum prices:

ITEM NO.	DESCRIPTION	QUANTITY	UNIT OF MEASURE	TOTAL ITEM COST
1. GENERAL (All Labor, Equipment, Delivery, Applicable taxes and Fees are to be included in Material Cost)				
1.01	Mobilization/demobilization	1	LS	
1.02	Insurance and bonds	1	LS	
1.03	Demolition of 6, 12 & 14-inch piping including the surface wash pump	1	LS	
1.04	10 & 12-inch filter piping, valves, MOVs, valves & meters	1	LS	
1.05	16-inch MOV, vault & piping	1	LS	
1.06	16-inch filter piping and fittings	1	LS	
1.07	24-inch filter piping and fittings	1	LS	
1.08	Concrete pad, filter footings, and asphalt repair	1	LS	
1.09	Instrumentation	1	LS	
1.10	Factory and field testing, and startup	1	LS	
1.11	Control Panels	1	LS	

1.12	Electrical – conduit, wire, and appurtenances	1	LS	
1.13	Disinfection and pressure Testing	1	LS	
1.14	Operational testing and commissioning	1	LS	
1.15	Training	1	LS	
1.16	Full Turnkey System with Installation	1	LS	

The bidder shall set forth, in clearly legible figures, the bid price in the spaces provided in the following schedule:

	TOTAL BID AMOUNT	$
Write out figures:		

The said quotations include the cost of insurance, sales tax, and every other item of expense direct or indirect incident to the contract.

LIST OF SUBCONTRACTORS

(Public Contract Code Section 4104)

In compliance with the provisions of Sections 4100 et seq. of the Government Code, the undersigned hereby designates below the names and locations of the place of business of each subcontractor who shall perform work on this contract in excess of one-half of one percent of the bid price. If the Contractor fails to specify a subcontractor for any portion of the work under the contract, he shall be deemed to have agreed to perform that work himself. Any change or substitution of subcontractors shall be accomplished in strict accordance with provisions of the Government Code.

Work to be Performed	Percent of Total Contract	Subcontractor's Name and Address	DIR #	CSLB Lic. #
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				

NOTE: *Additional numbered pages may be attached if needed.*

Accompanying this proposal is (cashier's check) (certified check) (bidder's bond) (NOTE: Cross out those that do not apply) in the amount of _____dollars, being at least ten percent (10%) of the total amount bid. Licensed in accordance with the act providing for the Registration of Contractors

Respectfully submitted:

_____	_____
Signature	Address
_____	_____
Title	Date
_____	_____
License Number (if applicable)	

Attest _____

LEGAL REGULATIONS AND RESPONSIBILITY TO THE PUBLIC

SECTION 6

Laws to be Observed

The Contractor shall keep himself fully informed of all existing State and National laws and all municipal ordinances and regulations which in any manner affect those engaged or employed in the work, or the materials used in the work, or which in any way affect the conduct of the work, and of all such orders and decrees of bodies or tribunals having any jurisdiction or authority over the same.

Permits and Licenses

The Contractor shall procure all permits and licenses, pay all charges and fees, and give all notices necessary and incidental to the due and lawful prosecution of the work.

Existing Facilities

The Contractor shall exercise due care to avoid injury or damage to existing improvements or facilities, utilities, adjacent property, monuments, and roadside trees and shrubbery that are not to be removed or relocated. Existing mail boxes, signs, shrubbery, lawn, trees, markers, or any other facility or improvement which must be removed shall be replaced with the undamaged original or a new facility equal to the original at the Contractor's expense if damaged by reason of the Contractor's operations, to the satisfaction of the property owner.

Utilities

The plans and specifications identify certain existing utilities as known to the Engineer. It shall be the Contractor's responsibility to exactly locate those facilities and to protect those facilities from damage as a result of his operations. The attention of the Contractor is called to the fact that there may be other unlocated utilities within the project area. Prior to making any such excavation, Contractor shall attempt to identify the location of any such utilities. It shall be the duty of the Contractor to protect any such utilities from damage, provided however, the Contractor shall be compensated for any costs of locating any such additional utilities and shall be further compensated if damage shall occur to any utilities not located upon the plans and Specifications which damages are not caused in any part by the failure of the Contractor to exercise reasonable care and discretion in removing or relocating utility facilities not indicated in the plans and specifications. The Contractor shall not be assessed any liquidated damages for any delays in completion of the project necessarily and reasonably incurred when such delay was proximately caused by the failure of the public agency or the owner of the utility to provide for the removal or relocation of such utility facilities. The Contractor's specific attention is called to the fact that existing service laterals and appurtenances to those service laterals exist within the project area and such laterals are not shown on the plans and specifications but can be reasonably inferred from the presence of other visible facilities such as building, meters, junction boxes, adjacent to the site of construction. No additional compensation shall be paid for any damages or delay caused to such service lateral facilities and it is the Contractor's sole and

exclusive obligation to provide for the protection, replacement and repair of any such facilities. If the Contractor, while performing the contract, discovers any utility facilities not identified by the public agency, other than the existing service laterals or appurtenances, he shall immediately notify the Engineer.

New Facilities

Until the formal acceptance of the complete work by **Olivehurst Public Utility District**, the Contractor shall have the charge of and care thereof, and shall bear the risk of injury or damage to any part of the work by the action of the elements or others. The contractor, at Contractor's cost, shall rebuild, repair, restore and make good all such damages to any portion of the work occasioned by any of such causes before its acceptance.

Clear-Up

Prior to final acceptance and payment, the Contractor shall clean all roads or streets, borrow pits and all areas occupied by the forces during the construction of the improvement facilities, remove all refuse, excess material, temporary structures and equipment; and leave the entire project in a neat and presentable condition.

INSURANCE AND LIABILITY

GENERAL

The Contractor shall not commence any work until he obtains at his own expense, all required insurance from insurance companies acceptable to the Owner. Such insurance must have the approval of the Owner as to limit, form, and amount. The Contractor shall not permit any subcontractor to commence work on this project until the same insurance requirements, as applicable, have been complied with by such subcontractor. Nothing contained in these insurance requirements is to be construed as limiting the extent of the Contractor's responsibility for payment of damages resulting from his operations under this contract. As evidence of specified insurance coverage, the Owner may, in lieu of actual policies, accept certificates issued by the insurance carrier showing such policies in force for the specified period. Each policy or certificate shall bear an endorsement or statement waiving right of cancellation or reduction in coverage without 30 days notice in writing to be delivered by registered mail to the Owner. In case of the breach of any provisions of this article, the Owner, at his option, may take out and maintain at the expense of the Contractor, such insurance as the Owner may deem proper and may deduct the cost of such insurance from any moneys which may be due or become due the Contractor under this contract.

COMPREHENSIVE GENERAL LIABILITY INSURANCE

Before commencement of the work, the Contractor shall submit written evidence that he and all his subcontractors have obtained for the period of the contract, full comprehensive general liability insurance coverage. This coverage shall provide for both bodily injury and property damage. The bodily injury portion shall include coverage for injury, sickness, disease, death, arising directly or indirectly out of, or in connection with, the performance of the work under this contract, and shall provide for a limit of not less than $1,000,000 for all damages arising out of bodily injury, sickness,

disease, or death of one person, and a total limit of $1,000,000 for damages arising out of bodily injury, sickness, disease, or death of two or more persons in any one occurrence. The property damage portion shall include "broad form" coverage for a limit of not less than $1,000,000 for all damages arising out of injury to or destruction of property of others arising directly or indirectly out of or in connection with the performance of work under this contract and in any one occurrence, including explosion, collapse, and underground exposure. Included in such insurance shall be contractual coverage sufficiently broad to insure that provision titled "Indemnity" hereinafter. The comprehensive general liability insurance shall include as additional named insured: the Owner, the Engineer and his consultants, and each of their officers, agents and employees.

WORKMEN'S COMPENSATION INSURANCE

Before the Contract between the Owner and the Contractor is entered into, the Contractor shall submit written evidence that he and all subcontractor's have obtained, for the period of the Contract, full Workmen's Compensation Insurance coverage for all persons whom they employ or may employ in carrying out the work under this contract. This insurance shall be in strict accordance with the requirements of the most current and applicable State Workmen's Compensation Insurance laws. The Contractor will be required to execute a certificate prior to performing the work of the Contract providing as follows: "I am aware of the provisions of Section 3700 of the Labor Code which requires every employer to be insured against liability for Workmen's Compensation or to undertake self insurance in accordance with the provisions of the Code and I will comply with such provisions before commencing the performance of the work of this Contract".

BUILDER'S RISK "ALL RISK" INSURANCE

Unless otherwise modified in the "Supplementary Conditions", the Contractor shall secure and maintain during the life of this Contract, Builder's Risk "All Risk" Insurance coverage for one hundred percent (100%) of the contract amount. Such insurance shall not exclude coverage for earthquake, landslide, flood, collapse, or loss due to the results of faulty workmanship, and shall provide for losses to be paid to the Contractor and the Owner as their interests appear. Such insurance may have a deductible clause not to exceed $250, except that the deductible on earthquake may be in accordance with the underwriter's requirements, provided that it does not exceed five percent (5%) of the contract amount.

INSURANCE COVERAGE FOR SPECIAL CONDITIONS

When the construction is to be accomplished within a public or private right-of-way requiring special insurance coverage, the Contractor shall conform to the particular requirements and provide the required insurance. The Contractor shall include in his liability policy all endorsements that the said authority may require for the protection of its officers, agents, employees and interests.

INDEMNIFY

To the fullest extent permitted by law, the Contractor shall hold harmless, indemnify and defend the Owner, the Engineer and his consultants, and each of their officers and employees and agents,

from any and all liability, claims, losses, damages, or costs, including but not limited to attorney's fees, arising or alleged to arise from or during the performance of the work described herein caused by the act or omission of contract, any subcontractor, directly or indirectly employed by them, or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by the party indemnified hereunder, or by the negligence or omission of the party indemnified herein.

NO PERSONAL LIABILITY OF PUBLIC OFFICIALS

In carrying out all the provisions hereof in exercising any authority granted by the contract, there will be no personal liability upon any public official.

Substitution of Security

In lieu of the 5% retention in payment as set forth hereinafter, the contractor may, upon request to the District, substitute in lieu thereof securities in form and content acceptable to the District, pursuant to the provisions of Section 4590 of the Government Code of the State of California. All costs and expense of any escrow or trustee shall be the responsibility of the contractor.

RESOLUTION OF CLAIMS

1. Public Contract Code Section 9204 specifies provisions on resolving contract claims of any size, and Public Contract Code Section 201014, et seq., specifies required provisions on resolving contract claims less than $375,000. Those statutes constitute a part of this Contract. In the event any other Contract provision violates such statutes, the applicable statute controls.

2. Public Contract Code Section 9204 provides:

   a. For the purposes of this section, "Claim" means a separate demand by Contractor for (1) a time extension, (2) payment or money or damages arising from Work done by or on behalf of Contractor arising under the Contract Documents and payment of which is not otherwise expressly provided for or the Claimant is not otherwise entitled to, or (3) an amount the payment of which is disputed by Owner.

   b. Procedure:

      1) Upon receipt of a Claim the Owner shall conduct a reasonable review of the Claim and within 45 days, or if Owner's governing body must approve Owner's response to the Claim and the governing body has not met within the 45 days then within three (3) days of the governing body's meeting, shall provide Contractor with a written statement identifying what portion of the claim is disputed and what portion is undisputed. Should Owner take no action on the Claim within 45 days of submission, it shall be deemed denied.
      2) If the Contractor disputes Owner's response to its Claim, including a failure to respond, it may submit via registered mail or certified mail,

return receipt requested, a written demand for an informal conference to meet and confer for settlement of the issues in dispute. Owner shall schedule such a meet and confer conference within 30 days for settlement of the dispute. Within ten (10) days of the meet and confer conference Owner shall provide Contractor with a written statement identifying the portion of the Claim that remains in dispute and the portion that is undisputed. If the Contractor disputes Owner's statement it shall inform Owner and they shall mutually agree to a mediator within 10 business days of the written statement.

3) Owner shall pay the undisputed portions of the Claim within 60 days of the issuance of a written statement identifying an undisputed portion.

4) Any disputed portion of the Claim, as identified by the Contractor in writing, shall be submitted to nonbinding mediation, with the Owner and the claimant sharing the associated costs equally. The Owner and claimant shall mutually agree to a mediator within 10 business days after the disputed portion of the claim has been identified in writing. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator. If mediation is unsuccessful, the parts of the Claim remaining in dispute shall be subject to applicable procedures outside this section.

5) For claims under $375,000, unless the parties agree otherwise in writing, mediation pursuant to these provisions shall excuse the mediation obligation under Public Contracting Code section 20104.4(a).

6) The parties may mutually agree, in writing, to waive the mediation requirements of this subsection and proceed to the commencement of a civil action or binding arbitration, as applicable.

7) Failure by the Owner to respond to a Claim from a Contractor within the time periods described in this subdivision or to otherwise meet the time requirements of this section shall result in the claim being deemed 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.

9) If a Subcontractor or a lower tier subcontractor lacks legal standing to assert a claim against Owner because privity of contract does not exist, the Contractor may present to the Owner a claim on behalf of a Subcontractor or lower tier subcontractor. A Subcontractor may request in writing, either on his or her own behalf or on behalf of a lower tier subcontractor, that the Contractor present a claim for work which was performed by the Subcontractor or by a lower tier subcontractor on behalf

of the Subcontractor. The Subcontractor requesting that the Claim be presented to the public entity shall furnish reasonable documentation to support the claim. Within 45 days of receipt of this written request, the Contractor shall notify the Subcontractor in writing as to whether the Contractor presented the claim to the Owner and, if the original Contractor did not present the claim, provide the Subcontractor with a statement of the reasons for not having done so.

10) Nothing in this section shall impose liability upon an Owner that makes loans or grants available through a competitive application process, for the failure of an awardee to meet its contractual obligations.

11) This section shall remain in effect only until January 1, 2020, and as of that date is repealed, unless a later enacted statute, that is enacted before January 1, 2020, deletes or extends that date.

3. To the extent applicable, Public Contract Code Section 20104, et seq., provide.

a. For the purposes of this section, "Claim" means a separate demand by Contractor of $375,000 or less for (1) a time extension, (2) payment or money or damages arising from Work done by or on behalf of Contractor arising under the Contract Documents and payment of which is not otherwise expressly provided for or the Claimant is not otherwise entitled to, or (3) an amount the payment of which is disputed by Owner. Separate Contractor Claims that together total more than $375,000 do not qualify as a "separate demand of $375,000 or less," as referenced above, and are not subject to this section.

b. Caution. This section does not apply to tort claims, and nothing in this section is intended nor shall be construed to change the time periods for filing tort claims or actions specified by Chapter 1 and Chapter 2 of Part 3 of Division 3.6 of Title 1 of the Government Code.

c. Procedure:

1) The Claim must be in writing, submitted in compliance with all requirements set forth in this document, without limitation, the time prescribed by and including the documents necessary to substantiate the Claim. Nothing in this section is intended to extend the time limit or supersede notice requirements for the filing of claims as set forth elsewhere in the Contract Documents.

2) For Claims of fifty thousand dollars ($50,000) or less, Owner shall respond in writing within forty-five (45) days of receipt of the Claim, or Owner may request in writing within thirty (30) days of receipt of the Claim, any additional documentation supporting the Claim or relating to any defenses or claims Owner may have against Claimant. If additional information is thereafter required, it shall be requested and provided in accordance with this section upon mutual agreement of Owner and Claimant. Owner's written response to the Claim, as further documented, shall be submitted to Claimant within fifteen (15) days after receipt of further documentation or within a period of time no greater than taken by Claimant in producing the additional information, whichever is greater.

3) For Claims over Fifty Thousand Dollars ($50,000) and less than or equal to $375,000: Owner shall respond in writing within sixty (60) days of receipt of the Claim, or Owner may request in writing within thirty (30) days of receipt of the Claim, any additional documentation supporting the Claim or relating to any defenses or claims Owner may have against Claimant. If additional information is thereafter required, it shall be requested and provided in accordance with this section, upon mutual agreement of Owner and Claimant; Owner's written response to the Claim, as further documented, shall be submitted to Claimant within thirty (30) days after receipt of further documentation or within a period of time no greater than taken by Claimant in producing the additional information, whichever is greater.

4) Meet and Confer: If Claimant disputes Owner's written response, or Owner fails to respond within the time prescribed above, Claimant shall notify Owner, in writing, either within fifteen (15) days of receipt of Owner's response or within fifteen (15) days of Owner's failure to timely respond, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon demand Owner will schedule a meet and confer conference within thirty (30) days for settlement of the dispute.

5) Following the meet and confer conference, if the Claim or any portion remains in dispute, Claimant may file a claim as provided in Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled from the time Claimant submits its written claim as set forth herein, until the time that Claim is denied as a result of the meet and confer process, including any period of time utilized by the meet and confer process.

STANDARD CONTRACT (AGREEMENT)

OLIVEHURST PUBLIC UTILITY DISTRICT

THIS AGREEMENT, made this _____ day of _____, ____, by and between **Olivehurst Public Utility District** (hereinafter called "OWNER"),
(Name of Owner), (an Individual)

and _____ doing business as
(Name of General Contractor)

(an individual,) or (a partnership.) or (a corporation) hereinafter called "CONTRACTOR".
The aforementioned parties agree as follows:

I

The Contractor agrees to furnish for the total sum of (includes bid additives)

_____ Dollars,

all labor, materials, tools and equipment and perform all the work required to construct and complete in a good workmanlike manner all improvements and work mentioned, described, delineated, shown and referred to in the plans and specifications, general conditions and special conditions Including any bid additives. Plans and specifications are included within this contract by reference as if set forth in full.

II

Contractor agrees to furnish all necessary tools, equipment, supplies, labor and materials required for the performance and completion of said work and improvement, all to the satisfaction of Owner, and subject to the requirements of the Engineer.

Owner hereby fixes the time for the commencement of said work and improvements under this Agreement to be within 20 calendar days, and such work and improvements shall be prosecuted

with diligence from day to day thereafter for a completion date of _____ It is agreed and stipulated between Owner and the Contractor that damage will be sustained by the Owner from any delays in the performance of this contract, and it is currently contemplated by the parties and estimated by the parties, that it will be impracticable and extremely difficult to fully ascertain and determine the actual damage which the Olivehurst Public Utility District will sustain by such delays. The parties agree that they shall be deemed to have jointly studied and attempted to estimate the damages suffered by the Olivehurst Public Utility District by such a delay under these circumstances and to agree and stipulate by this contract the sum of $____Dollars per day for each and every day's delay beyond the time prescribed to complete the work which has been agreed to by the parties as a fair estimate of the damage to be suffered by the Olivehurst Public Utility District from and as a direct result of such delay.

Contractor agrees to provide proof to Olivehurst Public Utility District of insurance naming Olivehurst Public Utility District and Engineer and employees as named insured in amounts of no less than coverage for $1,000,000 per person and $1,000,000 per occurrence and property damage up to $1,000,000 and a standard broad form comprehensive and automobile liability policy form. Contractor further agrees to insure that every subcontractor employed by Contractor shall have insurance of equal character and limits of $1,000,000 per person and $1,000,000 per each occurrence and property damage up to $1,000,000 per each occurrence and to provide certificates to Olivehurst Public Utility District of such insurance prior to allowing such subcontractor to commence work upon the project.

Contractor further agrees to provide prior to commencement of work and to require every subcontractor to provide prior to the commencement of work, a certificate pursuant to Labor Code Section 3700 et.seq. which will state as follows:

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

Contractor agrees to comply with each and every provision of the Section 1770 through Section 1780 of the Labor Code relating to prevailing wages. The Contractor shall be required to forfeit to Owner the amount of Fifty Dollars ($50) for each calendar day, or portion thereof, for each workman paid less than the prevailing wages as determined for the work done herein. The difference between prevailing wage rate and the amounts paid to each workman for each calendar day or portion thereof for which each workman was paid less than the prevailing wage rate shall be paid to each workman by the Contractor.

Contractor further agrees to comply with each and every provision of Section 1777.5 of the labor Code of the State of California relating to apprenticeship standards and the employment of apprentices upon project and to comply with each and every provision of Section 1810 through 1815 of the Labor Code relating to the employment of workmen in excess of eight (8) hours in violation of the Labor Code.

Is the contractor registered with the Department of Industrial Relations in accordance with California Labor Code section 1725.5 et seq.*? _____

*As of July 1, 2014, the District cannot enter into a Public Works Contract with a contractor that is not registered with the Department of Industrial Relations in accordance with California Labor Code section 1725.5 et seq..

III

Contractor agrees to pay to Olivehurst Public Utility District, or to make at its' own expense all repairs, replacements or payments necessitated by defects in materials or workmanship supplied

under the terms of this contract which exist within one (1) year after the date of final acceptance of the work. This Agreement shall cover defects which shall be in existence during such one (1) year period. This Agreement shall apply to all defects which exist in the first year whether or not discovered within the first year. The Contractor shall be fully responsible for all direct and indirect damages and expenses to Olivehurst Public Utility District proximately causes by such defects in materials or workmanship, including defects and materials which bear a guarantee or warranty in writing or by law for a period longer than one (1) year, Contractor hereby stipulates and agrees that such guarantees shall be inure for the benefit of Olivehurst Public utility District for such longer periods. The effective date for the start of the guarantee or warranty for equipment qualifying as substantially complete, shall be upon the time Olivehurst Public utility District takes possession and operation of equipment or materials. In any case the warranty period described in this contract shall not limit the applicable statute of limitations for breach of a written contract and legal provisions for the District. Certain items in the project specifications may have specific warranty periods and provisions specified and the longer of the specified or contractual warranty period shall prevail.

The Contractor also agrees to hold the Olivehurst Public Utility District harmless from liability, both direct and indirect, of any kind arising from damage due to such defects. The Contractor shall make all repairs, replacements, or payments promptly upon receipt of written order for the same from the Olivehurst Public Utility District. If Contractor fails to make the repairs or replacements or payments within the time specified by Owner, then, subject to the sole discretion of Olivehurst Public utility District, District may do the work in any manner it sees fit, and the Contractor and his surety shall be liable for the cost thereof, including all costs of engineers or consultants required to do said work and all cost related to the expedition of said work. Any

additional requirements for the project relative to the collection for defective work after final acceptance are provided for hereafter in this Agreement.

Contractor shall provide a faithful performance bond in the amount of one hundred percent (100%) of the contract price, and a labor and materials bond in the amount of one hundred percent (100%) of the contract price on the attached forms. Said bonds shall be issued by an admitted surety insurer within the State of California and will be supported by the information and certifications required under California Code of Civil Procedure Section 995.660.

IV

The complete Contract consists of the following documents to wit: The notice to Contractors, the General Provisions, the Technical Provisions, the Proposal (Bid), the form of Contract (Agreement), the Labor and Material Bond, the Performance Bond, all specifications and drawings, and all modifications made or incorporated in any of those documents. All of the above documents are intended to be complementary, so that any work called for in one and not mentioned in the other is to be executed the same as if mentioned in all of said documents. Similarly, any contract provision appearing in one shall be binding as if it appeared in all said documents.

V

Contractor shall be financially responsible for claims (including claims of OSHA or other agency with jurisdiction over the job), liens, or stop notices, including preliminary notices that are filed on the job. In lieu of retention of payment by the DISTRICT, CONTRACTOR may elect to deposit certain securities equivalent to the amount to be withheld into a District approved escrow account.

CONTRACTOR shall be solely responsible for all construction under this contract, including the technique, sequences, procedures, and means, and for coordination of all work. CONTRACTOR shall supervise and direct the work to the best of CONTRACTOR'S ability, and give all attention necessary for such proper supervision and direction. Contractor shall have full control over the site and shall be responsible to take all required steps, and implement all required procedures, required for the safety of employees and the public. Contractor shall be aware of and obey all OSHA regulations pursuant to the work he is engaged in for this project.

CONTRACTOR has the duty of providing for and overseeing all safety orders, precautions, and programs necessary to the reasonable safety of the work. In this connection, CONTRACTOR shall take reasonable precautions for the safety of all work employees and all other persons that the work might affect, all work and materials incorporated in the project, and all property improvements on the construction site and adjacent to the site, and comply with all applicable laws, ordinances, rules, regulations, and orders. Contractors' cost of work includes the costs of all required safety measures including sheeting, shoring and trenching for the protection of life and limb.

Owner:

Signature	Name
Title	Date

Attest:

Contractor:

Signature	Name
Title	Date

Attest:

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, that we, _____ _____hereinafter called Principal, and _____ _____hereinafter called Surety, are held and firmly bound unto_____ _____hereinafter called the Owner, in the sum of _____dollars ($_____) in lawful money, for the payment of which sum well and truly to be made, we bind ourselves, or heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas the Principal entered into a certain Contract, hereto attached, with the OWNER, dated _____, 201___, for the construction of:

OLIVEHURST PUBLIC UTILITY DISTRICT

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions and agreements of said Contract during the original term thereof and any extension thereof that may be granted by the OWNER, with or without notice to the Surety, and during the life of any guaranty required under the Contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all modifications of said Contract that may thereafter be made, except that no change will be made which increases the total contract amount more than twenty percent (20%) in excess of the original Contract amount without notice to the Surety, then this obligation shall be void, otherwise the same shall remain in full force and virtue.

Surety hereby expressly waives written notice of any changes, alterations, modifications of the contract entered into between Principal and OWNER and agrees and stipulates that such changes and modification shall be treated as part of such Contract and Surety shall be bound thereby except that Surety will not be bound to any changes or alterations which increase the total contract amount

more than twenty percent (20%) in excess of the original contract amount without written notice to Surety.

IN WITNESS THEREOF, the above bounded parties have executed this instrument under their several seals this _____day of _____, 20___, the name and corporate seal of each corporate party being hereto affixed and those presents duly signed by its undersigned representative pursuant to authority of its governing body.

IN PRESENCE OF:

Principal:

_____ _____

Signature Name

_____ _____

Title Date

Attest:

_____

Principal:

_____ _____

Signature Name

_____ _____

Title Date

Attest:

_____

Surety:

_____ _____

Signature Name

_____ _____

Title Date

Attest:

_____

The rate of premium on this bond is _____per thousand.

Total amount of premium charges _____Dollars ($_____)

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and must be authorized to transact business in the state where the PROJECT is located.

LABOR AND MATERIAL BOND

KNOW ALL MEN BY THESE PRESENTS, that, _____

_____

has awarded to _____

_____hereinafter

designated as the CONTRACTOR, a Contract for the work described as follows:

OLIVEHURST PUBLIC UTILITY DISTRICT

and, WHEREAS, said CONTRACTOR is required to furnish a bond in connection with said Contract, providing that if said CONTRACTOR, or any of his or its SUB-CONTRACTORS, shall fail to pay for any materials, provisions, provender, or other supplies or teams used in, upon, for, or about the performance of the work contracted to be done, or for any work or labor done thereon of any kind, that the Surety on this bond will pay the same.

NOW, THEREFORE, we, _____

_____

the undersigned contractor, as Principal, and _____

COMPANY, a corporation organized and existing under the laws of the State of _____, and duly authorized to transact business under the laws of the State of California, as Surety, are held and firmly bound unto _____

in the sum of _____Dollars ($_____), said sum being not less than the estimated amount payable by the said _____

_____under

the terms of the Contract, for which payment well and truly to be made, we bind ourselves, our heirs, executors and administrators, successors and assign, jointly and severally, firmly by these presents. THE CONDITION OF THIS BOND IS SUCH, that if the above bonded Principal or his subcontractors fail to pay any of the persons named in Section 3181 of the Civil Code of the State of California, or amounts due under the Unemployment Insurance Code with respect to work or labor performed by any such claimant, for any amounts required to be deducted, withheld, and paid over to the Franchise Tax Board from wages of employees of the Contractor or his subcontractor pursuant to Section 18806 of the Revenue and Taxation Code, with respect to such work and labor,

the Surety will pay the same, in an amount not exceeding the amount specified in this bond, and also, in case suit is brought upon this bond, a reasonable attorney's fee, to be fixed by the Court. This bond shall insure to the benefit of any and all persons, companies or corporations entitled to file claims under Section 3181 of the Civil Code of the State of California, so as to give a right of action to them or their assigns in any suit brought upon this bond.

Should the condition of this bond be fully performed, then obligation shall become null and void, otherwise it shall be and remain in full force, virtue and effect.

And the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of said contract or the Specifications accompanying the same shall in any manner affect its obligations on this bond, and it does hereby waive notice of any such change, extension, alteration or addition.

SIGNED, sealed with our seals, and dated this _____day of _____, 20____

(To be signed by Principal and Surety and acknowledgments and Notaries Seal attached)

Principal:

_____ _____

Signature Name

_____ _____

Title Date

Attest:

_____

Attorney-in-Fact:

_____ _____

Signature Name

_____ _____

Title Date

Attest:

_____

Surety:

_____ _____

Signature Name

Title

Date

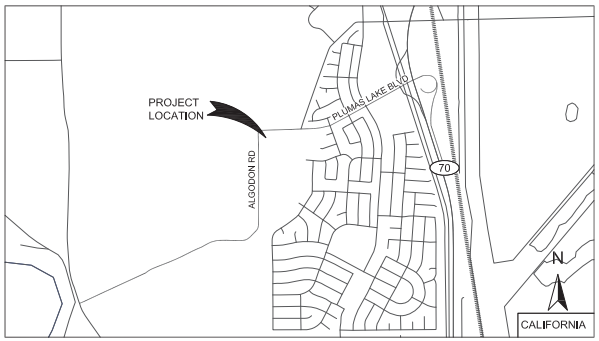
Attest:

Olivehurst Public Utility District

Plumas Lake Water Plant
Manganese Treatment
Olivehurst, CA

BID SET

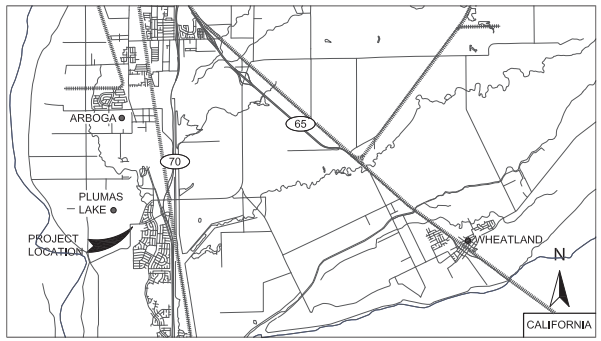
June 1, 2023



AREA MAP

AFFINITY ENGINEERING
3221 Fitzgerald Road, Rancho Cordova, CA, 95670
www.affinityengineering.com

James D. Carson
C43839
Principal Engineer



LOCATION MAP

Bid Set

CONSULTANT: AFFINITY ENGINEERING, 3433 Mardi Gras Court, Rancho Cordova, CA, 95670, www.affinityengineering.com	REGISTERED PROFESSIONAL ENGINEER JAMES D. CARSON 43839 EXP. 6/30/23 CIVIL STATE OF CALIFORNIA	NO.	REVISION DESCRIPTION	BY	DATE	CLIENT: Olivehurst Public Utility District, 1970 9th Avenue, Olivehurst, CA 95961	PROJECT: PLUMAS LAKE WATER PLANT MANGANESE TREATMENT EXPANSION	SCALE: ATTENTION LINE IS 2" AT FULL SIZE (SCALE ACCORDINGLY)	SHEET TITLE: COVER SHEET	SHEET NAME: CS SHEET NUMBER: 1 OF 40 6/1/23

Discipline	Sheet	Name	Title
General			
	1	CS	Cover Sheet
	2	G1	Drawing Index List
	3	G2	Abbreviations and Symbols
Process			
	4	PF1	Overall Facility
	5	I1	Instrumentation Symbols and Abbreviations
	6	I2	Well 31 P&ID
	7	I3	Well 32 P&ID and Filter Influent P&ID
	8	I4	Filter 1 P&ID
	9	I5	Filter 2 P&ID
	10	I6	Filter 3 P&ID
	11	I7	Filter 4 P&ID
	12	I8	Filter 5 P&ID
	13	I9	Future Filter 6 P&ID
	14	I10	Backwash Recycle P&ID
	15	I11	Reservoir P&ID
	16	I12	Booster Pump Station P&ID
	17	I13	Sodium Hypochlorite Feed and Auxiliary Systems P&ID
Civil			
	18	C1	Existing Site
	19	C2	Demolition Plan
	20	C3	Modification Site Plan

Discipline	Sheet	Name	Title
Mechanical			
	21	M1	Filter Vessels Plan View
	22	M2	Filter Vessels Sections – 1
	23	M3	Filter Vessels Sections – 2
	24	M4	Filter Effluent Valve Vault and Other Details
	25	MF1	Filter Prepurchase Details
Electrical			
	26	E1	Electrical Symbols and Abbreviations
	27	E2	Partial One Line Diagram and Panelboard Schedules
	28	E3	Control Panel Backpan Layout
	29	E4	Control Panel Power Distribution Diagram
	30	E5	Control Panel Example PLC I/O Wiring Diagrams
	31	E6	Filter Network Control Panels Elevation and Layout
	32	E7	Filter Network Control Panels Power Distribution Diagram
	33	E8	Control Building Electrical Plan
	34	E9	Filter System Electrical Plan
	35	E10	Filter System Electrical Plan Filters 1 and 2
	36	E11	Filter System Electrical Plan Filters 3, 4, 5
	37	E12	Electrical Site Plan
	38	E13	Electrical Details
	39	E14	Electrical Conduit Schedule
	40	E15	Electrical Conduit Schedule

Bid Set

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE:
ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

CIVIL

SHEET TITLE:
DRAWING INDEX

SHEET NAME: G1

SHEET NUMBER: 2 OF 40

6/1/23

ABBREVIATIONS

Ø	DIAMETER
°	DEGREES
'	FEET
"	INCHES
A	AMPS
AFF	ABOVE FINISHED FLOOR
ATS	AUTOMATIC TRANSFER SWITCH
BKS	BACKSPIN
BLDG	BUILDING
C	CONDUIT
CHEM	CHEMICAL
CL2	SODIUM HYPOCHLORITE
CNTL	CONTROL+
CONC	CONCRETE
D	DRAIN
DWG	DRAWING
(E)	EXISTING
EL	ELEVATION
EP	EDGE OF PAVEMENT
(F)	FUTURE
FF	FINISHED FLOOR
FIP	FEMALE IRON PIPE
GFI	GROUND FAULT INTERRUPTOR
HOA	HAND-OFF-AUTOMATIC
HH	HANDHOLE
HRS	HOURS
HP	HIGH POINT
INV	INVERT
KWH	KILOWATT HOUR
LP	LOW POINT
LTG	LIGHTING
MCC	MOTOR CONTROL CENTER
MH	MANHOLE
MJ	MECHANICAL JOINT
N.T.S	NOT TO SCALE
PB	PULL BOX
PG&E	PACIFIC GAS AND ELECTRIC COMPANY
PLC	PROGRAMMABLE LOGIC CONTROLLER
PNL	PANEL
POS	POSITION
PVC	POLYVINYL CHLORIDE
RECPT	RECEPTACLE
RLECWD	RIO LINDA / ELVERTA COMMUNITY WATER DISTRICT
S/O	SLIP ON
SCADA	SCADA
SD	STORM DRAIN
SPD	SPEED
SS	STAINLESS STEEL
STD	STANDARD
STL	STEEL
TB	TERMINAL BOX
TBE	THREADED BOTH ENDS
TOS	TOP OF SLAB
TW	TREATED WATER
TYP	TYPICAL
UPS	UNINTERRUPTIBLE POWER SUPPLY
V	VOLTS
VFD	VARIABLE FREQUENCY DRIVE
VLV	VALVE
W	WATER
WP	WEATHERPROOF WHILE IN USE
XFMR	TRANSFORMER

PATTERNS

- SOIL
- CONCRETE
- ASPHALT CONCRETE PAVEMENT
- DEMOLITION

COMMON LINES AND SYMBOLS

- EXPOSED
- BOUNDARY OR OUTLINE
- CENTERLINE
- HIDDEN (BELOW GRADE, IN WALLS, ETC.)
- PROPERTY LINE
- (E) OVERHEAD UTILITY
- GROUND WIRE
- ELECTRONIC SIGNAL (SUCH AS BETWEEN PLC CONTROL ALGORITHMS)
- (E) WATER
- (E) NATURAL GAS
- (E) SANITARY SEWER
- RIGHT OF WAY
- (E) BURIED ELECTRICAL
- FENCE
- FENCE
- CONTINUATION MARK
- SECTION CUT: REFERENCE LETTER TOP, SHEET REFERENCE TO WHERE SECTION APPEARS, ARROW POINTS IN DIRECTION THAT SECTION IS TAKEN (A / C5)
- NORTH ARROW, N IS IN THE DIRECTION OF NORTH
- REVISION SYMBOL, LOCATION CORRESPONDS TO PART OF DRAWING REVISED
- WELL SITE LOCATION MARKER

PROCESS, PIPING AND MECHANICAL SYSTEMS

- SHEET P3 — SHEET CONTINUATION
- I/O LABEL: SIGNAL TYPE AT BOTTOM, S AT TOP INDICATES THE I/O SHALL BE SHOWN ON THE PRIMARY SCADA SCREEN FOR THE PROCESS (S / LEVEL)
- TRIANGLES BELOW INDICATE THE I/O BEING ONE OF 4 TYPES AS SHOWN BELOW

I/O TYPES:

- DISCRETE INPUT
- DISCRETE OUTPUT
- ANALOG INPUT
- ANALOG OUTPUT
- HARD WIRED INTERLOCK
- CS-1 — LOGICAL (PROGRAMMED) INTERLOCK
- UNLTRASONIC OR RADAR LEVEL TRANSMITTER
- FLOAT SWITCH
- REDUCER

PROCESS, PIPING AND MECHANICAL SYSTEMS (CONTINUED)

- AIR RELEASE VALVE
- SITE DRAIN (D)
- CHECK VALVE
- MAGNETIC FLOW METER (M)
- VALVE: MANUAL, AUTOMATIC CONTROL (BUTTERFLY OR GATE)
- MOTOR (M)
- VERTICAL TURBINE PUMP
- HORIZONTAL SPLIT CASE CENTRIFUGAL PUMP
- SUMP PUMP
- TANK LEVEL SIGHT BOARD
- SAND SEPARATOR (S)
- SMALL DIAMETER VALVE (3" MAX)
- SOLENOID VALVE (S)

PROCESS, PIPING AND MECHANICAL SYSTEMS (CONTINUED)

FIELD MOUNTED INSTRUMENT IDENTIFIER (FUNC / TYPE NUM / SUF):
TYPE: ISA 5.1 INSTRUMENT TYPE DESIGNATIONS, SEE BELOW
NUM: INSTRUMENT NUMBERS (WHERE USED)
FUNC: FUNCTIONAL INFORMATION (AS NEEDED)
SUF: INSTRUMENT NUMBER SUFFIXES TO ESTABLISH UNIQUE INSTRUMENT IDENTIFIERS (AS NEEDED)

- INSTRUMENT IDENTIFIER AS ABOVE EXCEPT THAT THE INSTRUMENT IS MOUNTED ON A PANEL AND VISIBLE WITH THE DEAD FRONT DOOR CLOSED
- INSTRUMENT IDENTIFIER AS ABOVE EXCEPT THAT THE INSTRUMENT IS MOUNTED ON A PANEL AND NOT VISIBLE WITH THE DEAD FRONT DOOR CLOSED

ISA 5.1 INSTRUMENT TYPE DESIGNATIONS:
DESIGNATIONS BEGIN WITH ONE OR TWO LETTERS DEFINING THE MEASURED OR CONTROLLED VARIABLE:

A - ANALYSIS
F - FLOW
H - HAND
I - CURRENT
L - LEVEL
N, Y - USER DEFINED
P - PRESSURE
PD - DIFFERENTIAL PRESSURE
T - TEMPERATURE
Z - POSITION

THE SUBSEQUENT ONE OR TWO LETTERS OF THE DESIGNATION DEFINES THE INSTRUMENT FUNCTION:

I - INDICATE
C - CONTROL
R - RECORD
S - SWITCH
T - TRANSMIT

THE FINAL LETTER OF THE DESIGNATION MAY BE USED TO INDICATE AN ACTUATION LEVEL:

H - HIGH
L - LOW
O - OPEN
C - CLOSED

EXAMPLES:

FIT - FLOW INDICATING TRANSMITTER
HS - HAND SWITCH
LSL - LEVEL SWITCH LOW
ZC - POSITION CONTROLLER
ZSC - POSITION SWITCH CLOSED

DRAWING COORDINATE SYSTEM:
CA STATE PLANE - ZONE 2

Bid Set

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

NO.	REVISION DESCRIPTION	BY	DATE

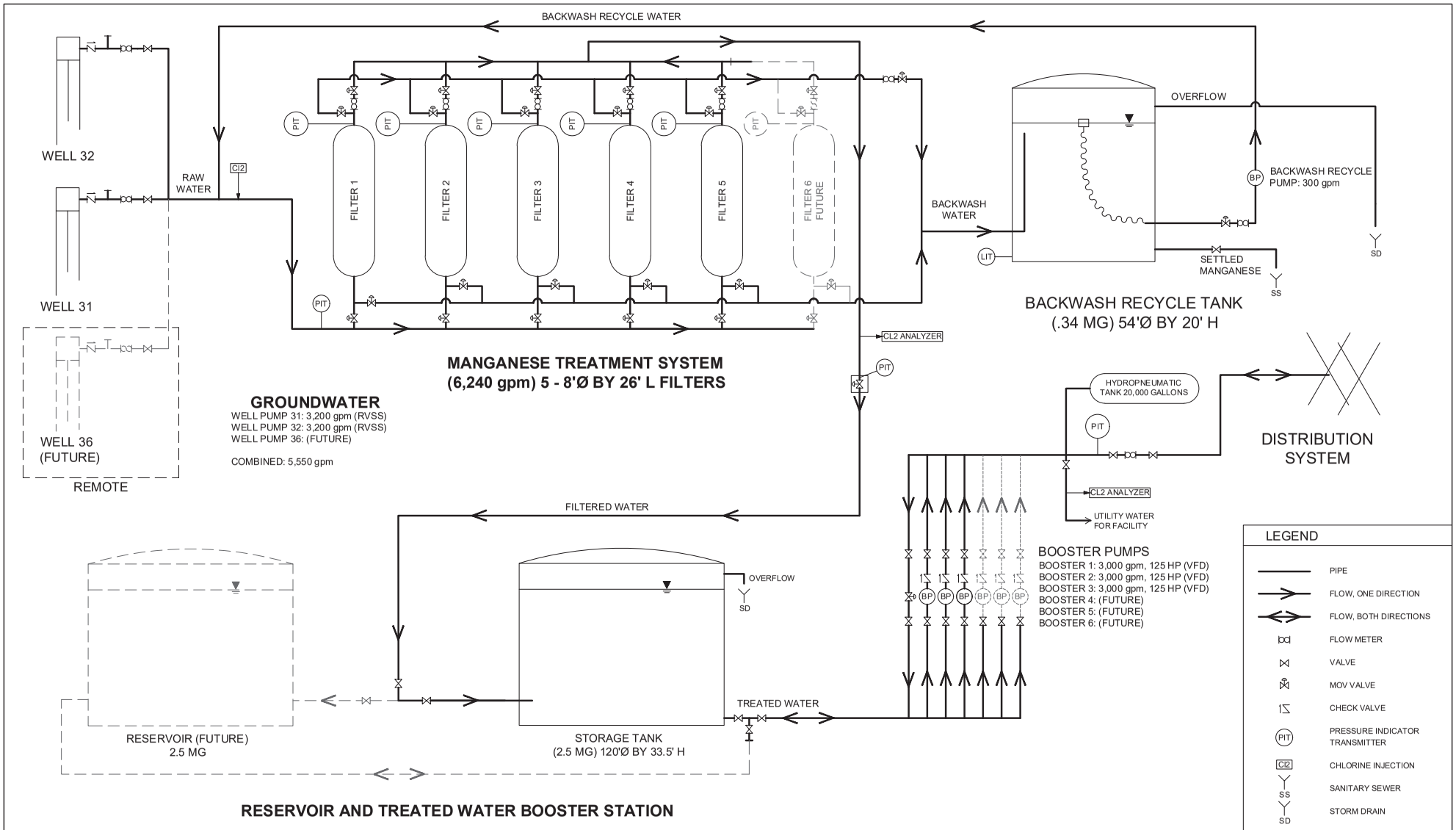
CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE:
ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

SHEET TITLE:
ABBREVIATIONS AND SYMBOLS

SHEET NAME: G2
SHEET NUMBER: 3 OF 40
6/1/23



Bid Set

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE:
NO SCALE

ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

SHEET TITLE:
PROCESS FLOW DIAGRAM
FACILITY OVERVIEW

SHEET NAME: PF1
SHEET NUMBER: 4 OF 40
6/1/23

P&ID ABBREVIATIONS

INSTRUMENTATION SYMBOLS

	FIRST LETTER		SUCCEEDING LETTERS		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		
B	BURNER, COMBUSTION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
C	CONDUCTIVITY			CONTROLLER	
D	DENSITY	DIFFERENTIAL			
E	VOLTAGE		SENSOR, PRIMARY ELEMENT		
F	FLOW	RATIO			
G	GENERAL		GLASS VIEWING DEVICE		
H	HAND				HIGH, OPENED
I	CURRENT		INDICATING, INDICATOR		
J	POWER	SCAN			
K	TIME, TIME SCHEDULED	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT		LOW, CLOSED
M	MOISTURE	MOMENTARY			MIDDLE
N	STATUS		STATUS	USER'S CHOICE	USER'S CHOICE
O	OPERTOR		ORIFICE, RESTRICTION		
P	PRESSURE, VACUUM		POINT (TEST) CONNECTION		
Q	QUANTITY	INTEGRATE, TOTALIZE			
R	RESET		RECORD		
S	SPEED, FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMITTER	TEST
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION			VAVE, DAMPER, LOUVER	
W	WEIGHT		WELL		
X	SWITCH	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE OF PRESENCE	Y AXIS		RELAY, COMPUTER, CONVERTER	
Z	POSITION, DIMENSION	Z AXIS		DRIVER, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT	

P&ID ABBREVIATIONS

SWITCH IDENTIFIER

F/R	FORWARD/REVERSE	OPN	OPEN
HOA	HAND-OFF-AUTO	CLS	CLOSE
HOR	HAND-OFF-REMOTE	SEL	SELECTOR
LOS	LOCK OUT STOP	S/S	START / STOP
L/R	LOCAL / REMOTE	%	PERCENT ADJUSTMENT
MOA	MANUAL-OFF-AUTO		
OCA	OPEN-CLOSE-AUTO		
O/C	OPEN / CLOSE		
O/O	ON / OFF		

P&ID SYMBOLS

ISA SYMBOLS

- FIELD MOUNTED INSTRUMENT
- INSTRUMENT MOUNTED ON DOOR OF LOCAL PANEL, OPERATOR ACCESSIBLE
- INSTRUMENT MOUNTED ON DOOR OF FIELD PANEL, OPERATOR ACCESSIBLE
- INSTRUMENT MOUNTED WITHIN PANEL, OPERATOR INACCESSIBLE
- INSTRUMENT MOUNTED WITHIN FIELD PANEL, OPERATOR INACCESSIBLE
- OPERATION PERFORMED WITH LOGIC OR HARDWIRED DEVICES
- MCE-XX — ASSOCIATED MOTOR CONTROL ELEMENTARY IF APPLICABLE
- UNIT — VISUAL DISPLAY OF PLC ANALOG REGISTER SCALE TO UNITS AS SHOWN
- VISUAL DISPLAY OF PLC ANALOG ALARM REGISTER
- VISUAL DISPLAY OF PLC DIGITAL REGISTER
- VISUAL DISPLAY OF PLC DIGITAL ALARM REGISTER
- TAG DESCRIPTION
- PLC I/O TAG
- PLC DIGITAL INPUT
- PLC DIGITAL OUTPUT
- ANALOG INPUT
- ANALOG OUTPUT
- AUDIBLE ALARM (BUZZER OR HORN)
- LAMP INDICATION COLOR DENOTED BY "X" RED, BLU, GRN, WHT, AMBER
- CONTINUATION TAG FROM ONE AREA TO ANOTHER AREA OF DIFFERENT DRAWINGS "a" TAG IDENTIFIER TO POINT ON DRAWING NUMBER XXXX.
- CONTINUED ON DWG I-X

LINE TYPES

- PRIMARY PROCESS LINE
- SECONDARY PROCESS LINE
- ELECTRICAL SIGNAL LINE (DIGITAL OR ANALOG)
- SOFTWARE OR DATA LINK
- BOUNDARY OF EQUIPMENT PACKAGE SYSTEM
- COMMUNICATION CONNECTION

VALVES

- GATE VALVE
- CHECK VALVE
- PLUG VALVE
- BALL VALVE
- BALL CHECK VALVE
- BUTTERFLY VALVE
- ANGLE VALVE
- NEEDLE VALVE
- RELIEF VALVE
- DIAPHRAGM VALVE
- 3-WAY VALVE
- FLOW CONTROL VALVE
- PINCH VALVE
- CONE VALVE
- ANTISIPHON/BACKPRESSURE VALVE
- SOLENOID VALVE (2-WAY) (S→M FOR MOTORIZED VALVE)
- SOLENOID VALVE (3-WAY) (S→M FOR MOTORIZED VALVE)
- SOLENOID VALVE (4-WAY) (S→M FOR MOTORIZED VALVE)
- PNEUMATIC DIAPHRAGM CONTROL VALVE
- PRESSURE SUSTAINING VALVE
- PRESSURE REGULATING VALVE
- MULTIFUNCTION VALVE
- SLUICE GATE (SG) OR SLIDE GATE (SLG)
- AIR RELIEF VALVE (ARV)
- FLOAT VALVE
- STRAINER
- BACKFLOW PREVENTER
- CALIBRATION VALVE
- CALIBRATION COLUMN
- ROTAMETER
- UNION

ACTUATORS

- MOTORIZED
- SOLENOID
- PNEUMATIC OPERATOR S= SOLENOID - OPEN/CLOSE A= POSITIONER - MODULATING

PUMPS

- CENTRIFUGAL PUMP OR BLOWER
- SUBMERSIBLE SEWAGE PUMP
- VERTICAL TURBINE PUMP OR WELL PUMP
- SUBMERSIBLE WELL PUMP
- GEAR PUMP
- POSITIVE DISPLACEMENT PUMP OR BLOWER
- DIAPHRAGM PUMP
- PERISTALTIC PUMP
- MOTOR

SENSORS

- ORIFICE PLATE
- LIT XXX — ULTRASONIC LEVEL TRANSMITTER (FLOW IF OVER FLUME OR WEIR)
- LE XXX — CONDUCTANCE TYPE LEVEL ELEMENTS
- LIT XXX — RADAR TYPE LEVEL TRANSMITTER GUIDED OPTION
- LIT XXX — CAPACITANCE TYPE LEVEL TRANSMITTER

MISCELLANEOUS ITEMS

- OMNI ANTENNA NON-DIRECTIONAL
- YAGI ANTENNA DIRECTIONAL

SENSORS

- MAG — MAGNETIC FLOWMETER
- % — DENSITY METER
- ~ — ULTRASONIC FLOWMETER
- TURBINE OR PROPELLER METER
- VENTURI TUBE
- THERMAL DISPERSION FLOWMETER OR SWITCH
- PADDLE WHEEL FLOWMETER
- C — CORIOLIS FLOWMETER
- PARSHALL FLUME

MISCELLANEOUS MECHANICAL ITEMS

- PIPE REDUCER
- RUPTURE DISC
- PRESSURE OR VACUUM RELIEF VALVE
- DIAPHRAGM SEAL
- ANNUALAR SEAL
- DRAIN TO WASTE
- MIXER
- F OR F — FILTER
- VENT W/CAP OR SCREEN
- FLEXIBLE HOSE OR TUBING
- SPRAY NOZZLE SYSTEM
- EXPANSION JOINT
- STATIC MIXER
- INJECTION POINT
- EJECTOR / EDUCTOR
- HOSE COUPLING
- PULSATION DAMPENER
- BASKET STRAINER

FRISCH ENGINEERING, INC.
CONSULTING ELECTRICAL ENGINEERS
PH 916.353.1025
WWW.FRISCHENGINEERING.COM

FILE: 2208A01.DWG
DATE: MAY 18, 2023 TIME: 3:45:23PM

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

REGISTERED PROFESSIONAL ENGINEER — THOMAS P. FRISCH — No. E15761 — ELECTRICAL — STATE OF CALIFORNIA

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE:
NO SCALE

ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

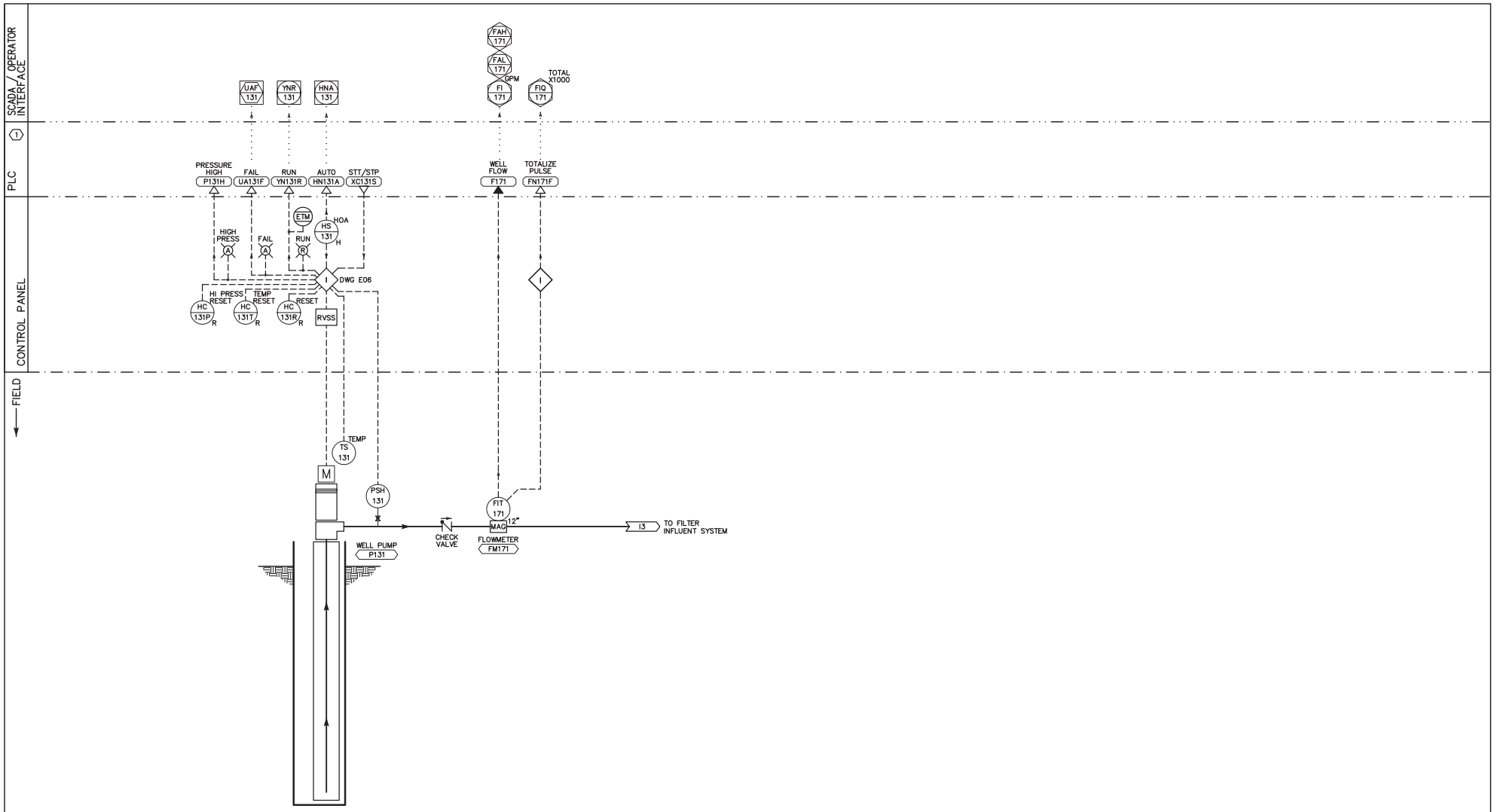
INSTRUMENTATION

SHEET TITLE:
INSTRUMENTATION SYMBOLS AND ABBREVIATIONS

SHEET NAME: I1

SHEET NUMBER: 5 OF 40

6/1/23



WELL 31 P&ID

ALL WELL EQUIPMENT IS EXISTING

DRAWING REFERENCED NOTES:

1. EXISTING SIGNALS TO MAIN CONTROL PANEL TO BE RECONNECTED TO NEW PLC BACKPAN, COMMISSIONED, AND TESTED.

FRISCH ENGINEERING, INC.
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PH 916.353.1025
WWW.FRISCHENGINEERING.COM

FILE: 2208A402.DWG
DATE: MAY 18, 2023 TIME: 3:45:30PM

NO.	REVISION DESCRIPTION	BY	DATE

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

PROFESSIONAL ENGINEER — THOMAS P. FRISCH — No. E15761 — ELECTRICAL — STATE OF CALIFORNIA

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE: NO SCALE

ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

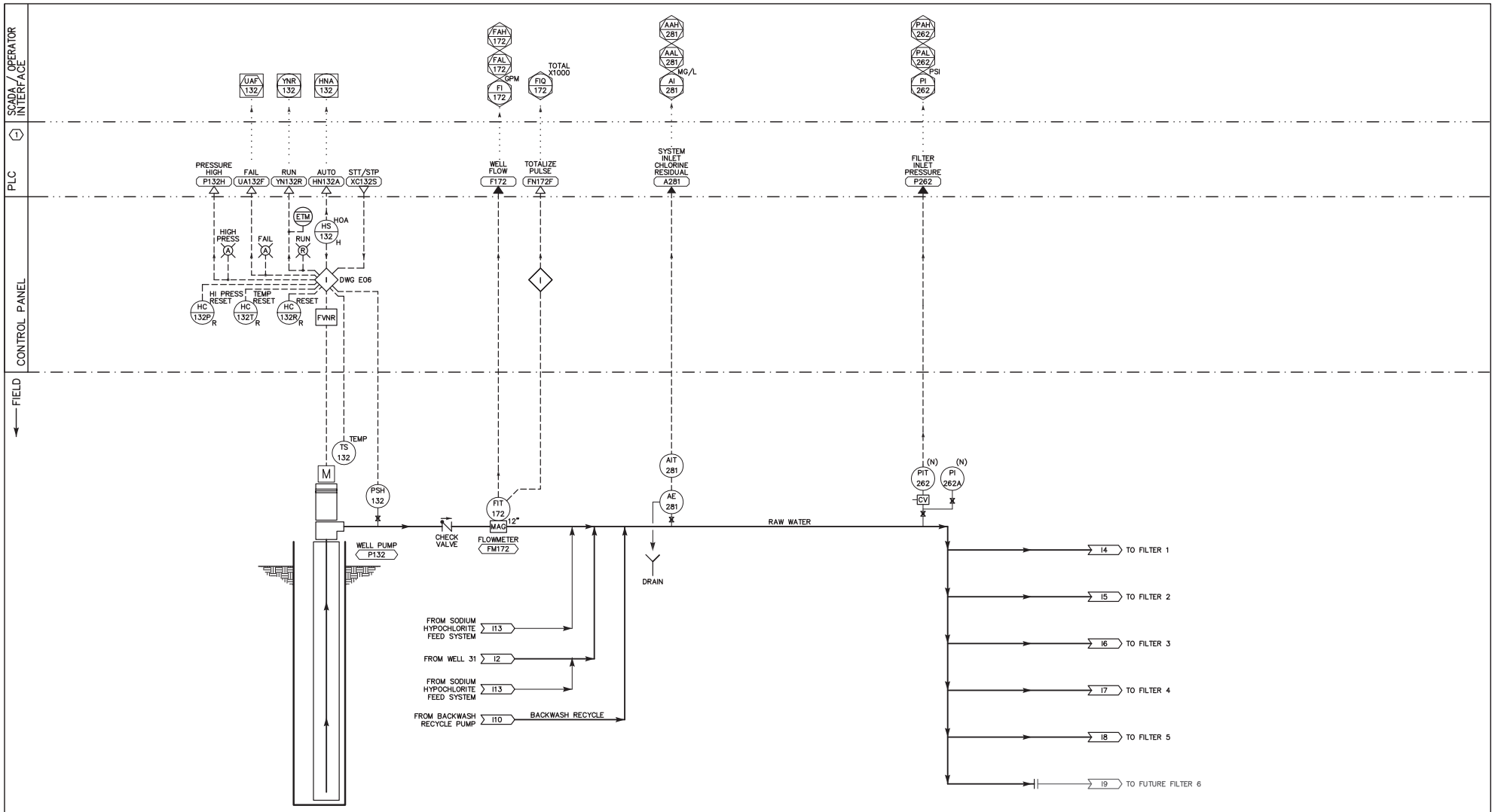
INSTRUMENTATION

SHEET TITLE: WELL 31 P&ID

SHEET NAME: I2

SHEET NUMBER: 6 OF 40

6/1/23



WELL 32 P&ID

ALL WELL EQUIPMENT IS EXISTING EXCEPT WHERE NOTED

FILTER DISTRIBUTION P&ID

MODIFY PIPING AS REQUIRED FOR NEW FILTERS
NEW EQUIPMENT SHOWN AS (N) NEW

DRAWING REFERENCED NOTES:

1. EXISTING SIGNALS TO MAIN CONTROL PANEL TO BE RECONNECTED TO NEW PLC BACKPAN, COMMISSIONED, AND TESTED.

FRISCH ENGINEERING, INC.
CONSULTING ELECTRICAL ENGINEERS
PH 916.353.1025
WWW.FRISCHENGINEERING.COM

FILE: 2208A103.DWG
DATE: MAY 18, 2023 TIME: 3:45:39PM

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

PROFESSIONAL ENGINEER — THOMAS P. FRISCH — No. E15761 — ELECTRICAL — STATE OF CALIFORNIA

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE: NO SCALE

ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

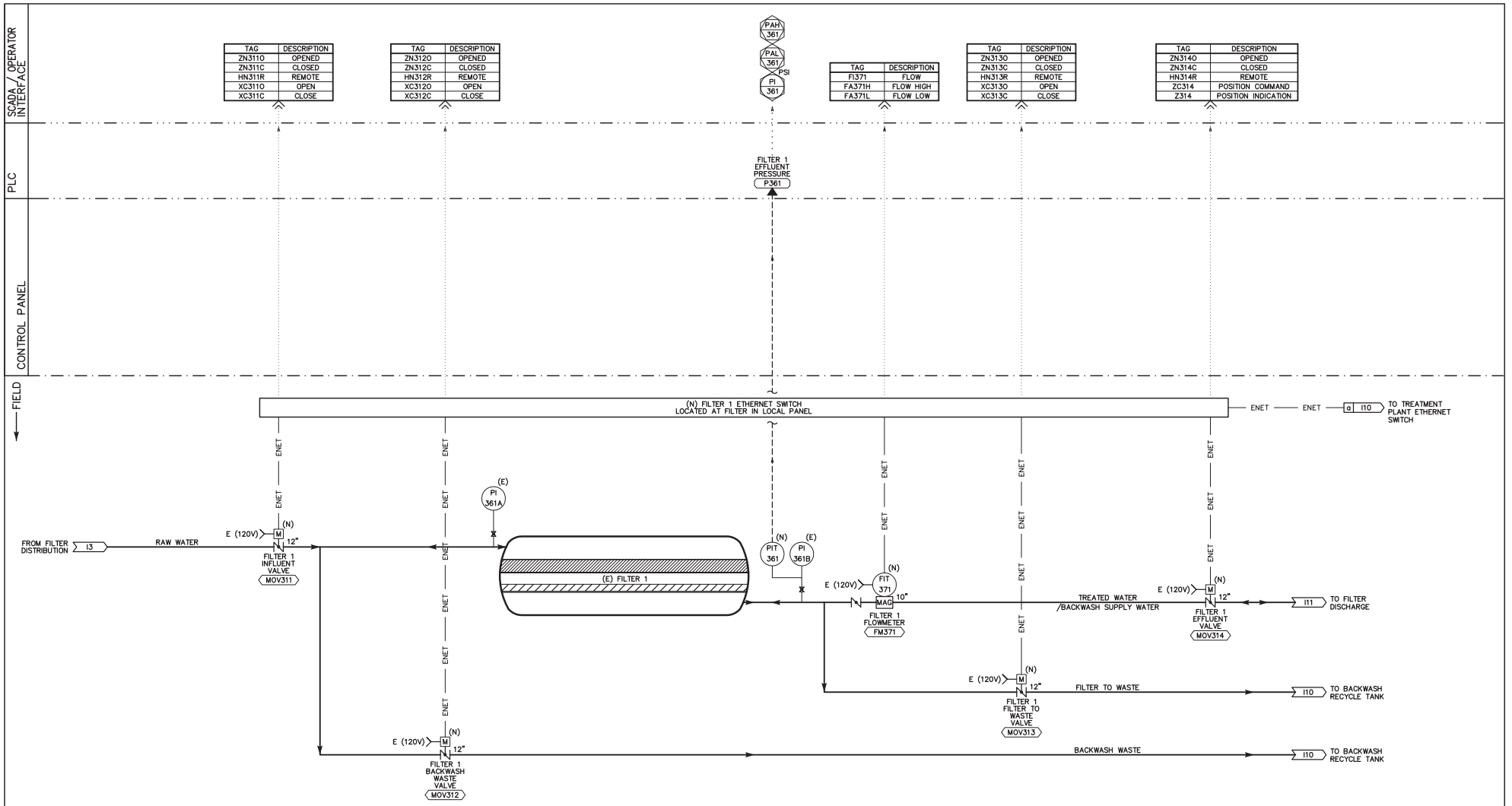
INSTRUMENTATION

SHEET TITLE:
WELL 32 AND FILTER INFLUENT P&ID

SHEET NAME: I3

SHEET NUMBER: 7 OF 40

6/1/23



EXISTING FILTER 1 P&ID

EXISTING EQUIPMENT
NEW EQUIPMENT INDICATED AS NEW (N)

FRISCH ENGINEERING, INC.
CONSULTING ELECTRICAL ENGINEERS
PH 916.353.1025
WWW.FRISCHENGINEERING.COM

FILE: 2208A04.DWG
DATE: MAY 18, 2023 TIME: 3:45:45PM

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

PROFESSIONAL ENGINEER — THOMAS P. FRISCH — No. E15761 — ELECTRICAL — STATE OF CALIFORNIA

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE: NO SCALE

ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

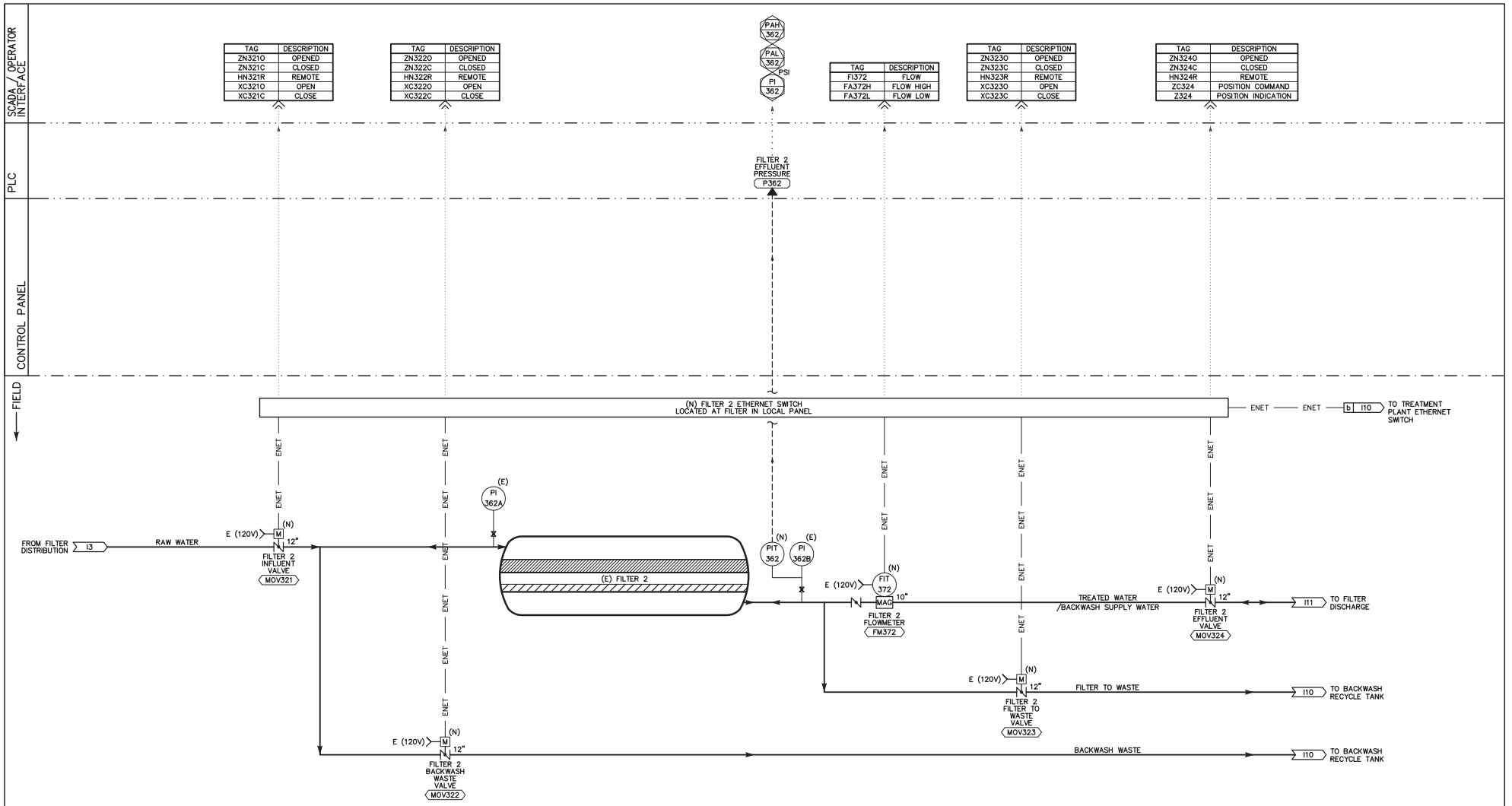
INSTRUMENTATION

SHEET TITLE:
FILTER 1 P&ID

SHEET NAME: I4

SHEET NUMBER: 8 OF 40

6/1/23



EXISTING FILTER 2 P&ID

EXISTING EQUIPMENT
NEW EQUIPMENT INDICATED AS NEW (N)

FRISCH ENGINEERING, INC.
CONSULTING ELECTRICAL ENGINEERS
PH 916.353.1025
WWW.FRISCHENGINEERING.COM

FILE: 2208A405.DWG
DATE: MAY 18, 2023 TIME: 3:46:00PM

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

PROFESSIONAL ENGINEER — THOMAS P. FRISCH — No. E15761 — ELECTRICAL — STATE OF CALIFORNIA

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE:
NO SCALE
ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

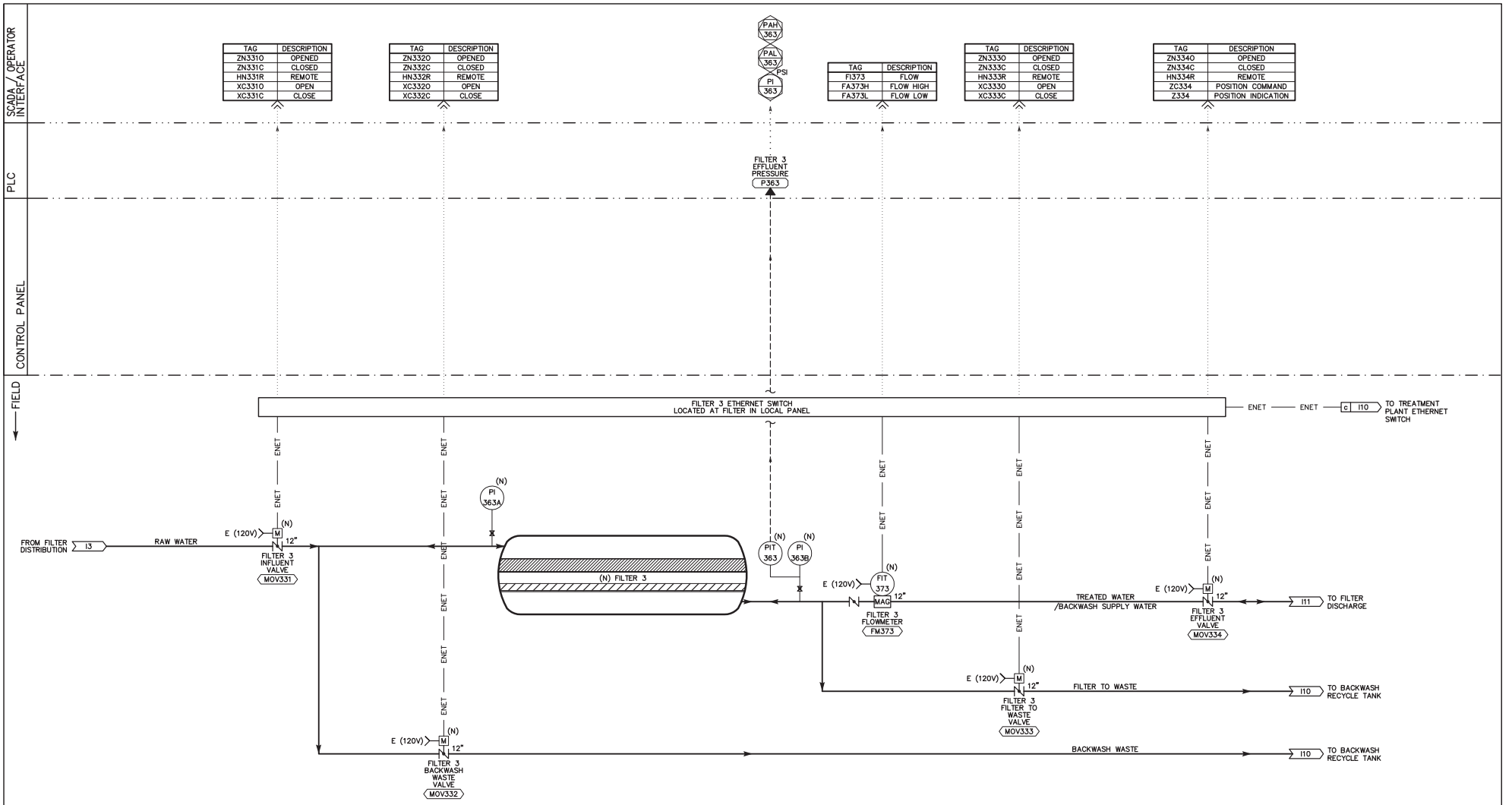
INSTRUMENTATION

SHEET TITLE:
FILTER 2 P&ID

SHEET NAME:
I5

SHEET NUMBER:
9 OF 40

6/1/23



NEW FILTER 3 P&ID

ALL EQUIPMENT IS NEW

FRISCH ENGINEERING, INC.
CONSULTING ELECTRICAL ENGINEERS
PH 916.353.1025
WWW.FRISCHENGINEERING.COM

FILE: 2208A05.DWG
DATE: MAY 18, 2023 TIME: 3:46:09PM

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

REGISTERED PROFESSIONAL ENGINEER — THOMAS P. FRISCH — No. E15761 — ELECTRICAL — STATE OF CALIFORNIA

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE:
NO SCALE

ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

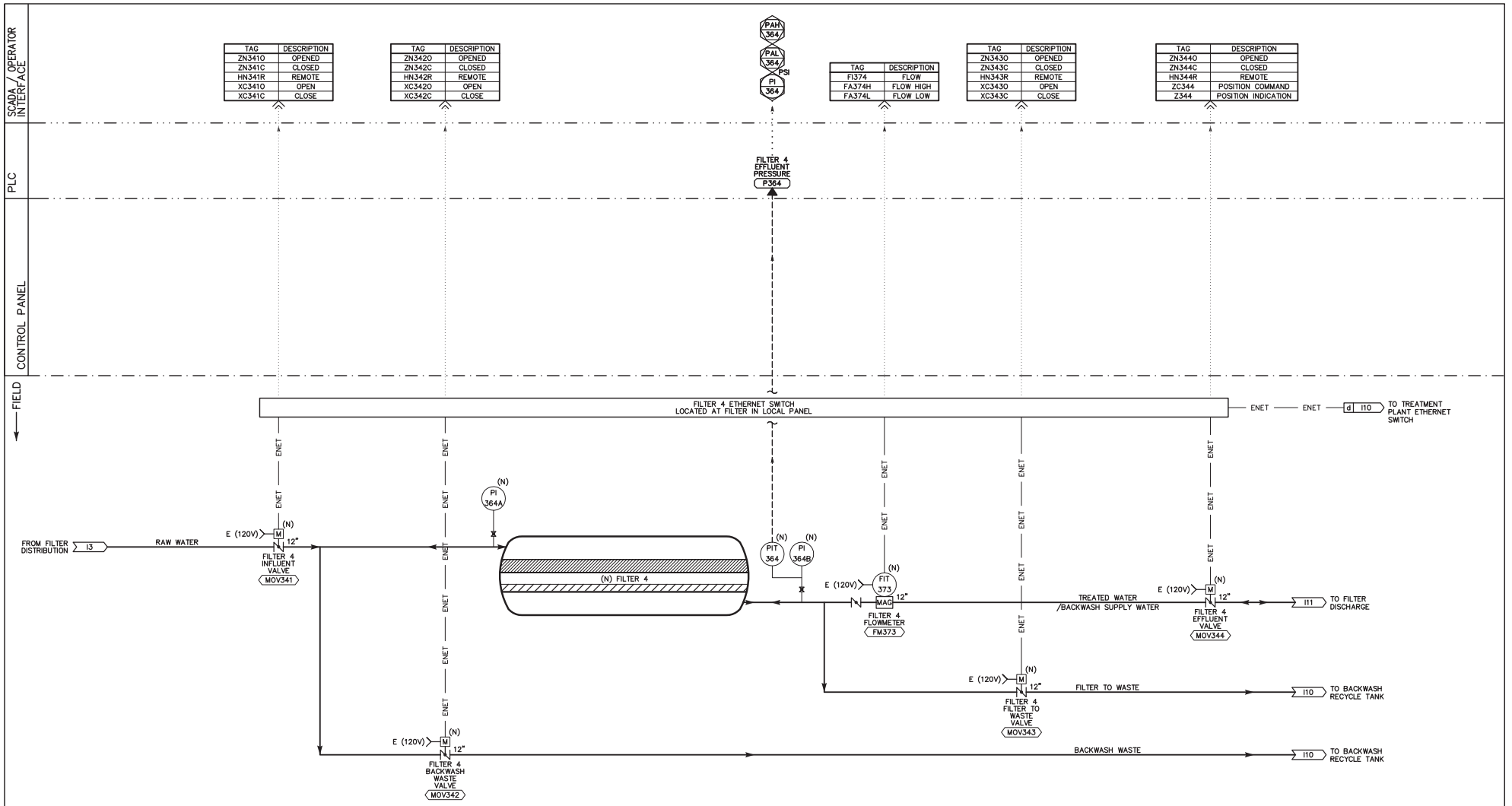
INSTRUMENTATION

SHEET TITLE:
FILTER 3 P&ID

SHEET NAME: I6

SHEET NUMBER: 10 OF 40

6/1/23



NEW FILTER 4 P&ID

ALL EQUIPMENT IS NEW

FRISCH ENGINEERING, INC.
CONSULTING ELECTRICAL ENGINEERS
PH 916.353.1025
WWW.FRISCHENGINEERING.COM

FILE: 2208A107.DWG
DATE: MAY 18, 2023 TIME: 3:46:18PM

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

PROFESSIONAL ENGINEER — THOMAS P. FRISCH — No. E15761 — ELECTRICAL — STATE OF CALIFORNIA

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE:
NO SCALE

ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

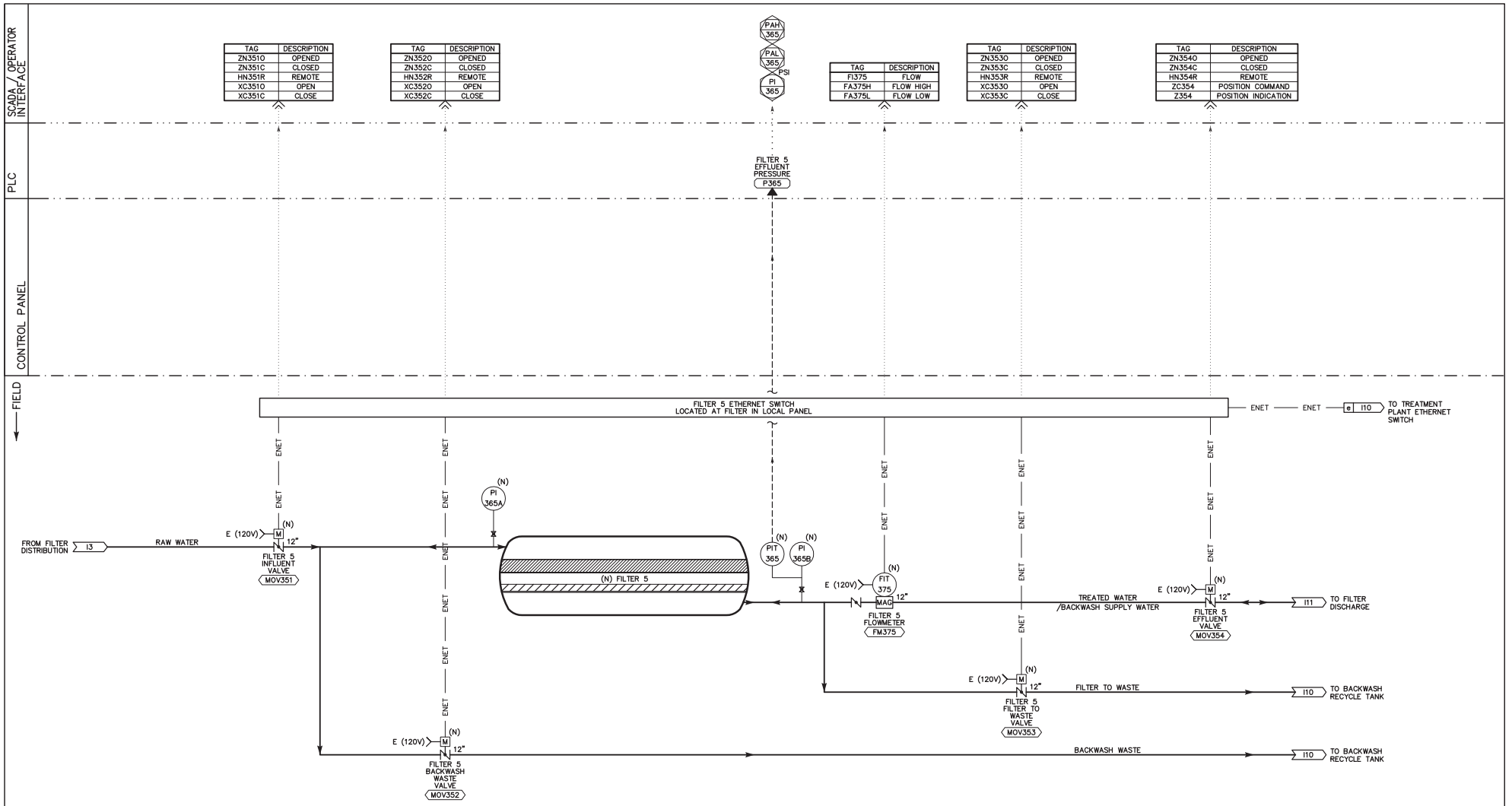
INSTRUMENTATION

SHEET TITLE:
FILTER 4 P&ID

SHEET NAME:
I7

SHEET NUMBER:
11 OF 40

6/1/23



NEW FILTER 5 P&ID

ALL EQUIPMENT IS NEW

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CONSULTING ELECTRICAL ENGINEERS
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WWW.FRISCHENGINEERING.COM

FILE: 2208A05.DWG
DATE: MAY 18, 2023 TIME: 3:46:34PM

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

PROFESSIONAL ENGINEER — THOMAS P. FRISCH — No. E15761 — ELECTRICAL — STATE OF CALIFORNIA

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE:
NO SCALE

ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

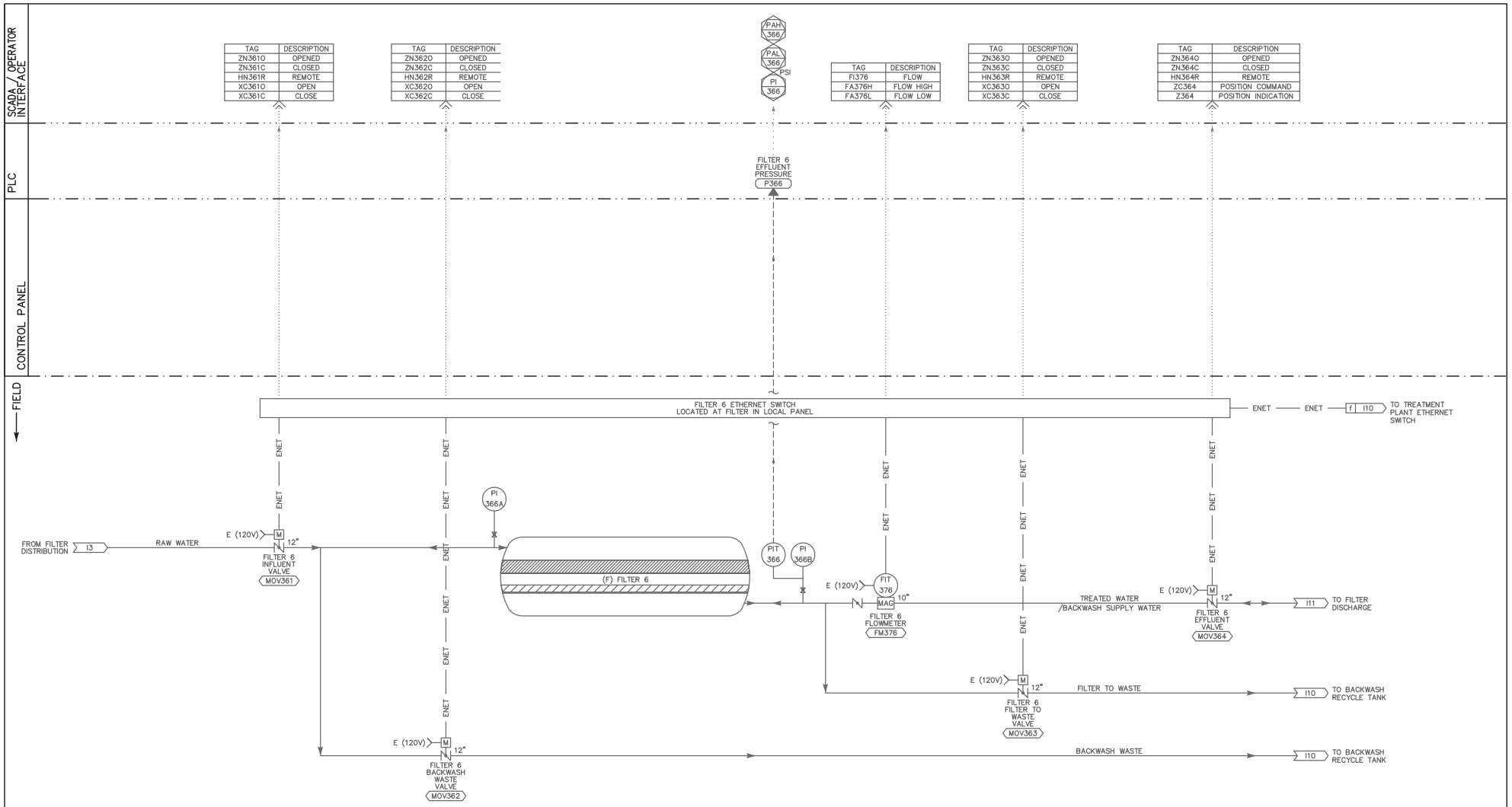
INSTRUMENTATION

SHEET TITLE:
FILTER 5 P&ID

SHEET NAME: I8

SHEET NUMBER: 12 OF 40

6/1/23



FUTURE FILTER 6 P&ID

ALL EQUIPMENT IS FUTURE PROVIDE SPACE FOR FUTURE I/O AND NETWORK EQUIPMENT

FRISCH ENGINEERING, INC.
CONSULTING ELECTRICAL ENGINEERS
PH 916.353.1025
WWW.FRISCHENGINEERING.COM

FILE: 2208A109.DWG
DATE: MAY 18, 2023 TIME: 3:46:42PM

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

REGISTERED PROFESSIONAL ENGINEER — THOMAS P. FRISCH — No. E15761 — ELECTRICAL — STATE OF CALIFORNIA

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE:
NO SCALE

ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

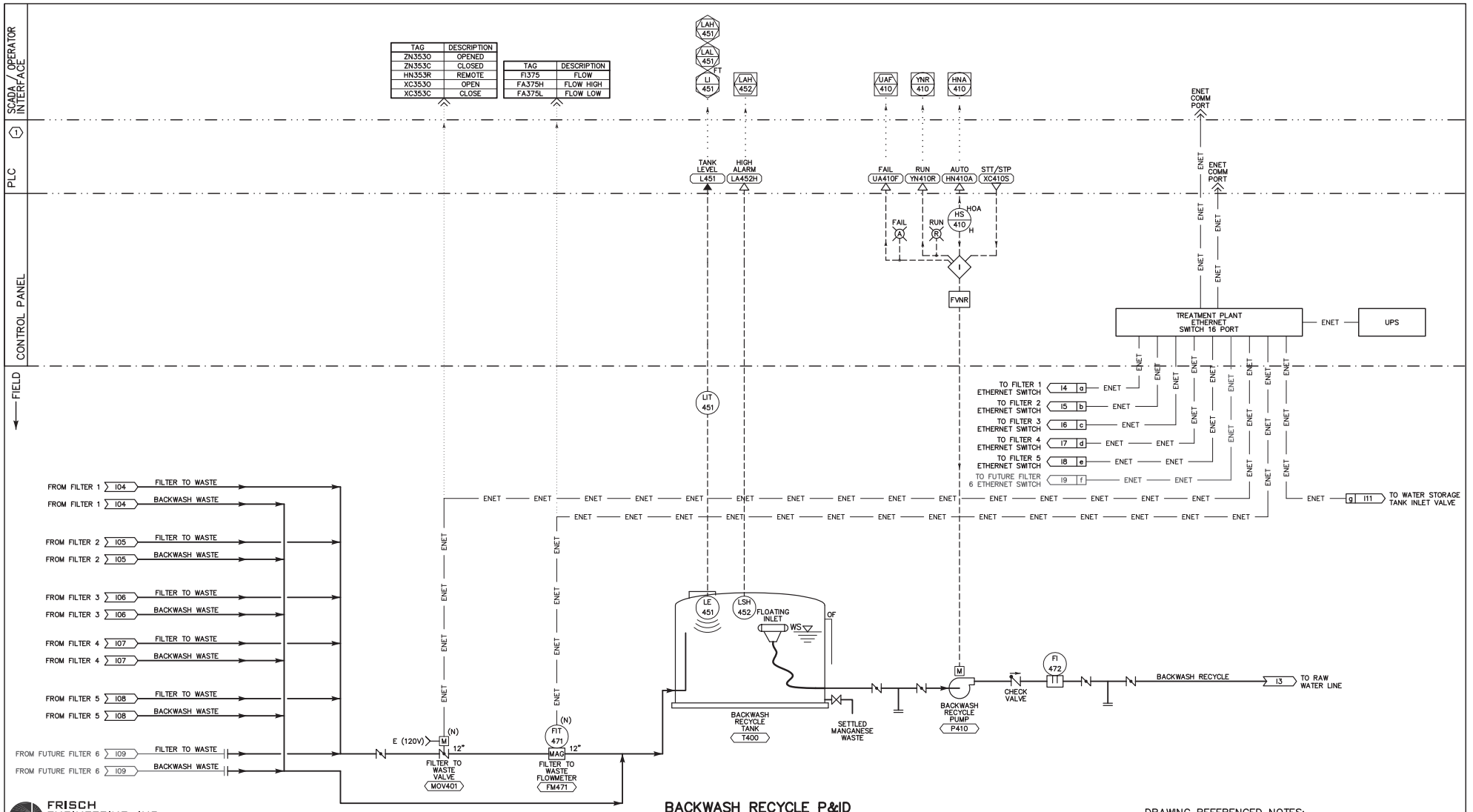
INSTRUMENTATION

SHEET TITLE:
FUTURE FILTER 6 P&ID

SHEET NAME:
I9

SHEET NUMBER:
13 OF 40

6/1/23



FRISCH ENGINEERING, INC.
CONSULTING ELECTRICAL ENGINEERS
PH 916.353.1025
WWW.FRISCHENGINEERING.COM
FILE: 2208A110.DWG
DATE: MAY 18, 2023 TIME: 3:46:50PM

BACKWASH RECYCLE P&ID

MODIFY PIPING AS REQUIRED FOR NEW FILTERS. EQUIPMENT IS EXISTING UNLESS SHOWN AS NEW. NEW EQUIPMENT SHOWN AS (N) NEW

DRAWING REFERENCED NOTES:

1. EXISTING SIGNALS TO MAIN CONTROL PANEL TO BE RECONNECTED TO NEW PLC BACKPAN, COMMISSIONED, AND TESTED.

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

THOMAS P. FRISCH No. E15761 ELECTRICAL STATE OF CALIFORNIA REGISTERED PROFESSIONAL ENGINEER

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE:
NO SCALE
ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

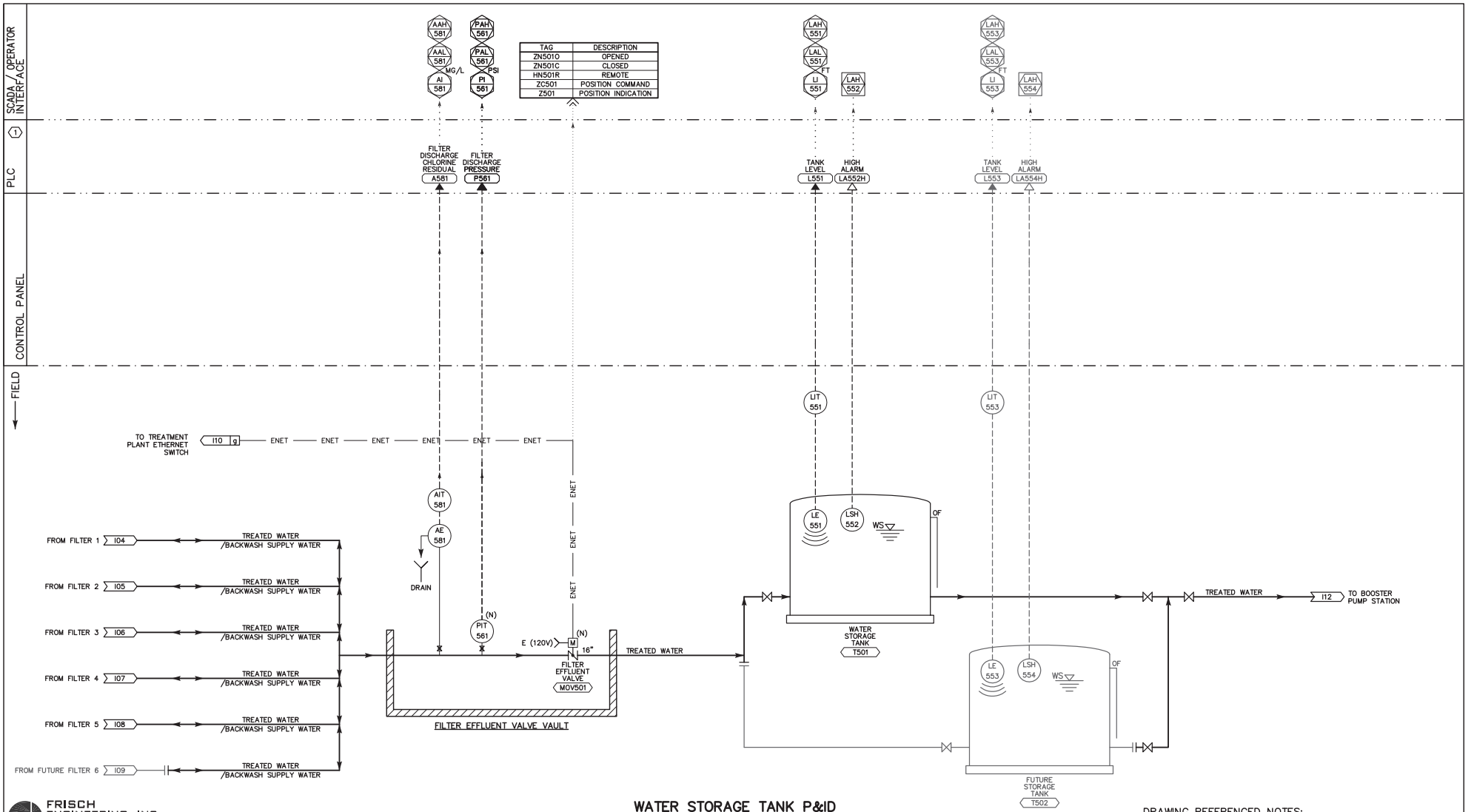
INSTRUMENTATION

SHEET TITLE:
BACKWASH RECYCLE P&ID

SHEET NAME:
I10

SHEET NUMBER:
14 OF 40

6/1/23



WATER STORAGE TANK P&ID

MODIFY PIPING AS REQUIRED FOR NEW FILTERS
EQUIPMENT IS EXISTING UNLESS SHOWN AS NEW
NEW EQUIPMENT SHOWN AS (N) NEW

DRAWING REFERENCED NOTES:

1. EXISTING SIGNALS TO MAIN CONTROL PANEL TO BE RECONNECTED TO NEW PLC BACKPAN, COMMISSIONED, AND TESTED.

FRISCH ENGINEERING, INC.
CONSULTING ELECTRICAL ENGINEERS
PH 916.353.1025
WWW.FRISCHENGINEERING.COM

FILE: 2208A11.DWG
DATE: MAY 18, 2023 TIME: 3:46:58PM

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

REGISTERED PROFESSIONAL ENGINEER — THOMAS P. FRISCH — No. E15761 — ELECTRICAL — STATE OF CALIFORNIA

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE:
NO SCALE

ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

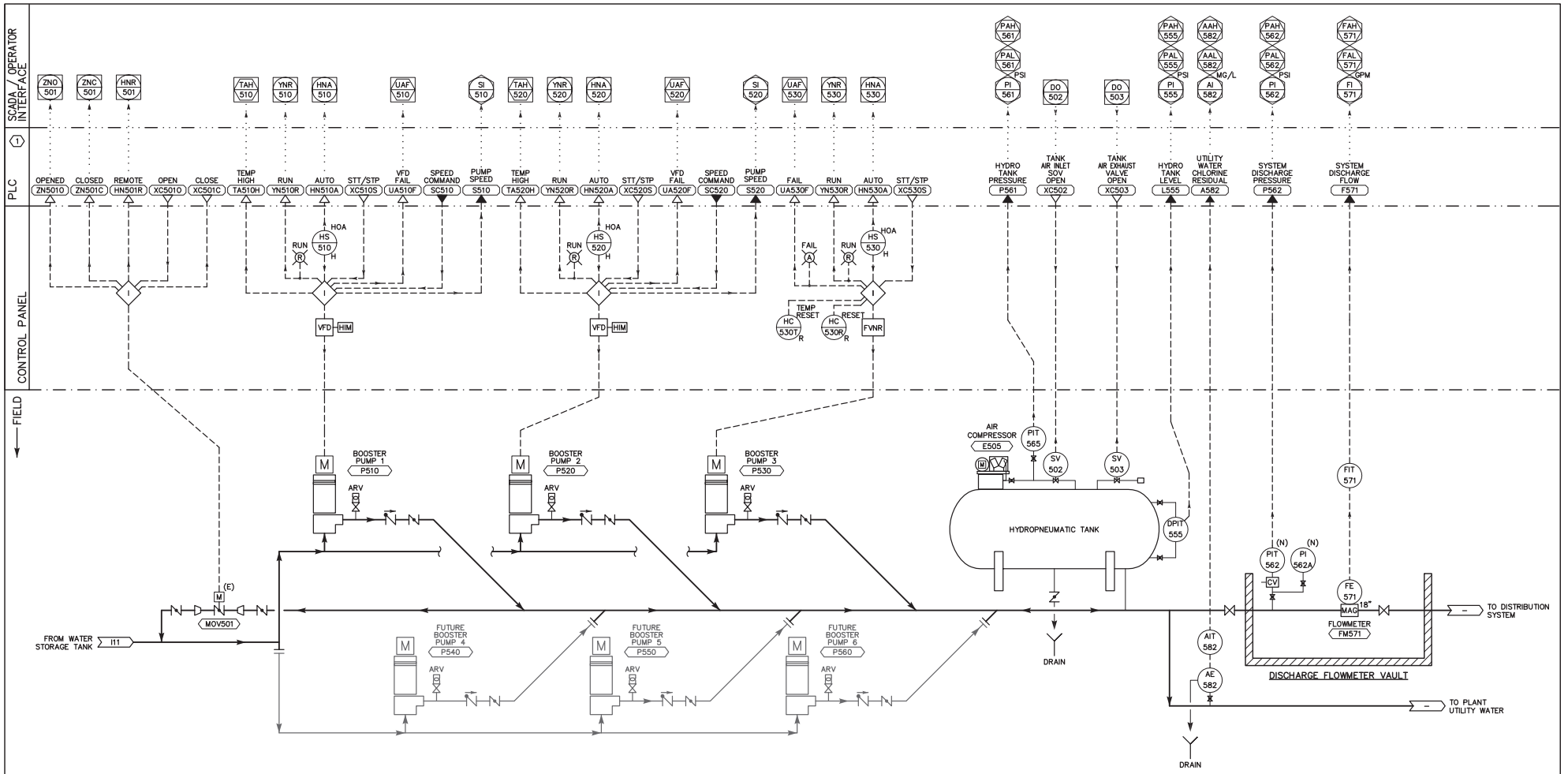
INSTRUMENTATION

SHEET TITLE:
WATER STORAGE TANK P&ID

SHEET NAME:
I11

SHEET NUMBER:
15 OF 40

6/1/23



EXISTING BOOSTER PUMP STATION P&ID

EQUIPMENT IS EXISTING UNLESS SHOWN AS NEW
NEW EQUIPMENT SHOWN AS (N) NEW

DRAWING REFERENCED NOTES:

1. EXISTING SIGNALS TO MAIN CONTROL PANEL TO BE RECONNECTED TO NEW PLC BACKPAN, COMMISSIONED, AND TESTED.

FRISCH ENGINEERING, INC.
CONSULTING ELECTRICAL ENGINEERS
PH 916.353.1025
WWW.FRISCHENGINEERING.COM

FILE: 2208A12.DWG
DATE: MAY 18, 2023 TIME: 3:47:05PM

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

PROFESSIONAL ENGINEER — THOMAS P. FRISCH — No. E15761 — ELECTRICAL — STATE OF CALIFORNIA

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

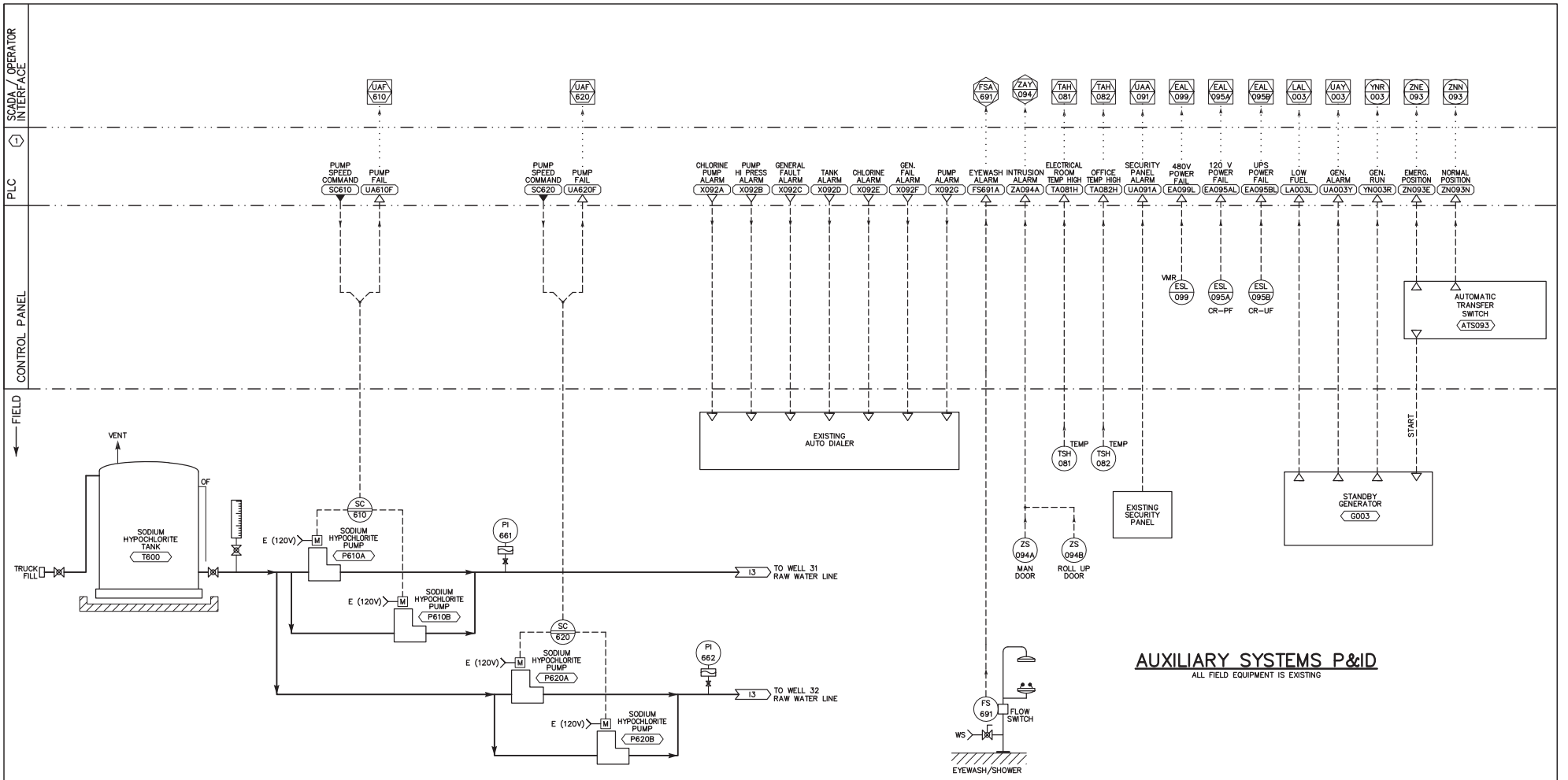
PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE:
NO SCALE
ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

INSTRUMENTATION

SHEET TITLE:
BOOSTER PUMP STATION P&ID

SHEET NAME: I12
SHEET NUMBER: 16 OF 40
6/1/23



AUXILIARY SYSTEMS P&ID

ALL FIELD EQUIPMENT IS EXISTING

SODIUM HYPOCHLORITE FEED SYSTEM

ALL FIELD EQUIPMENT IS EXISTING

DRAWING REFERENCED NOTES:

1. EXISTING SIGNALS TO MAIN CONTROL PANEL TO BE RECONNECTED TO NEW PLC BACKPAN, COMMISSIONED, AND TESTED.

FRISCH ENGINEERING, INC.
CONSULTING ELECTRICAL ENGINEERS
PH 916.353.1025
WWW.FRISCHENGINEERING.COM

FILE: 2208A13.DWG
DATE: MAY 18, 2023 TIME: 3:47:14PM

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

REGISTERED PROFESSIONAL ENGINEER — THOMAS P. FRISCH — No. E15761 — ELECTRICAL — STATE OF CALIFORNIA

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT

MANGANESE TREATMENT EXPANSION

SCALE:
NO SCALE

ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

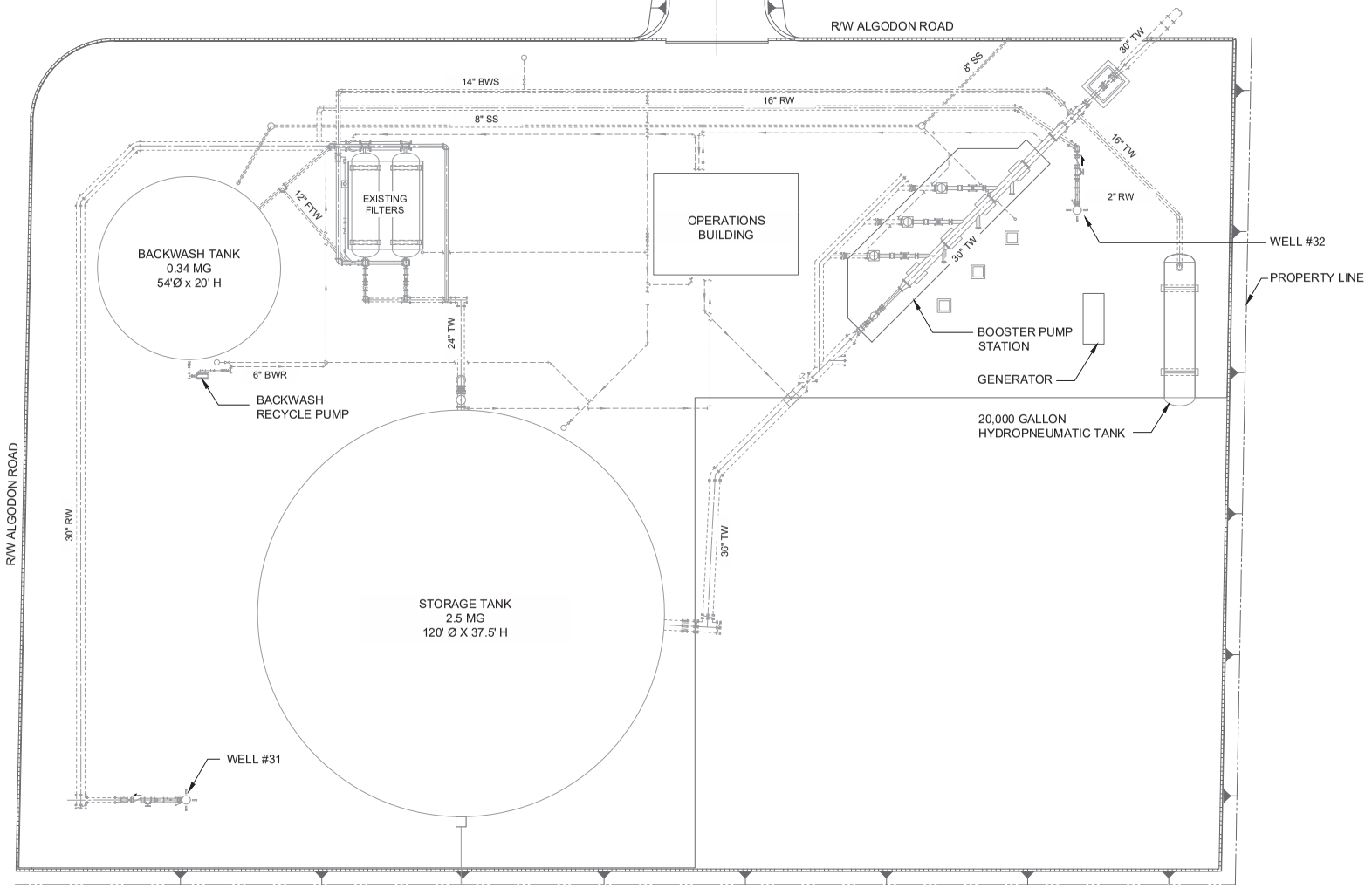
INSTRUMENTATION

SHEET TITLE:
SODIUM HYPOCHLORITE FEED AND AUXILIARY SYSTEMS P&ID

SHEET NAME: I13

SHEET NUMBER: 17 OF 40

6/1/23



PLAN VIEW
1" = 16'

Bid Set

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

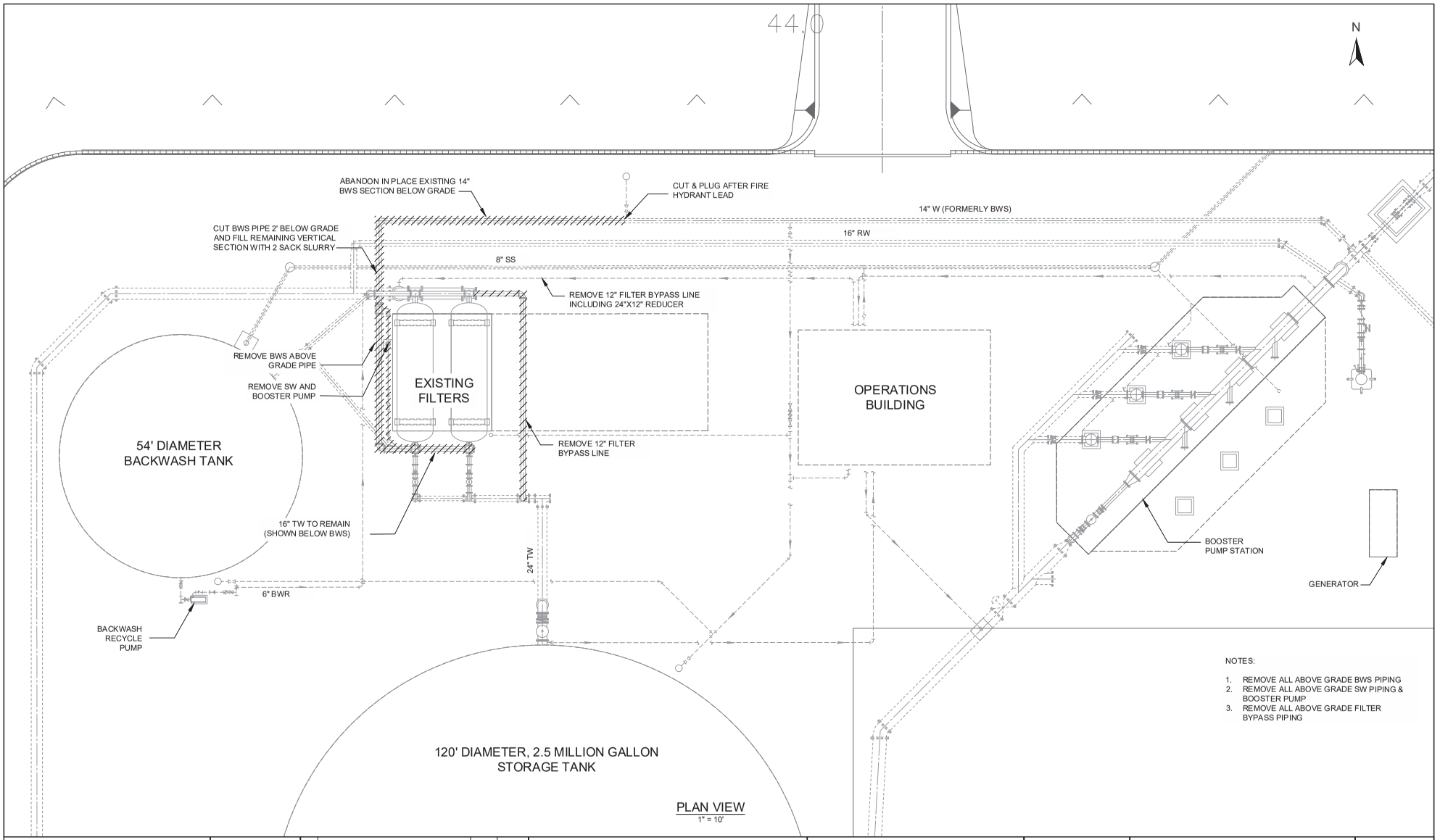
PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE:
1" = 10'
ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

CIVIL

SHEET TITLE:
EXISTING SITE PLAN

SHEET NAME: C1
SHEET NUMBER: 18 OF 40
6/1/23



PLAN VIEW
1" = 10'

NOTES:

1. REMOVE ALL ABOVE GRADE BWS PIPING
2. REMOVE ALL ABOVE GRADE SW PIPING & BOOSTER PUMP
3. REMOVE ALL ABOVE GRADE FILTER BYPASS PIPING

Bid Set

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE: 1" = 10'

ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

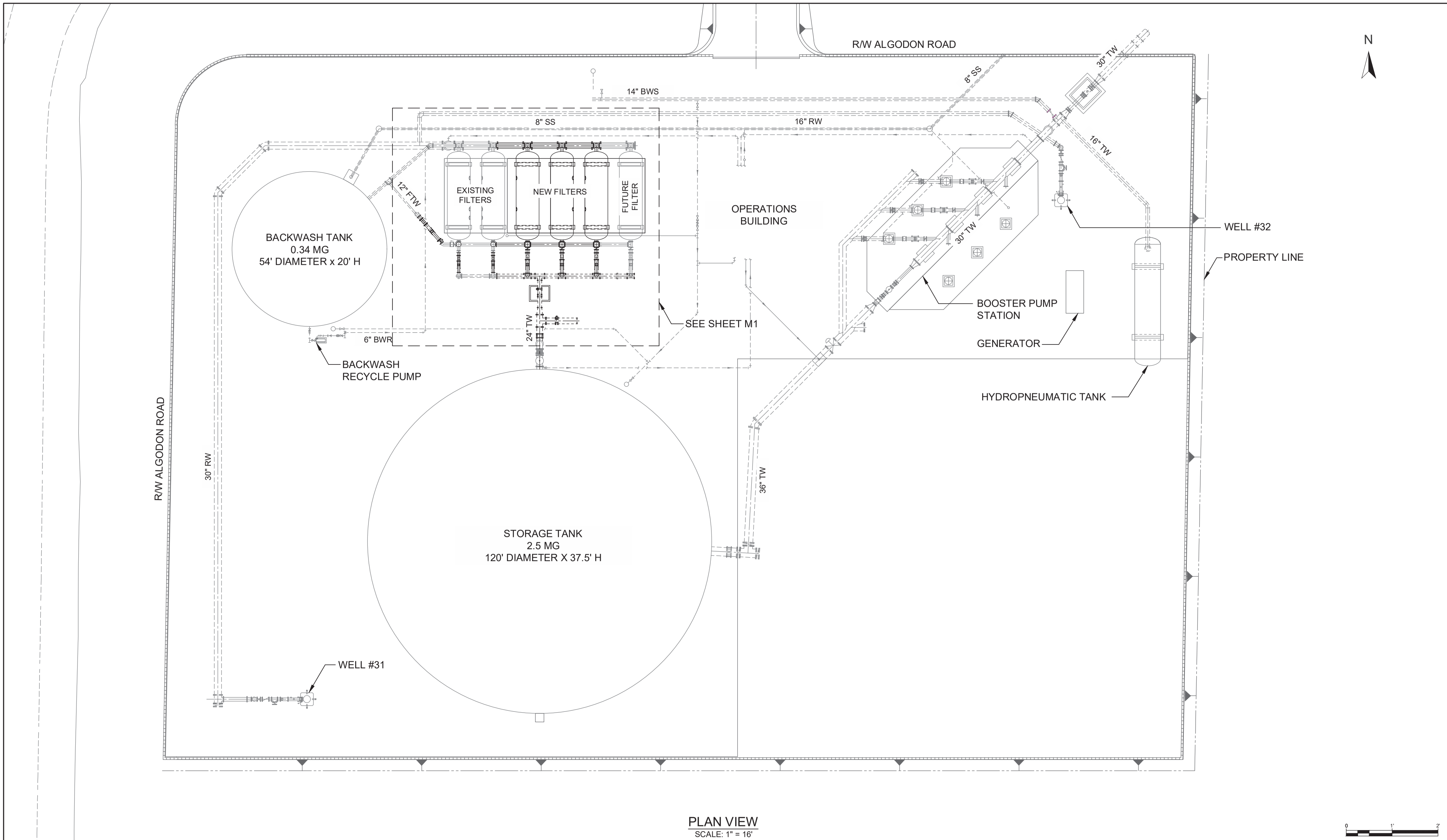
CIVIL

SHEET TITLE:
DEMOLITION PLAN

SHEET NAME: C2

SHEET NUMBER: 19 OF 40

6/1/23



PLAN VIEW
SCALE: 1" = 16'

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE:
AS SHOWN

ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

CIVIL

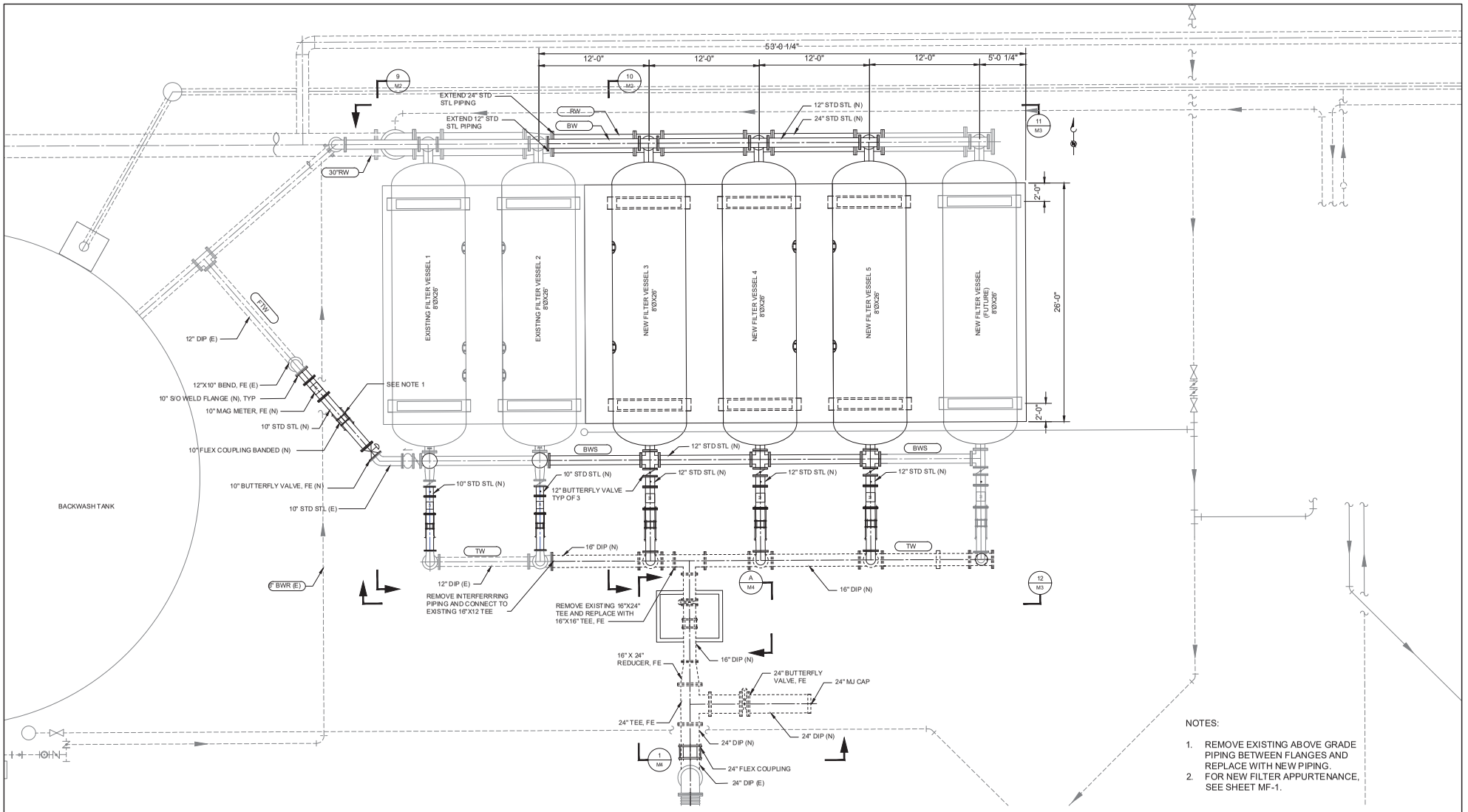
SHEET TITLE:
MODIFICATION SITE PLAN

SHEET NAME:
C3

SHEET NUMBER:
20 OF 40

6/1/23

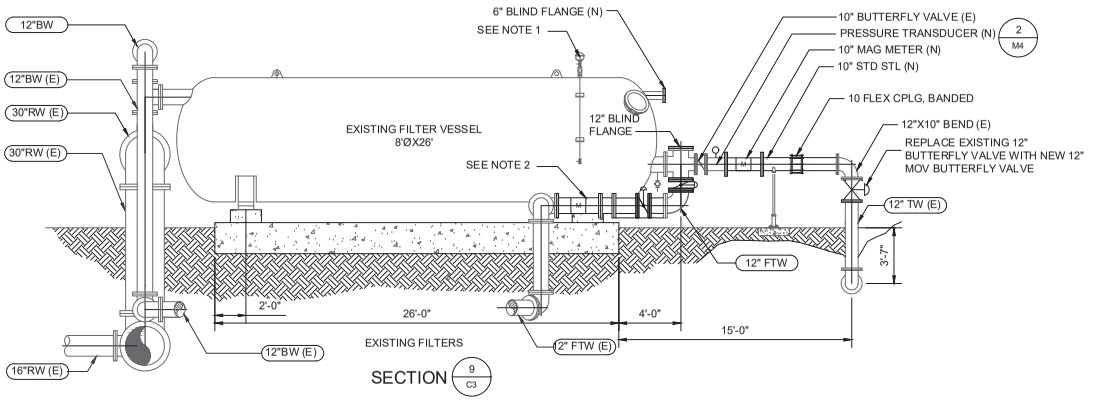
Bid Set

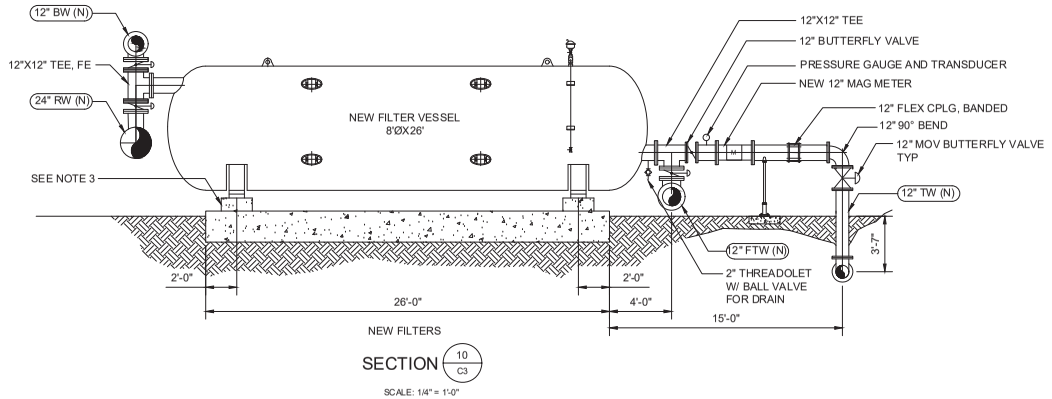


PLAN VIEW
SCALE: 1" = 5'

Bid Set

CONSULTANT: AFFINITY ENGINEERING, 3433 Mardi Gras Court, Rancho Cordova, CA, 95670, www.affinityengineering.com	NO.	REVISION DESCRIPTION	BY	DATE	CLIENT: Olivehurst Public Utility District, 1970 9th Avenue, Olivehurst, CA 95961	PROJECT: PLUMAS LAKE WATER PLANT MANGANESE TREATMENT EXPANSION	SCALE: AS SHOWN ATTENTION LINE IS 2" AT FULL SIZE (SCALE ACCORDINGLY)	CIVIL SHEET TITLE: FILTER VESSELS PLAN VIEW	SHEET NAME: M1 SHEET NUMBER: 21 OF 40 6/1/23





NOTES:

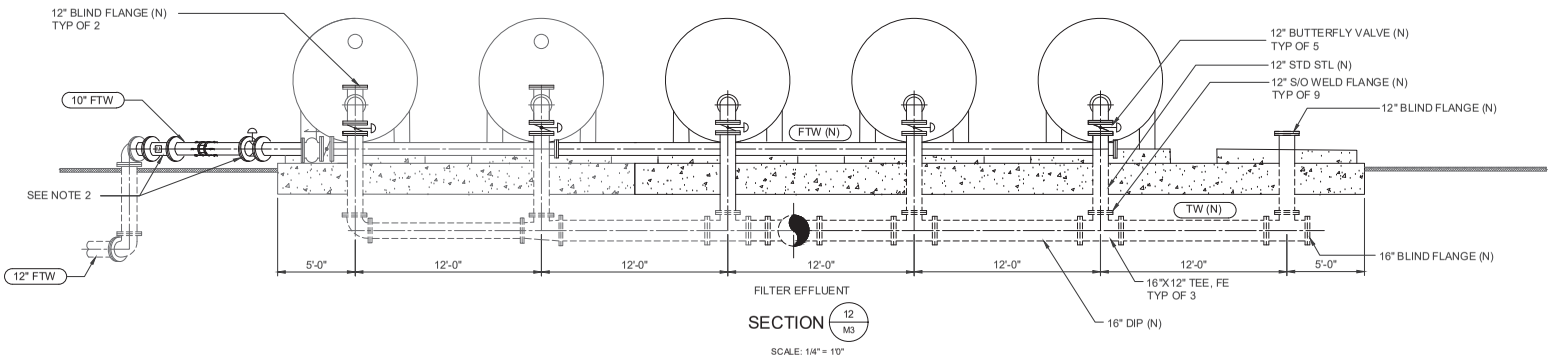
1. ARVB TO BE PIPED TO 1' ABOVE GROUND.
2. SEE M1 FOR PIPING CALLOUT
3. EXACT HEIGHT OF FILTER PEDESTALS TO BE SET TO MATCH ELEVATION OF EXISTING FILTERS 1 AND 2'S EFFLUENTS

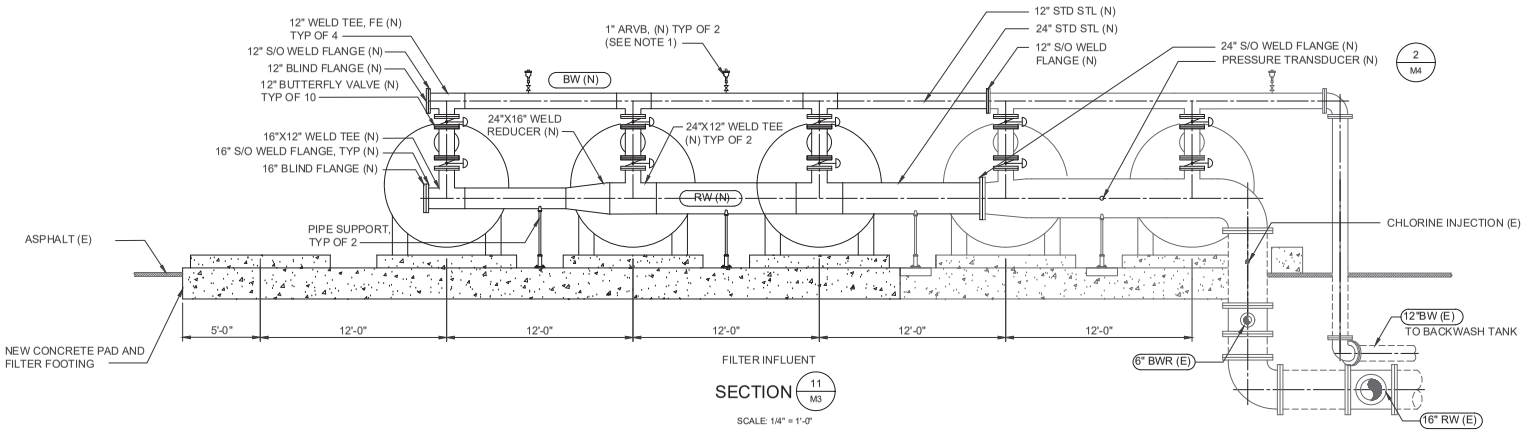
Bid Set

CONSULTANT:		NO.	REVISION DESCRIPTION	BY	DATE	CLIENT:	PROJECT:	SCALE:	MECHANICAL	SHEET NAME:
AFFINITY ENGINEERING 3433 Mardi Gras Court, Rancho Cordova, CA, 95670 www.affinityengineering.com						**Olivehurst Public Utility District** 1970 9th Avenue, Olivehurst, CA 95961	PLUMAS LAKE WATER PLANT MANGANESE TREATMENT EXPANSION	AS SHOWN **ATTENTION** **LINE IS 2" AT FULL SIZE** **(SCALE ACCORDINGLY)**	SHEET TITLE: FILTER VESSEL SECTIONS - 1	M2 SHEET NUMBER: 22 OF 40 6/1/23

NOTES:

1. ARVB TO BE PIPED TO 1' ABOVE GROUND.
2. SEE M1 FOR FTW PIPING CALLOUTS.

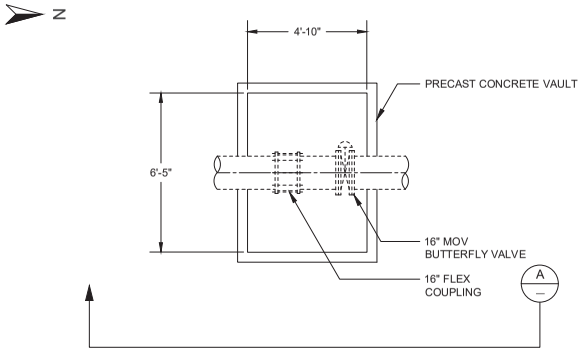




Bid Set

CONSULTANT: AFFINITY ENGINEERING, 3433 Mardi Gras Court, Rancho Cordova, CA, 95670, www.affinityengineering.com		NO.	REVISION DESCRIPTION	BY	DATE	CLIENT: Olivehurst Public Utility District, 1970 9th Avenue, Olivehurst, CA 95961	PROJECT: PLUMAS LAKE WATER PLANT MANGANESE TREATMENT EXPANSION

SCALE: AS SHOWN ATTENTION LINE IS 2" AT FULL SIZE (SCALE ACCORDINGLY)	MECHANICAL SHEET TITLE: FILTER VESSEL SECTIONS - 2	SHEET NAME: M3 SHEET NUMBER: 23 OF 40 6/1/23



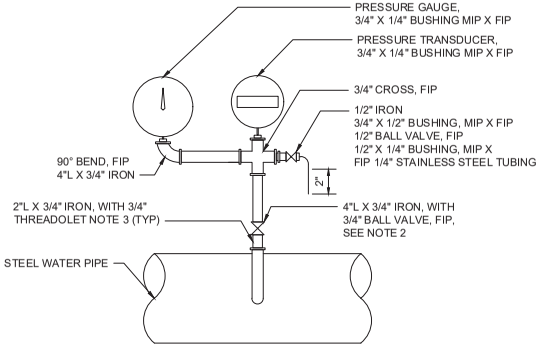
FLOW METER VAULT PLAN

DETAIL 1 / M7

SCALE: NTS

NOTES:

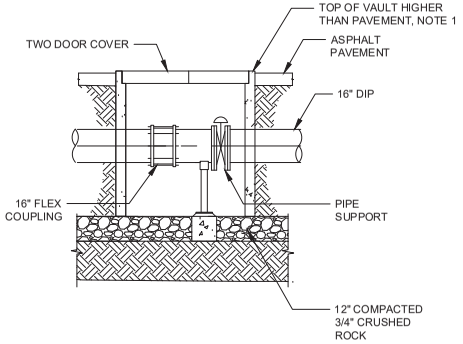
1. SET FLOW METER VAULT LID TO BE 1" HIGHER THAN SURROUNDING CONCRETE PAVEMENT.



TYPICAL PRESSURE GAUGE, PRESSURE TRANSDUCER, AND SAMPLE PORT

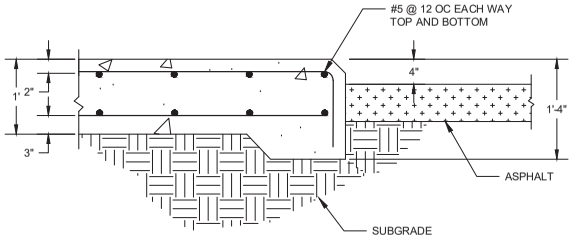
DETAIL 2 / M2

SCALE: NTS



SECTION A / M7

SCALE: NTS



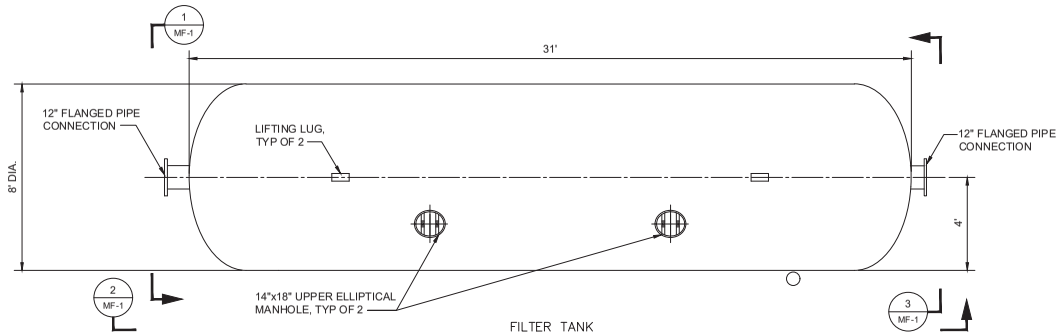
SMALL EQUIPMENT SLAB ON GRADE

SECTION B

SCALE: NTS

Bid Set

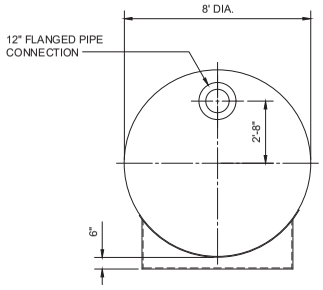
CONSULTANT: AFFINITY ENGINEERING, 3433 Mardi Gras Court, Rancho Cordova, CA, 95670, www.affinityengineering.com		NO. / REVISION DESCRIPTION / BY / DATE	CLIENT: Olivehurst Public Utility District, 1970 9th Avenue, Olivehurst, CA 95961	PROJECT: PLUMAS LAKE WATER PLANT; MANGANESE TREATMENT EXPANSION	SCALE: AS SHOWN; ATTENTION LINE IS 2" AT FULL SIZE (SCALE ACCORDINGLY)	MECHANICAL; SHEET TITLE: FILTER EFFLUENT VALVE VAULT AND OTHER DETAILS	SHEET NAME: M4; SHEET NUMBER: 24 OF 40; 6/1/23



FILTER TANK

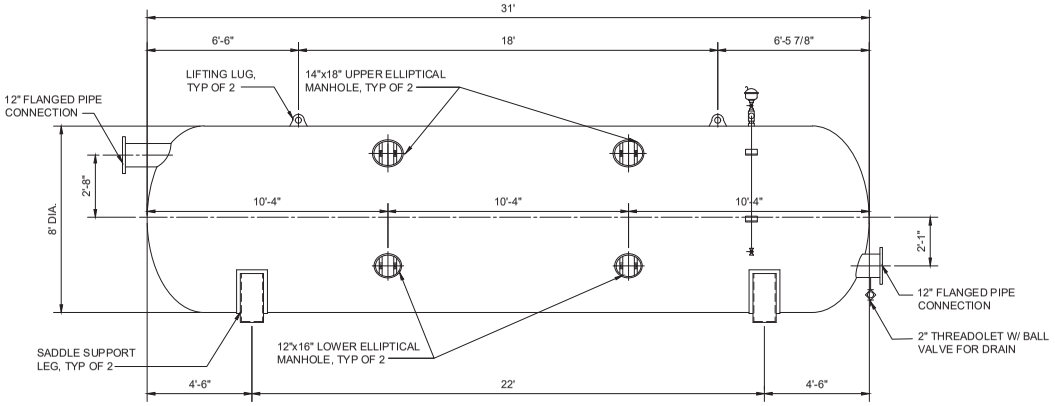
PLAN

SCALE: 3/8" = 1'-0"



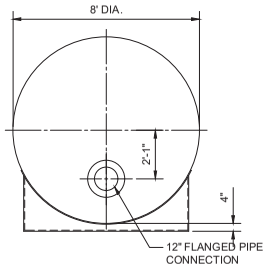
SECTION 1 / MF1

SCALE: 3/8" = 1'-0"



SECTION 2 / MF1

SCALE: 3/8" = 1'-0"



SECTION 3 / MF1

SCALE: 3/8" = 1'-0"

BID SET

CONSULTANT:		NO.	REVISION DESCRIPTION	BY	DATE	CLIENT:	PROJECT:	SCALE:	MECHANICAL	SHEET NAME:
AFFINITY ENGINEERING 3433 Mardi Gras Court, Rancho Cordova, CA, 95670 www.affinityengineering.com	JAMES C. CHAN 4.18.19 EXP. 6/30/23 CIVIL STATE OF CALIFORNIA					**Olivehurst Public Utility District** 1970 9th Avenue, Olivehurst, CA 95961	PLUMAS LAKE WATER PLANT MANGANESE TREATMENT EXPANSION	AS SHOWN **ATTENTION** **LINE IS 2" AT FULL SIZE** **(SCALE ACCORDINGLY)**	SHEET TITLE: FILTER DETAILS	MF-1 SHEET NUMBER: 25 OF 40 6/1/23

COMPONENTS

SYMBOL	DESCRIPTION
RES	RESISTOR
SV	SOLENOID COIL
HTR	HEATER
	CAPACITOR
	DIODE
	DIODE, ZENER
MOV	METAL OXIDE VARISTOR
	AUDIBLE ALARM
?	3 PHASE MOTOR ? = MOTOR HP
M	3 PHASE MOTOR
M	SINGLE PHASE MOTOR
	TRANSFORMER SIZE AND VOLTAGE AS SHOWN
M	UTILITY POWER METER
	UFER GROUND
	GROUND ROD
	CURRENT TRANSFORMER RATIO AS NOTED
	DISCONNECT SWITCH SIZED PER FEEDER
PDB	POWER DISTRIBUTION BLOCK

SWITCHES – PROCESS

SYMBOL	DESCRIPTION
FS	FLOW SWITCH – CLOSES UPON INCREASING FLOW
FS	FLOW SWITCH – OPENS UPON INCREASING FLOW
LS	LEVEL SWITCH – CLOSES UPON INCREASING LEVEL
LS	LEVEL SWITCH – OPENS UPON INCREASING LEVEL
PS	PRESSURE SWITCH – CLOSES UPON INCREASING PRESSURE (DECREASING VACUUM)
PS	PRESSURE SWITCH – OPENS UPON INCREASING PRESSURE (DECREASING VACUUM)
TS	TEMPERATURE SWITCH – CLOSES UPON INCREASING TEMPERATURE
TS	TEMPERATURE SWITCH – OPENS UPON INCREASING TEMPERATURE
ZS	LIMIT SWITCH – CLOSES AT SET LIMIT
ZS	LIMIT SWITCH – OPENS AT SET LIMIT
WS	TORQUE SWITCH – CLOSES UPON INCREASING TORQUE
WS	TORQUE SWITCH – OPENS UPON INCREASING TORQUE

DEVICES – RELAY

SYMBOL	DESCRIPTION
M1	CONTACTOR OR STARTER M1
CR 1	CONTROL RELAY CR1
TR 2	TIME DELAY RELAY TR2 – ADJUSTABLE TIME DELAY RANGE & SETTING AS SHOWN
TDOE TDOD	TIME DELAY ON ENERGIZATION TIME DELAY ON DE-ENERGIZATION
107, 121	REFERENCED RELAY WITH N.O. CONTACT ON LINE 107 N.C. CONTACT ON LINE 121
CR1 (105)	NORMALLY OPEN, RELAY CONTACT – ACTUATED BY RELAY CR1 COIL LOCATED ON LINE 105
CR1	NORMALLY CLOSED, RELAY CONTACT – ACTUATED BY RELAY CR1
TR2	NORMALLY OPEN, TIME DELAY RELAY CONTACT – CONTACT CLOSES AFTER TR2 IS ENERGIZED
TR2	NORMALLY CLOSED, TIME DELAY RELAY CONTACT – CONTACT OPENS AFTER TR2 IS ENERGIZED
TR2	NORMALLY OPEN, TIME DELAY RELAY CONTACT – CONTACT OPENS AFTER TR2 IS DE-ENERGIZED
TR2	NORMALLY CLOSED, TIME DELAY RELAY CONTACT – CONTACT CLOSES AFTER TR2 IS DE-ENERGIZED
TR2	CONTACT OPENS AND CLOSES IN A TIMED REPEAT CYCLE

WIRING – CONNECTIONS

SYMBOL	DESCRIPTION
	PANEL OR EQUIPMENT WIRING
	FIELD WIRING
	CONDUCTORS – NOT CONNECTED
	CONDUCTORS – CONNECTED
	GROUND CONNECTION
	PLUG AND RECEPTACLE
	INCOMING LINE
123	TERMINAL BLOCKS WITH TERMINAL NUMBER AS SHOWN OR AS DETERMINED BY SUBMITTAL
123	DISCONNECTING TERMINAL BLOCK
	FUSE
SHIELD CONDUCTOR	SHIELDED CABLE

PLAN – SYMBOLS

	CONDUIT, EXPOSED
	CONDUIT, IN SLAB OR BELOW GRADE
	CONDUIT, CONCEALED IN WALL OR CEILING
	CONDUIT STUBBED OUT & CAPPED
	CONDUIT BENDS TOWARD OBSERVER
	CONDUIT BENDS AWAY FROM OBSERVER
	CONDUIT ENDS
J	FLEXIBLE CONDUIT CONNECTION FROM J-BOX TO EQUIPMENT
	CONDUIT CHANGE IN ELEVATION
G	BARE COPPER GROUND WIRE
G	GROUND CONNECTION BOLTED TYPE
G	GROUND CONNECTION EXOTHERMIC WELD TYPE
	DISCONNECT SWITCH
	FIELD MOUNTED DEVICE
	TELEPHONE/DATA RECEPTACLE 2 PORT TA568A, 2 CAT 6 CABLES
#	CONDUIT REFERENCE TO SCHEDULE
T	THERMOSTAT
E	EYS SEAL
J	JUNCTION BOX
	PULL BOX OF SIZE SHOWN (CHRISTY BOX SIZE MINIMUM)
A a #	LIGHTING FIXTURE # – CIRCUIT BREAKER NUMBER A – FIXTURE SCHEDULE REF. a – CONTROL SWITCH REFERENCE
WP #7 WP	DUPLEX RECEPTACLE # – CIRCUIT BREAKER NUMBER WP – WEATHERPROOF (IF SHOWN) GFI – GROUND FAULT TYPE
aM	TOGGLE SWITCH a – FIXTURES CONTROLLED 3 – 3 WAY M – MOTION DETECTOR T – TIMER SWITCH
	SPECIAL RECEPTACLE AS REQUIRED FOR EQUIPMENT TO BE CONNECTED

SWITCHES – OPERATOR

SYMBOL	DESCRIPTION
SW	TOGGLE OR DISCONNECT SWITCH
PB	PUSHBUTTON – NORMALLY OPEN, MOMENTARY ACTION
PB	PUSHBUTTON – NORMALLY CLOSED, MOMENTARY UNLESS LOS (LOCK OUT STOP) WHERE MECHANICALLY HELD
PB	PUSHBUTTON, MECHANICALLY CONNECTED, DOUBLE CIRCUIT – NORMALLY CLOSED AND NORMALLY OPEN
HAND OFF AUTO	SELECTOR SWITCH, 3 POSITION – CONTACT STATUS SHOWN EXISTS I.E. AT POSITION OF HAND, OFF, OR AUTO
	SELECTOR SWITCH, 2 POSITION – MIDDLE POSITION IS DELETED
	ALTERNATE METHOD: X00 = HAND 0X0 = AUTO, 00X = OFF
	POTENTIOMETER

DEVICES – FRONT PANEL

SYMBOL	DESCRIPTION
X	INDICATING LIGHT, LETTER "X" INDICATES COLOR: R=RED G=GREEN, A=AMBER, W=WHITE Y=YELLOW, B=BLUE
PTT X	INDICATING LIGHT, PUSH TO TEST
ETM	ELAPSED TIME METER

DEVICES – PROTECTIVE

SYMBOL	DESCRIPTION
S	CT SHORTING TERMINAL BLOCK
PTS	POWER MONITOR FUSED POTENTIAL TRANSFORMER, 208 / 120 V SECONDARY OR AS SURGE PROTECTION DEVICE
PM	
SPD	
PFR	POWER FAIL RELAY

DEVICES – PROTECTIVE

SYMBOL	DESCRIPTION
Y xA xP xT	LOW VOLTAGE MOLDED CASE, INSULATED CASE OR POWER CIRCUIT BREAKER. RATINGS AS SHOWN IN DRAWINGS AND AS DEFINED BELOW: xA: CIRCUIT BREAKER AMERAGE xAT: AMPERAGE TRIP xAF: AMPERAGE FRAME xP: NUMBER OF POLES xT: TRIP PROTECTION MCP: MOTOR CIRCUIT PROTECTION TM: THERMAL MAGNETIC L: LONG TIME DELAY S: SHORT TIME DELAY I: INSTANTANEOUS TRIP G: GROUND FAULT A: ARC FLASH PROTECTION 100% DUTY RATED
100%	
S K M E	y: BREAKER FEATURES / OPTIONS – SHUNT TRIP – KIRK-KEY INTERLOCK – MANUALLY CHARGED PUSHBUTTON OPERATION – ELECTRICALLY CHARGED PUSHBUTTON OPERATION
OL	THERMAL OVERLOAD CONTACT
	THERMAL OVERLOAD ELEMENT
	FUSE MEDIUM VOLTAGE CIRCUIT BREAKER
52	TRIP FUNCTIONS PER DRAWINGS AND SPECIFICATIONS
MFR	MULTIFUNCTION RELAY PER SPECIFICATIONS

MISCELLANEOUS ABBREVIATIONS

&	AND	MV	MERCURY VAPOR, MEDIUM VOLTAGE
@	AT	N	NEUTRAL
A	AMBER, AMPERES	NC	NORMALLY CLOSED
AC	ALTERNATING CURRENT	NHC	NORMALLY HELD CLOSED
ACK	ACKNOWLEDGE	NHO	NORMALLY HELD OPEN
AFF	ABOVE FINISHED FLOOR	NIC	NOT IN CONTRACT
AH	AMP HOUR	NL	NIGHT LIGHT
AI	ANALOG INPUT	NO	NORMALLY OPEN
AIC	AMP INTERRUPTING CAPACITY SYMMETRICAL	NTS	NOT TO SCALE
AM	AMP METER	(N)	NEW
AO	ANALOG OUTPUT	OC	ON CENTER
AWG	AMERICAN WIRE GUAGE	OI, OIT	OPERATOR INTERFACE
ATS	AUTOMATIC TRANSFER SWITCH	OL	OVERLOAD
BATT	BATTERY	ORP	OXIDATION REDUCTION POTENTIAL
BFC	BELOW FINISHED CEILING	P	POLE
BOD	BIOCHEMICAL OXYGEN DEMAND	PB	PUSHBUTTON
BPF	BAND PASS FILTER	PBX	PULL BOX
BYP	BYPASS	PDB	POWER DISTRIBUTION BLOCK
C	CONDUIT	PF	POWER FACTOR
CAP	CAPACITOR	PFR	POWER FAIL RELAY
CB	CIRCUIT BREAKER	PH	HYDROGEN ION CONCENTRATION
CKT	CIRCUIT	PLC	PROGRAMMABLE LOGIC CONTROLLER
COAX	COAXIAL CABLE	PM	POWER MONITOR
COMM	COMMUNICATION	PNL	PANEL
CR	CONTROL RELAY	POT	POTENTIOMETER
CT	CURRENT TRANSFORMER	PR	PAIR, TWISTED AND SHIELDED
CS	CONSTANT SPEED	PRI	PRIMARY
CU	COPPER	PROVIDE	FURNISH, INSTALL, AND CONNECT
DC	DIRECT CURRENT	PS	PRESSURE SWITCH
DET	DETAIL	PT	POTENTIAL TRANSFORMER
DI	DIGITAL INPUT	PTT	PUSH TO TEST
DISC	DISCONNECT	PVC	POLYVINYLCHLORIDE
DO	DIGITAL OUTPUT	PWR	POWER
DPDT	DOUBLE POLE DOUBLE THROW	REF	REFERENCE
DWG	DRAWING	RFI	RADIO FREQUENCY INTERFERENCE
E-DTL	ELECTRICAL DRAWING DETAIL	RMS	ROOT MEAN SQUARE
ELEV	ELEVATION	RTD	RESISTANCE TEMPERATURE DETECTOR
ENET	ETHERNET	RST	RESET
ETM	ELAPSED TIME METER	RVAT	REDUCE VOLTAGE AUTO TRANSFORMER
ESW	ETHERNET SWITCH	RTU	REMOTE TERMINAL UNIT
(E)	EXISTING	(R)	REWIRE, RELOCATE, REVISE, REUSE
FCS	FIELD CONTROL STATION	SCH	SCHEDULE
FLA	FULL LOAD AMPS	SEC	SECONDARY, SECOND
FLEX	FLEXIBLE LIQUID TIGHT CONDUIT	SECS	SECONDS
FS	FLOW SWITCH	SEL	SELECTOR
FVNR	FULL VOLTAGE NON-REVERSING	SFA	SERVICE FACTOR AMPS
FVR	FULL VOLTAGE REVERSING	SPEC	SPECIFICATION
FWD	FORWARD	SPD	SURGE PROTECTIVE DEVICE
(F)	FUTURE	SS	STAINLESS STEEL
GALV	GALVANIZED	SSRC	STAINLESS STEEL RIGID CONDUIT
GFI	GROUND FAULT INTERRUPTER	SSS	SOLID STATE STARTER
GND	GROUND	STT	START
GRS	GALVANIZED RIGID STEEL CONDUIT	STP	STOP
GRS-PVC	PVC COATED GRS CONDUIT	SV	SOLENOID VALVE
HI	HIGH	SW	SWITCH
HIM	HUMAN INTERFACE MODULE	SWBD	SWITCHBOARD
HOA	HAND OFF AUTO	SYM	SYMMETRICAL
HP	HORSE POWER	TB	TERMINAL BLOCK
HPS	HIGH PRESSURE SODIUM	TC	TIME CLOCK
HS	HAND SWITCH	TDOD	TIME DELAY ON DE-ENERGIZATION
HTR	HEATER	TDOE	TIME DELAY ON ENERGIZATION
HZ	HERTZ	TELCO	TELEPHONE COMPANY
HZD	HAZARD	TM	THERMAL MAGNETIC
I	INTERLOCK	TEMP	TEMPERATURE
I/O	INPUT/OUTPUT	TR	TIME DELAY RELAY
INST	INSTANTANEOUS	TRIAD	TWISTED AND SHIELDED 3 CONDUCTOR
ISR	INTRINSICALLY SAFE RELAY	TS	TEMPERATURE SWITCH
IS	INTRINSICALLY SAFE	TSPR	TWISTED AND SHIELDED PAIR
J	JUNCTION BOX	TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSOR
K	KILO, PREFIX	TYP	TYPICAL
LA	LIGHTNING ARRESTOR	UG	UNDERGROUND
LC	LIGHTING CONTACTOR	ULH	ULTRA LOW HARMONIC
LEL	LOWER EXPLOSION LIMIT	UON	UNLESS OTHERWISE NOTED
LOS	LOCK OUT STOP	UPS	UNINTERRUPTIBLE POWER SUPPLY
LP	LIGHTING PANEL	V	VOLTAGE
LS	LIMIT SWITCH	VA	VOLT AMPS
M	MOTOR CONTACTOR	VAR	VOLT AMPS REACTIVE
MAG	MAGNETIC FLOWMETER	VFD	VARIABLE FREQUENCY DRIVE
MAX	MAXIMUM	VLV	VALVE
MCC	MOTOR CONTROL CENTER	VM	VOLTMETER
MCM	THOUSAND CIRCULAR MILS	VMR	VOLTAGE MONITOR RELAY
MCP	MOTOR CIRCUIT PROTECTOR	VR	VOLTAGE RELAY
MCS	MOLDED CASE SWITCH	W	WATTS
MH	MANHOLE	WP	WEATHER PROOF, NEMA 3R
MIN	MINIMUM, MINUTE	WTP	WATER TREATMENT PLANT
MODEM	MODEM	WWTP	WASTE WATER TREATMENT PLANT
MOV	MOTOR OPERATED VALVE	XFMR	TRANSFORMER
MTR	MOTOR	Z	IMPEDANCE
MUX	MULTIPLEXER	ZS	LIMIT SWITCH

FRISCH ENGINEERING, INC.
CONSULTING ELECTRICAL ENGINEERS
PH 916.353.1025
WWW.FRISCHENGINEERING.COM

FILE: 2208AE01.DWG
DATE: MAY 18, 2023 TIME: 3:43:13PM

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

REGISTERED PROFESSIONAL ENGINEER
THOMAS P. FRISCH
No. E15761
ELECTRICAL
STATE OF CALIFORNIA

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE:
NO SCALE
ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

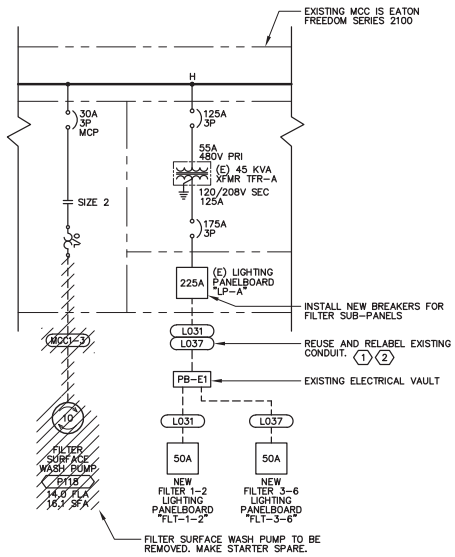
ELECTRICAL

SHEET TITLE:
ELECTRICAL
SYMBOLS AND ABBREVIATIONS

SHEET NAME: E1

SHEET NUMBER: 26 OF 40

6/1/23



MCC-1 ONE-LINE (PARTIAL) DIAGRAM

DRAWING REFERENCED NOTES:

1. USE EXISTING CONDUIT PREVIOUSLY FEEDING FLT111 VALVES (CKT 31) TO FEED PANELBOARD FLT-1-2. REMOVE EXISTING WIRE AND PULL NEW WIRE PER CONDUIT SCHEDULE. LABEL CONDUIT L031.
2. USE EXISTING CONDUIT PREVIOUSLY FEEDING FLT112 VALVES (CKT 33) TO FEED PANELBOARD FLT-3-6. REMOVE EXISTING WIRE AND PULL NEW WIRE PER CONDUIT SCHEDULE. LABEL CONDUIT L037.

(E) PANEL "LP-A"

LOCATION: ELECTRICAL ROOM
ENCLOSURE: EXISTING MCC-1
AIC RATING: 65 KAIC

120/208 VOLTS, 3 PHASE, 4 WIRE
225 AMP BUS
150 AMP MAIN BREAKER

INSTALL NEW BREAKERS FOR FILTER SUB-PANELS: 1 → BKR NO. 31, 33; 2 → BKR NO. 39, 41

BKR NO.	DESCRIPTION	LOAD VA	PHASE AMPS A	B	C	AMPS/ POLE	BKR NO.	BKR NO.	AMPS/ POLE	PHASE AMPS A	B	C	LOAD VA	DESCRIPTION	BKR NO.
1	SPARE	0	0.0			20/1	1	2	20/1	1.1			135	PLC 100 UPS	2
3	LC-1 LTG CONTACTOR (IRR. CONTROL)	150		1.3		20/1	3	4	20/1		3.8		450	FLOURIDE PUMP	4
5	RESTROOM WATER HEATER	300			2.5	30/1	5	6	20/1			2.5	300	FLOURIDE SOLENOID	6
7	ELEC/CHEM ROOM LTG	100	0.8			20/1	7	8	20/1	0.7			80	CL2 ANALYZERS 1 & 2	8
9	BLDG EXTERIOR LIGHTS	100		0.8		20/1	9	10	20/1		0.4		50	BLDG RECEPTACLE	10
11	OFFICE LIGHTS	100			0.8	20/1	11	12	20/1			0.4	50	BLDG RECEPTACLE	12
13	GEN 1 BATTERY CHARGER	20	0.2			20/1	13	14	20/1	0.4			50	BLDG RECEPTACLE	14
15	SPARE (F GEN 2 BATT CHARGER)	0		0.0		20/1	15	16	30/2		0.5		60	GENERATOR 1 BLOCK HEATER	16
17	CMP 151 COMPRESSORS	70			0.6	20/1	17	18				0.5	60		18
19	VFD 141 SPACE HEATER	80	0.7			20/1	19	20	30/2		0.0		0	SPARE	20
21	CL2 DOSING PKG 1	200		1.7		20/1	21	22				0.0	0	(F GEN 2 BLOCK HEATER)	22
23	CL2 DOSING PKG 2	200			1.7	20/1	23	24	20/1			0.0	0	SPARE	24
25	VFD 142 SPACE HEATER	30	0.3			20/1	25	26	20/1	0.0			0	SPARE	26
27	SECURITY PANEL	70		0.6		20/1	27	28	20/1		0.6		70	PANELBOARD	28
29	AUTODIALER	70			0.6	20/1	29	30	20/1			0.0	0	SPARE	30
31	PANELBOARD FLT-1-2	800	6.7			50/3	31	32	30/1	2.5			300	CHEM ROOM WATER HEATER	32
33	(NEW BREAKER)	400		3.3			33	34	20/1		0.0		0	SPARE	34
35		400			3.3		35	36	20/1			0.0	0	SPARE	36
37	PANELBOARD FLT-3-6	1000	8.3			50/3	37	38	20/1	0.0			0	SPARE	38
39	(NEW BREAKER)	800		6.7			39	40	20/1		0.0		0	SPARE	40
41		600			5.0		41	42	20/1			0.0	0	SPARE	42

PHASE	A	B	C		A	B	C	PHASE
LEFT SIDE AMPS	16.9	14.3	14.5	NEUTRAL	4.7	5.3	3.4	RIGHT SIDE AMPS
LEFT SIDE KVA	2.03	1.72	1.74		0.57	0.63	0.41	RIGHT SIDE KVA
				GROUND				
TOTAL PHASE KVA	2.60	2.35	2.15		7.10			TOTAL KVA
TOTAL PHASE AMPS	21.6	19.6	17.9		19.69			TOTAL AMPS @ 208V, 3P
% OF AVERAGE	110	99	91		0.80			DEMAND FACTOR
					5.68			LOAD KVA

NOTES: 1 MEANS OF WIRE COLOR CODING SHALL BE POSTED ON PANELBOARD PER NEC 210 (4)
2 ASTERISK (*) DENOTES GFI BREAKER REQUIRED WITH 5 MA SENSITIVITY
3 TILDA (~) DENOTES GFI BREAKER REQUIRED WITH 30 MA SENSITIVITY

PANEL "FLT-1-2"

LOCATION: NEMA 4X OUTDOOR
ENCLOSURE: STANCHION
AIC RATING: 10 KAIC

120/208 VOLTS, 3 PHASE, 4 WIRE
50 AMP BUS
100 AMP MAIN BREAKER

BKR NO.	DESCRIPTION	LOAD VA	PHASE AMPS A	B	C	AMPS/ POLE	BKR NO.	BKR NO.	AMPS/ POLE	PHASE AMPS A	B	C	LOAD VA	DESCRIPTION	BKR NO.
1	FILTER 1 VALVE 1	200	1.7			20/1	1	2	20/1	1.7			200	FILTER 2 VALVE 1	2
3	FILTER 1 VALVE 2	200		1.7		20/1	3	4	20/1		1.7		200	FILTER 2 VALVE 2	4
5	FILTER 1 VALVE 3	200			1.7	20/1	5	6	20/1			1.7	200	FILTER 2 VALVE 3	6
7	FILTER 1 VALVE 4	200	1.7			20/1	7	8	20/1	1.7			200	FILTER 2 VALVE 4	8
9	SPARE			0.0		20/1	9	10	20/1		0.0			SPARE	10
11	SPARE				0.0	20/1	11	12	20/1			0.0		SPARE	12
13	SPARE		0.0			20/1	13	14	20/1	0.0				SPARE	14
15	SPARE			0.0		20/1	15	16	20/1		0.0			SPARE	16
17	FILTER 1-2 NETWORK CP AUX	600			5.0	20/1	17	18	20/1			1.7	200	FILTER TO WASTE VALVE	18

PHASE	A	B	C		A	B	C	PHASE
LEFT SIDE AMPS	3.3	1.7	6.7	NEUTRAL	3.3	1.7	3.3	RIGHT SIDE AMPS
LEFT SIDE KVA	0.40	0.20	0.80		0.40	0.20	0.40	RIGHT SIDE KVA
				GROUND				
TOTAL PHASE KVA	0.80	0.40	1.20		2.40			TOTAL KVA
TOTAL PHASE AMPS	6.7	3.3	10.0		6.66			TOTAL AMPS @ 208V, 3P
% OF AVERAGE	100	50	150		0.80			DEMAND FACTOR
					1.92			LOAD KVA

NOTES: 1 MEANS OF WIRE COLOR CODING SHALL BE POSTED ON PANELBOARD PER NEC 210 (4)
2 ASTERISK (*) DENOTES GFI BREAKER REQUIRED WITH 5 MA SENSITIVITY
3 TILDA (~) DENOTES GFI BREAKER REQUIRED WITH 30 MA SENSITIVITY

PANEL "FLT-3-6"

LOCATION: NEMA 4X OUTDOOR
ENCLOSURE: STANCHION
AIC RATING: 10 KAIC

120/208 VOLTS, 3 PHASE, 4 WIRE
50 AMP BUS
100 AMP MAIN BREAKER

BKR NO.	DESCRIPTION	LOAD VA	PHASE AMPS A	B	C	AMPS/ POLE	BKR NO.	BKR NO.	AMPS/ POLE	PHASE AMPS A	B	C	LOAD VA	DESCRIPTION	BKR NO.
1	FILTER 3 VALVE 1	200	1.7			20/1	1	2	20/1	1.7			200	FILTER 5 VALVE 1	2
3	FILTER 3 VALVE 2	200		1.7		20/1	3	4	20/1		1.7		200	FILTER 5 VALVE 2	4
5	FILTER 3 VALVE 3	200			1.7	20/1	5	6	20/1			1.7	200	FILTER 5 VALVE 3	6
7	FILTER 3 VALVE 4	200	1.7			20/1	7	8	20/1	1.7			200	FILTER 5 VALVE 4	8
9	FILTER 4 VALVE 1	200		1.7		20/1	9	10	20/1		0.0		0	SPARE (F FILTER 6 VALVE 1)	10
11	FILTER 4 VALVE 2	200			1.7	20/1	11	12	20/1			0.0	0	SPARE (F FILTER 6 VALVE 2)	12
13	FILTER 4 VALVE 3	200	1.7			20/1	13	14	20/1	0.0			0	SPARE (F FILTER 6 VALVE 3)	14
15	FILTER 4 VALVE 4	200		1.7		20/1	15	16	20/1		0.0		0	SPARE (F FILTER 6 VALVE 4)	16
17	FILTER 3-6 NETWORK CP AUX	600			5.0	20/1	17	18	20/1			1.7	200	FILTER EFFLUENT MODULATING VALVE	18

PHASE	A	B	C		A	B	C	PHASE
LEFT SIDE AMPS	5.0	5.0	8.3	NEUTRAL	3.3	1.7	3.3	RIGHT SIDE AMPS
LEFT SIDE KVA	0.60	0.60	1.00		0.40	0.20	0.40	RIGHT SIDE KVA
				GROUND				
TOTAL PHASE KVA	1.00	0.80	1.40		3.20			TOTAL KVA
TOTAL PHASE AMPS	8.3	6.7	11.7		8.88			TOTAL AMPS @ 208V, 3P
% OF AVERAGE	94	75	131		0.80			DEMAND FACTOR
					2.56			LOAD KVA

NOTES: 1 MEANS OF WIRE COLOR CODING SHALL BE POSTED ON PANELBOARD PER NEC 210 (4)
2 ASTERISK (*) DENOTES GFI BREAKER REQUIRED WITH 5 MA SENSITIVITY
3 TILDA (~) DENOTES GFI BREAKER REQUIRED WITH 30 MA SENSITIVITY

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CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

REGISTERED PROFESSIONAL ENGINEER — THOMAS P. FRISCH — No. E15761 — ELECTRICAL — STATE OF CALIFORNIA

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

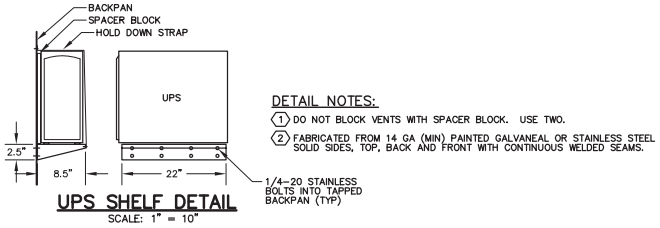
PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE: NO SCALE
ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

ELECTRICAL

SHEET TITLE:
PARTIAL ONE LINE DIAGRAM AND PANELBOARD SCHEDULES

SHEET NAME: E2
SHEET NUMBER: 27 OF 40
6/1/23

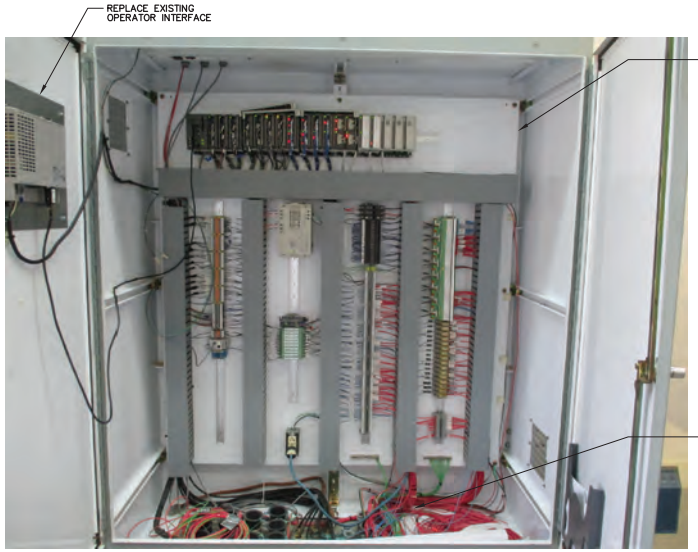


UPS SHELF DETAIL

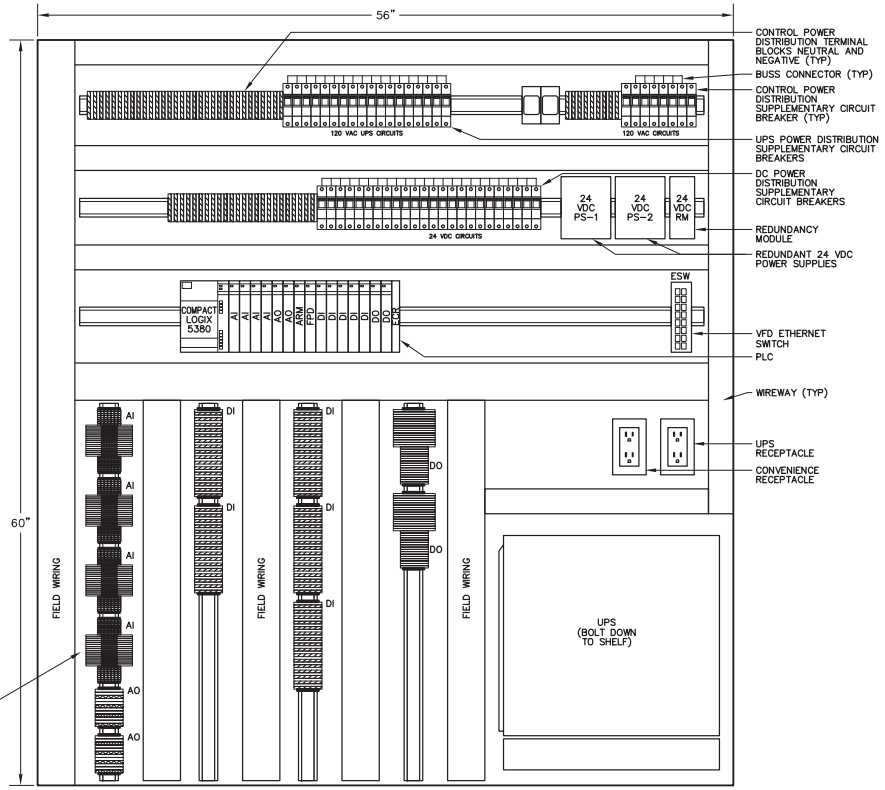
SCALE: 1" = 10"

DETAIL NOTES:

1. DO NOT BLOCK VENTS WITH SPACER BLOCK. USE TWO.
2. FABRICATED FROM 14 GA (MIN) PAINTED GALVANEAL OR STAINLESS STEEL SOLID SIDES, TOP, BACK AND FRONT WITH CONTINUOUS WELDED SEAMS.



EXISTING CONTROL PANEL



BACKPAN LAYOUT 1

DRAWING REFERENCED NOTES:

1. EXISTING CONTROL PANEL SHALL REMAIN. REPLACE EXISTING BACKPAN SHOWN IN PHOTO AT LEFT, WITH NEW BACKPAN LAYOUT AS SHOWN AT RIGHT.
2. CONNECT EXISTING I/O WIRE TO NEW TERMINAL BLOCKS PER EXAMPLE I/O DRAWING AND P&ID DRAWINGS

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REGISTERED PROFESSIONAL ENGINEER — THOMAS P. FRISCH — No. E15761 — ELECTRICAL — STATE OF CALIFORNIA

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

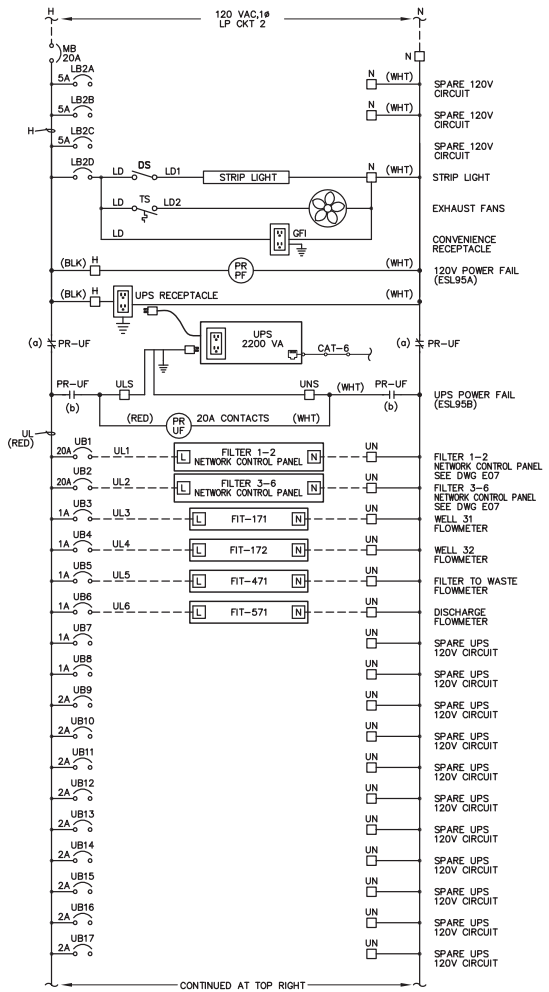
PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE:
NO SCALE
ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

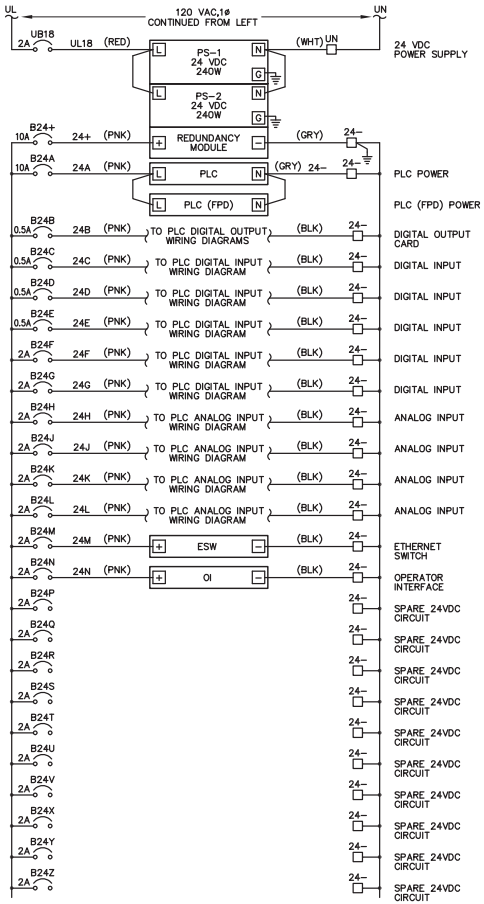
ELECTRICAL

SHEET TITLE:
CONTROL PANEL BACKPAN LAYOUT

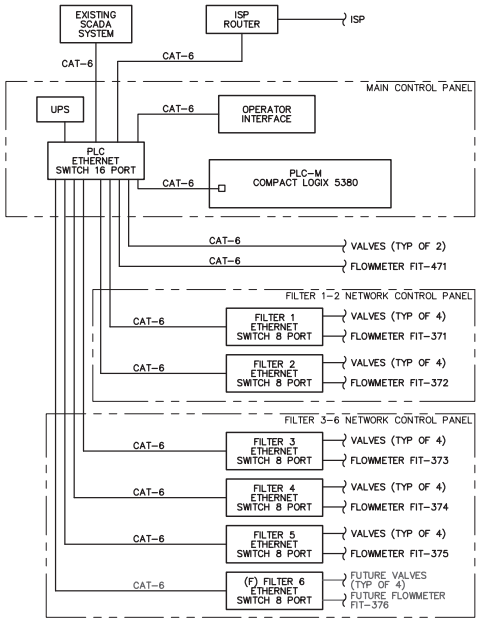
SHEET NAME: E3
SHEET NUMBER: 28 OF 40
6/1/23



POWER DISTRIBUTION DIAGRAM



POWER DISTRIBUTION DIAGRAM – CONTINUED



COMMUNICATION BLOCK DIAGRAM

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CONSULTANT:
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REGISTERED PROFESSIONAL ENGINEER THOMAS P. FRISCH No. E15761 ELECTRICAL STATE OF CALIFORNIA

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

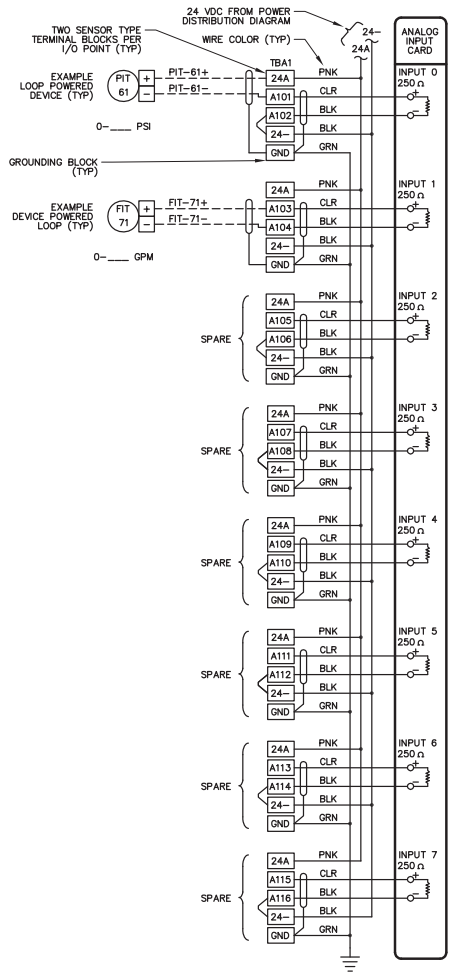
PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE:
NO SCALE
ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

ELECTRICAL

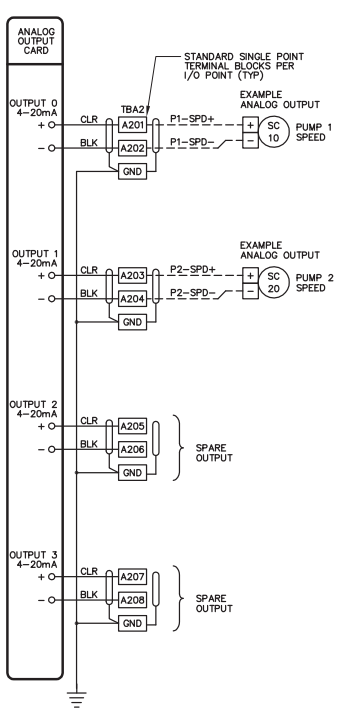
SHEET TITLE:
CONTROL PANEL POWER DISTRIBUTION DIAGRAM

SHEET NAME: E4
SHEET NUMBER: 29 OF 40
6/1/23



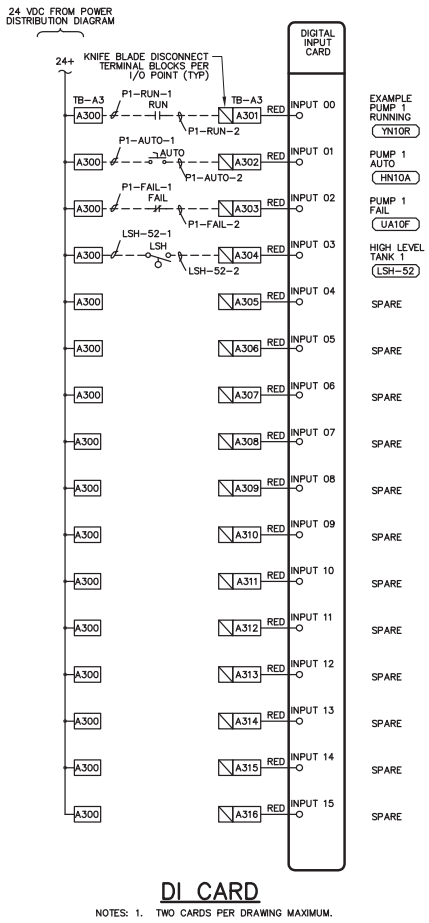
AI CARD

NOTES: 1. TWO CARDS PER DRAWING MAXIMUM.
2. USE MANUFACTURED TERMINAL BLOCK JUMPERS WHERE POSSIBLE



AO CARD

NOTES: 1. TWO CARDS PER DRAWING MAXIMUM.

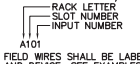


DI CARD

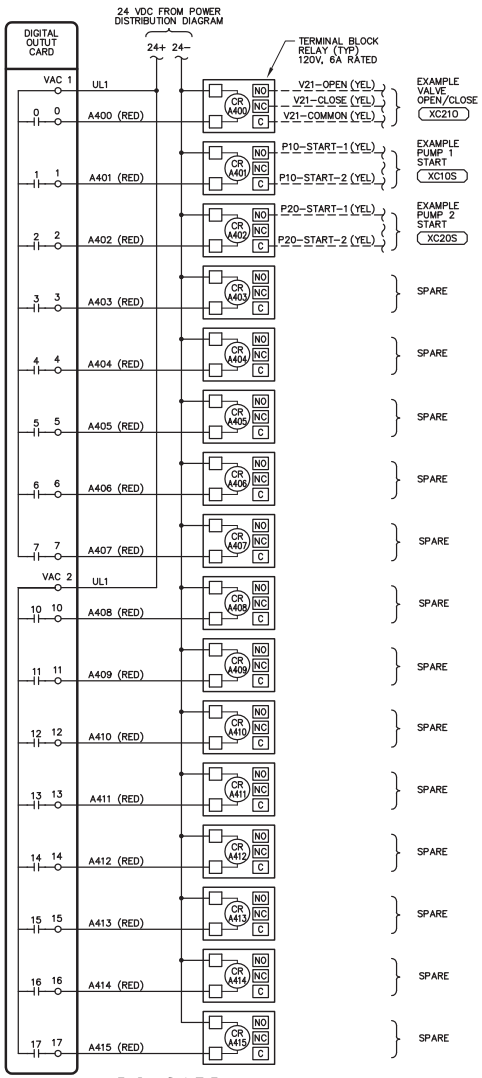
NOTES: 1. TWO CARDS PER DRAWING MAXIMUM.

EXAMPLE PLC I/O WIRING DIAGRAMS

NOTES: 1. WIRE SPARE PLC I/O POINTS TO TERMINAL BLOCKS.
2. EXAMPLE I/O POINTS SHOWN. THIS DRAWING INTENDED TO SHOW I/O WIRING ONLY.
3. I/O TYPE AND NUMBER OF POINTS AND CARDS REQUIRED IS DETERMINED BY P&ID DRAWINGS.
4. MINIMUM 20% SPARE I/O POINTS PER I/O TYPE.
5. INTERNAL PANEL PLC I/O CARD WIRE NUMBERS SHALL BE BUILT AS SHOWN IN EXAMPLE BELOW.



6. FIELD WIRES SHALL BE LABELED WITH ACRONYM OF CONTROL PANEL ID (NOT SHOWN) AND DEVICE: SEE EXAMPLES.



DO CARD

NOTES: 1. TWO CARDS PER DRAWING MAXIMUM.

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THOMAS P. FRISCH No. E15761 REGISTERED PROFESSIONAL ENGINEER ELECTRICAL STATE OF CALIFORNIA

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

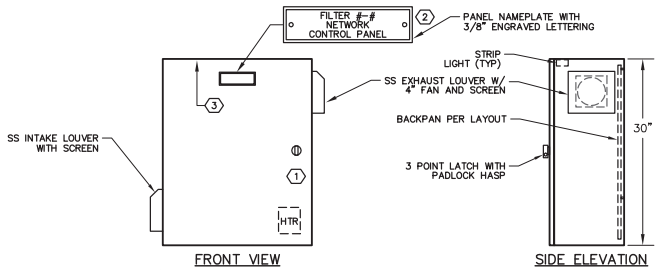
PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

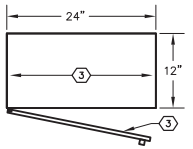
SCALE: NO SCALE
ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

ELECTRICAL

SHEET TITLE:
CONTROL PANEL
EXAMPLE PLC I/O WIRING DIAGRAMS

SHEET NAME: E5
SHEET NUMBER: 30 OF 40
6/1/23





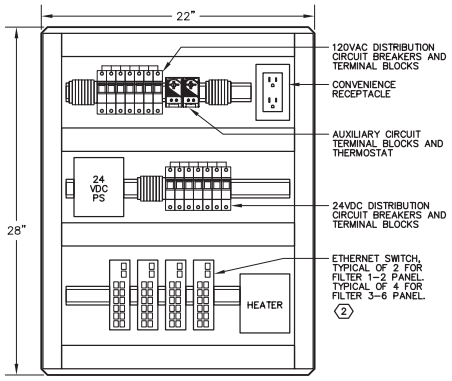
CONTROL PANEL ELEVATION

PANEL FABRICATION METHODS

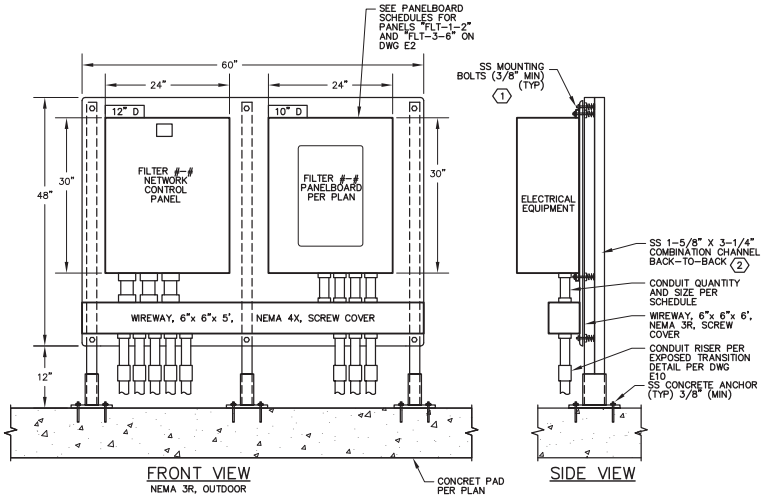
1. NEMA 4X, 316SS OUTDOOR WALLMOUNT INSTALLATION.
2. ALL SEAMS CONTINUOUS WELDED.
3. OUTER DOORS TO BE PADLOCKABLE WITH HEAVY DUTY SINGLE POINT LATCHES.
4. DOOR HINGES AND PINS SHALL BE 316 STAINLESS STEEL.
5. NO SCREWS, RIVETS, OR BOLTS SHALL PROTRUDE EXTERNALLY.
6. INTERNAL SCREWS, BOLTS, AND NUTS SHALL BE MACHINE THREAD.
7. PLASTIC SCREW MOUNTED NAMEPLATES SHALL BE PROVIDED FOR ALL DEVICES ON DEADFRONT SCREWS SHALL BE STAINLESS STEEL.
8. FABRICATION AND WIRING SHALL CONFORM TO U.L. AND NEMA STANDARDS.
9. ALL WIRING SHALL BE PERMANENTLY LABELLED WITH WIRE MARKERS ON BOTH ENDS.
10. WIRING DIAGRAMS SHALL BE PLACED IN A PLASTIC DRAWING HOLDER PERMANENTLY ATTACHED TO THE INSIDE OF THE FRONT DOOR.
11. AS – BUILT WIRING DIAGRAMS SHALL BE SHIPPED WITH EQUIPMENT.

DRAWING REFERENCED NOTES:

1. CONTROL ENCLOSURE SHALL BE HOFFMAN CONCEPT MODEL NUMBER CSD302412SS STAINLESS STEEL CONSTRUCTION OR EQUAL. PROVIDE DOOR LATCHES, BACKPAN, AND ANY OTHER PARTS TO COMPLETE PANEL.
2. FILTER NETWORK CONTROL PANEL TYPICAL OF 2. FILTER 1–2 NETWORK CONTROL PANEL SHALL HAVE 2 NETWORK SWITCHES FOR FILTERS 1 AND 2. FILTER 3–6 NETWORK CONTROL PANEL SHALL HAVE 4 NETWORK SWITCHES FOR FILTERS 3 THROUGH 6. FILTER 6 IS FUTURE, PROVIDE SPARE SWITCH FOR FILTER 6.
3. INSULATE INSIDE PANEL DOOR, SIDES AND TOP. CUT OUT FOR FANS, VENTS AND LATCHES.



BACKPAN LAYOUT



EMP – EQUIPMENT MOUNTING PANEL DETAIL

NOT TO SCALE, TYPICAL OF 2

NOTES:
1. MOUNT ALL DEVICES TO BACKPAN USING ALL STAINLESS STEEL HARDWARE.
2. NUMBER OF VERTICAL UNISTRUT SUPPORTS TO BE 2 (MIN) OR 1 EVERY 2 FT PLUS 1.

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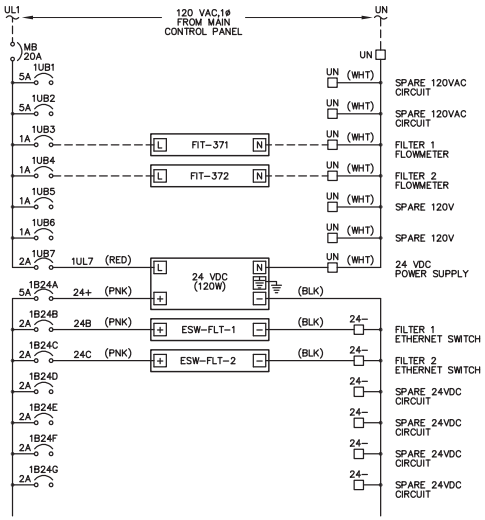
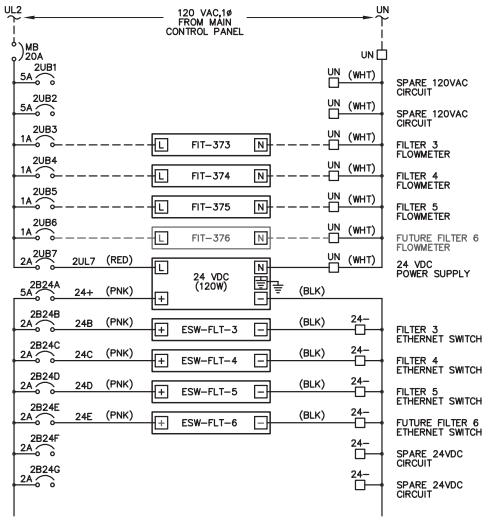
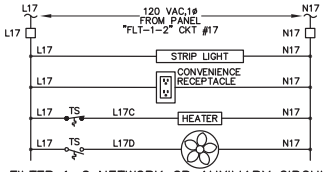
CONSULTANT:				CLIENT:	PROJECT:	SCALE:		SHEET NAME:
AFFINITY ENGINEERING 3433 Mardi Gras Court, Rancho Cordova, CA, 95670 www.affinityengineering.com	REGISTERED PROFESSIONAL ENGINEER THOMAS P. FRISCH No. E15761 ELECTRICAL STATE OF CALIFORNIA	NO.	REVISION DESCRIPTION / BY / DATE	Olivehurst Public Utility District 1970 9th Avenue, Olivehurst, CA 95961	PLUMAS LAKE WATER PLANT MANGANESE TREATMENT EXPANSION	NO SCALE ATTENTION LINE IS 2" AT FULL SIZE (SCALE ACCORDINGLY)	ELECTRICAL SHEET TITLE: FILTER NETWORK CONTROL PANELS ELEVATION AND LAYOUT	E6 SHEET NUMBER: 31 OF 40 6/1/23



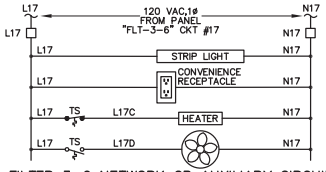
FILTER 1–2 NETWORK CONTROL PANEL
POWER DISTRIBUTION DIAGRAM



FILTER 3–6 NETWORK CONTROL PANEL
POWER DISTRIBUTION DIAGRAM



FILTER 1–2 NETWORK CP AUXILIARY CIRCUIT



FILTER 3–6 NETWORK CP AUXILIARY CIRCUIT

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REGISTERED PROFESSIONAL ENGINEER
THOMAS P. FRISCH
No. E15761
ELECTRICAL
STATE OF CALIFORNIA

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE:
NO SCALE
ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

ELECTRICAL

SHEET TITLE:
FILTER NETWORK CONTROL PANELS
POWER DISTRIBUTION DIAGRAM

SHEET NAME:
E7

SHEET NUMBER:
32 OF 40

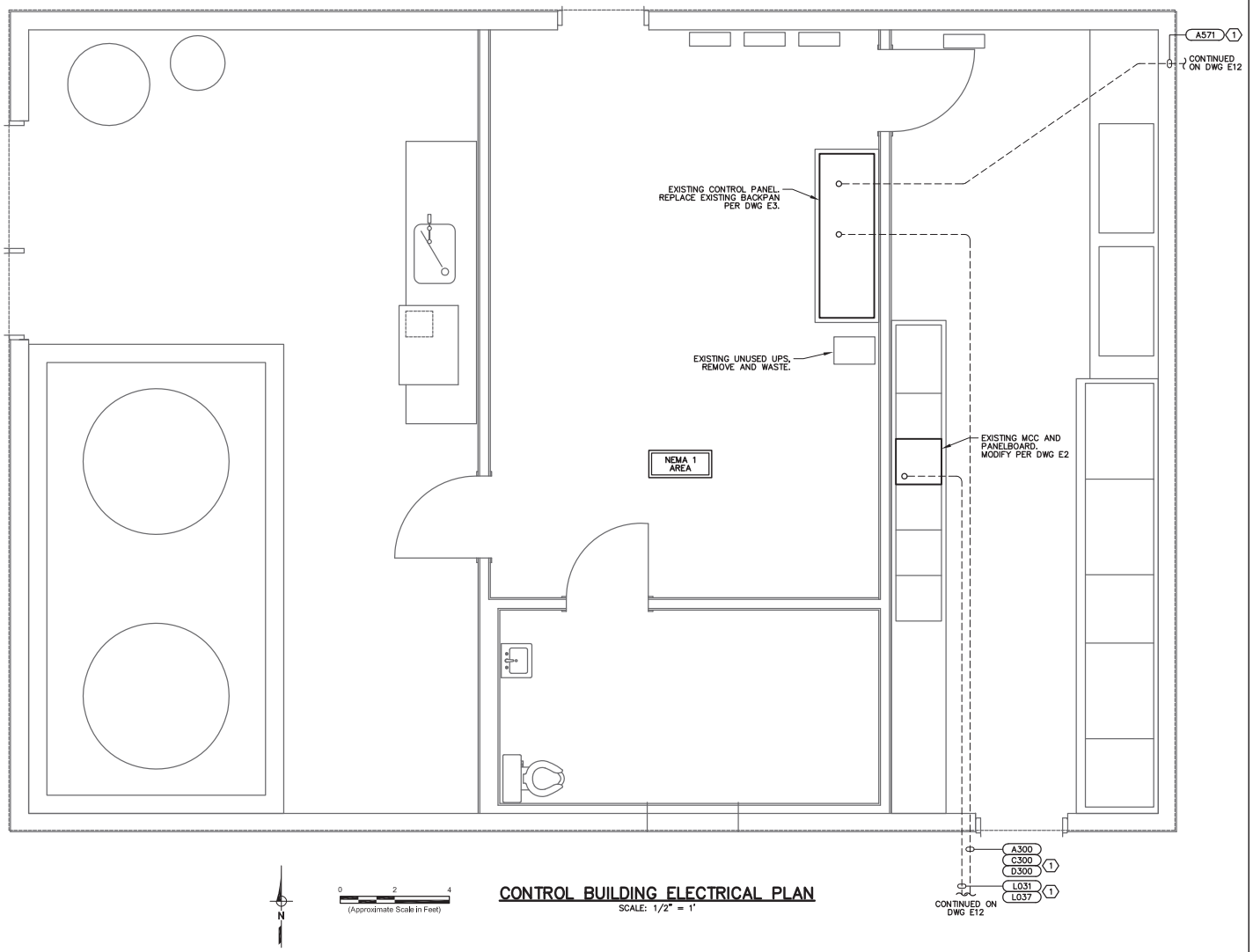
6/1/23

ELECTRICAL PLAN NOTES:

1. SEE ELECTRICAL SYMBOLS AND ABBREVIATIONS DRAWING FOR SYMBOL DEFINITION.
2. ALL WORK SHALL CONFORM TO LOCAL CODES AND NATIONAL ELECTRIC CODE.
3. SITEPLAN ACCURATE FOR ELECTRICAL WORK ONLY. COORDINATE WITH OTHER DISCIPLINES.
4. CONFIRM HOOKUP REQUIREMENTS FOR ELECTRICAL AND MECHANICAL EQUIPMENT PRIOR TO INSTALLING UNDERGROUND CONDUIT AND STUB-UPS. MISSING CONDUITS, INCORRECT SIZING, OR OTHER ISSUES MUST BE BROUGHT TO THE ATTENTION OF ENGINEER PRIOR TO BACKFILL.
5. CONDUIT ROUTING IS SHOWN GENERALLY DIAGRAMMATIC AND DOES NOT INDICATE TRENCH WIDTH OR TRENCH LAYOUT. FOR CONDUITS OUTSIDE BUILDINGS, IF CONTRACTOR WANTS TO RUN CONDUITS IN ROUTES OTHER THAN THOSE SHOWN FOR ANY REASON, THEN HE SHALL SUBMIT THE PLAN FOR APPROVAL PRIOR TO INSTALLATION. SPECIFY REASON FOR CHANGE.
6. INSTALL NON-UTILITY CONDUITS PER DRAWING DETAILS AND SPECIFICATIONS SECTION 16110.
7. CONDUITS SIZE, TYPE AND FILL DEFINED BY TAG NAME IN CONDUIT AND WIRE ROUTING SCHEDULE.
8. INSTALL UNDERGROUND NON-DUCTBANK CONDUITS PER ELECTRICAL DETAIL LVC.
9. CONDUIT TRANSITIONS SHALL BE PER EXPOSED CONDUIT TRANSITION DETAIL ECT.
10. EXPOSED CONDUIT TYPE AND FITTINGS TO BE USED ABOVE TRANSITION SHALL BE PER AREA CLASSIFICATION DEFINED IN CONDUIT SPECIFICATIONS AND EQUIPMENT SPECIFIC DETAIL.
11. REPAIR SURFACE TO PREVIOUS CONDITION FOR ALL UNDERGROUND CONDUIT ROUTES. GROUT, CAULK, AND PAINT ANY PENETRATIONS INTO STRUCTURES FOR WATERTIGHT SEAL.
12. USE SS EXPANSION WEDGE ANCHORS OR EPOXY ANCHORS AS NECESSARY FOR EQUIPMENT MOUNTING.

DRAWING REFERENCED NOTES:

(1) EXISTING CONDUIT, CONDUIT FILL PER SCHEDULE.



CONTROL BUILDING ELECTRICAL PLAN

SCALE: 1/2" = 1'

FRISCH ENGINEERING, INC.
CONSULTING ELECTRICAL ENGINEERS
PH 916.353.1025
WWW.FRISCHENGINEERING.COM

FILE: 2208A-ECB.DWG
DATE: MAY 18, 2023 TIME: 3:44:15PM

CONSULTANT:		NO.	REVISION DESCRIPTION	BY	DATE
AFFINITY ENGINEERING 3433 Mardi Gras Court, Rancho Cordova, CA, 95670 www.affinityengineering.com	REGISTERED PROFESSIONAL ENGINEER THOMAS P. FRISCH No. E15761 ELECTRICAL STATE OF CALIFORNIA				

CLIENT:	PROJECT:	SCALE:	SHEET NAME:
Olivehurst Public Utility District 1970 9th Avenue, Olivehurst, CA 95961	PLUMAS LAKE WATER PLANT MANGANESE TREATMENT EXPANSION	ATTENTION LINE IS 2" AT FULL SIZE (SCALE ACCORDINGLY)	ELECTRICAL SHEET TITLE: CONTROL BUILDING ELECTRICAL PLAN

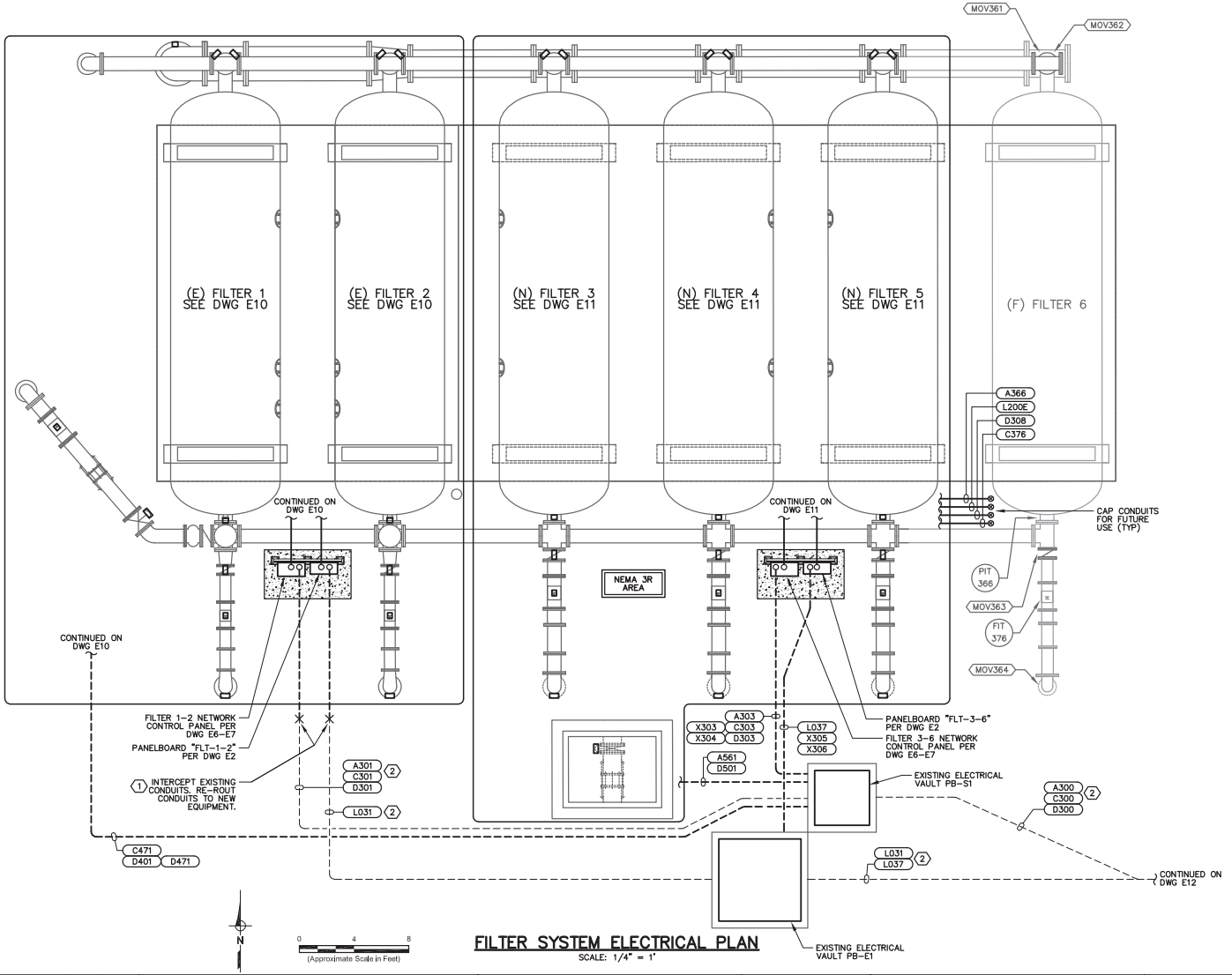
SHEET NAME:	SHEET NUMBER:	
E8	33 OF 40	6/1/23

ELECTRICAL PLAN NOTES:

1. SEE ELECTRICAL SYMBOLS AND ABBREVIATIONS DRAWING FOR SYMBOL DEFINITION.
2. ALL WORK SHALL CONFORM TO LOCAL CODES AND NATIONAL ELECTRIC CODE.
3. SITEPLAN ACCURATE FOR ELECTRICAL WORK ONLY. COORDINATE WITH OTHER DISCIPLINES.
4. CONFIRM HOOKUP REQUIREMENTS FOR ELECTRICAL AND MECHANICAL EQUIPMENT PRIOR TO INSTALLING UNDERGROUND CONDUIT AND STUB-UPS. MISSING CONDUITS, INCORRECT SIZING, OR OTHER ISSUES MUST BE BROUGHT TO THE ATTENTION OF ENGINEER PRIOR TO BACKFILL.
5. CONDUIT ROUTING IS SHOWN GENERALLY DIAGRAMMATIC AND DOES NOT INDICATE TRENCH WIDTH OR TRENCH LAYOUT. FOR CONDUITS OUTSIDE BUILDINGS, IF CONTRACTOR WANTS TO RUN CONDUITS IN ROUTES OTHER THAN THOSE SHOWN FOR ANY REASON, THEN HE SHALL SUBMIT THE PLAN FOR APPROVAL PRIOR TO INSTALLATION. SPECIFY REASON FOR CHANGE.
6. INSTALL NON-UTILITY CONDUITS PER DRAWING DETAILS AND SPECIFICATIONS SECTION 16110.
7. CONDUITS SIZE, TYPE AND FILL DEFINED BY TAG NAME IN CONDUIT AND WIRE ROUTING SCHEDULE.
8. INSTALL UNDERGROUND NON-DUCTBANK CONDUITS PER ELECTRICAL DETAIL LVC.
9. CONDUIT TRANSITIONS SHALL BE PER EXPOSED CONDUIT TRANSITION DETAIL ECT.
10. EXPOSED CONDUIT TYPE AND FITTINGS TO BE USED ABOVE TRANSITION SHALL BE PER AREA CLASSIFICATION DEFINED IN CONDUIT SPECIFICATIONS AND EQUIPMENT SPECIFIC DETAIL.
11. REPAIR SURFACE TO PREVIOUS CONDITION FOR ALL UNDERGROUND CONDUIT ROUTES. GROUT, CAULK, AND PAINT ANY PENETRATIONS INTO STRUCTURES FOR WATERTIGHT SEAL.
12. USE SS EXPANSION WEDGE ANCHORS OR EPOXY ANCHORS AS NECESSARY FOR EQUIPMENT MOUNTING.

DRAWING REFERENCED NOTES:

(1) REMOVE WIRE FROM EXISTING CONDUIT. REROUT CONDUIT TO NEW ELECTRICAL EQUIPMENT. INSTALL NEW WIRE PER CONDUIT SCHEDULE.
(2) EXISTING CONDUIT, CONDUIT FILL PER SCHEDULE.



N

0 4 8
(Approximate Scale in Feet)

FILTER SYSTEM ELECTRICAL PLAN

SCALE: 1/4" = 1'

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DATE: MAY 18, 2023 TIME: 3:44:24PM

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

REGISTERED PROFESSIONAL ENGINEER
THOMAS P. FRISCH
No. E15761
ELECTRICAL
STATE OF CALIFORNIA

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE:

ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

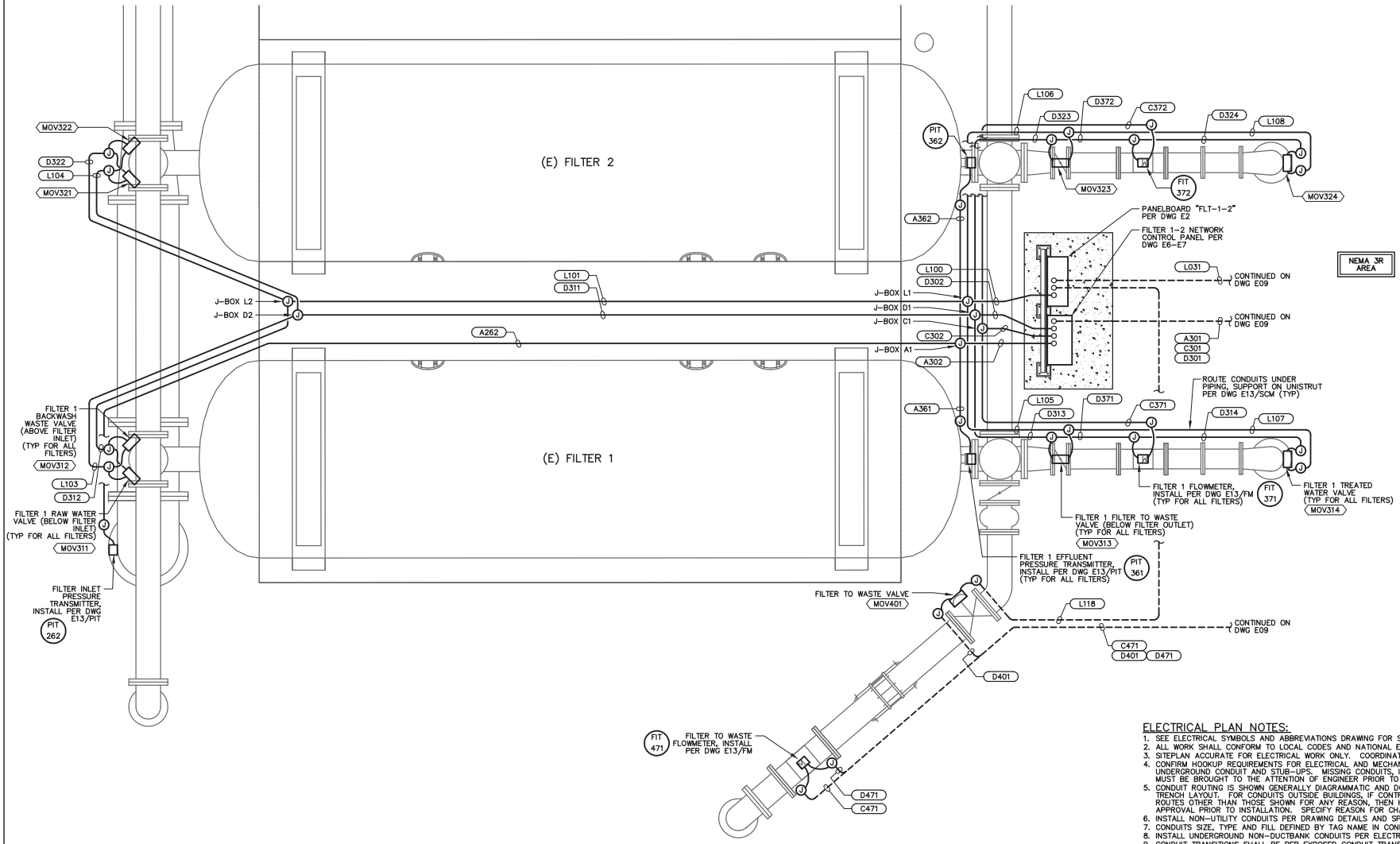
ELECTRICAL

SHEET TITLE:
FILTER SYSTEM ELECTRICAL PLAN

SHEET NAME: E9

SHEET NUMBER: 34 OF 40

6/1/23



FILTERS 1 AND 2 ELECTRICAL PLAN

SCALE: 1/2" = 1'

ELECTRICAL PLAN NOTES:

1. SEE ELECTRICAL SYMBOLS AND ABBREVIATIONS DRAWING FOR SYMBOL DEFINITION.
2. ALL WORK SHALL CONFORM TO LOCAL CODES AND NATIONAL ELECTRIC CODE.
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FRISCH ENGINEERING, INC.
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DATE: MAY 18, 2023 TIME: 3:44:32PM

NO.	REVISION DESCRIPTION	BY	DATE

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

PROFESSIONAL ENGINEER — REGISTERED ELECTRICAL ENGINEER — THOMAS P. FRISCH — No. E15761 — ELECTRICAL — STATE OF CALIFORNIA

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE:

ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

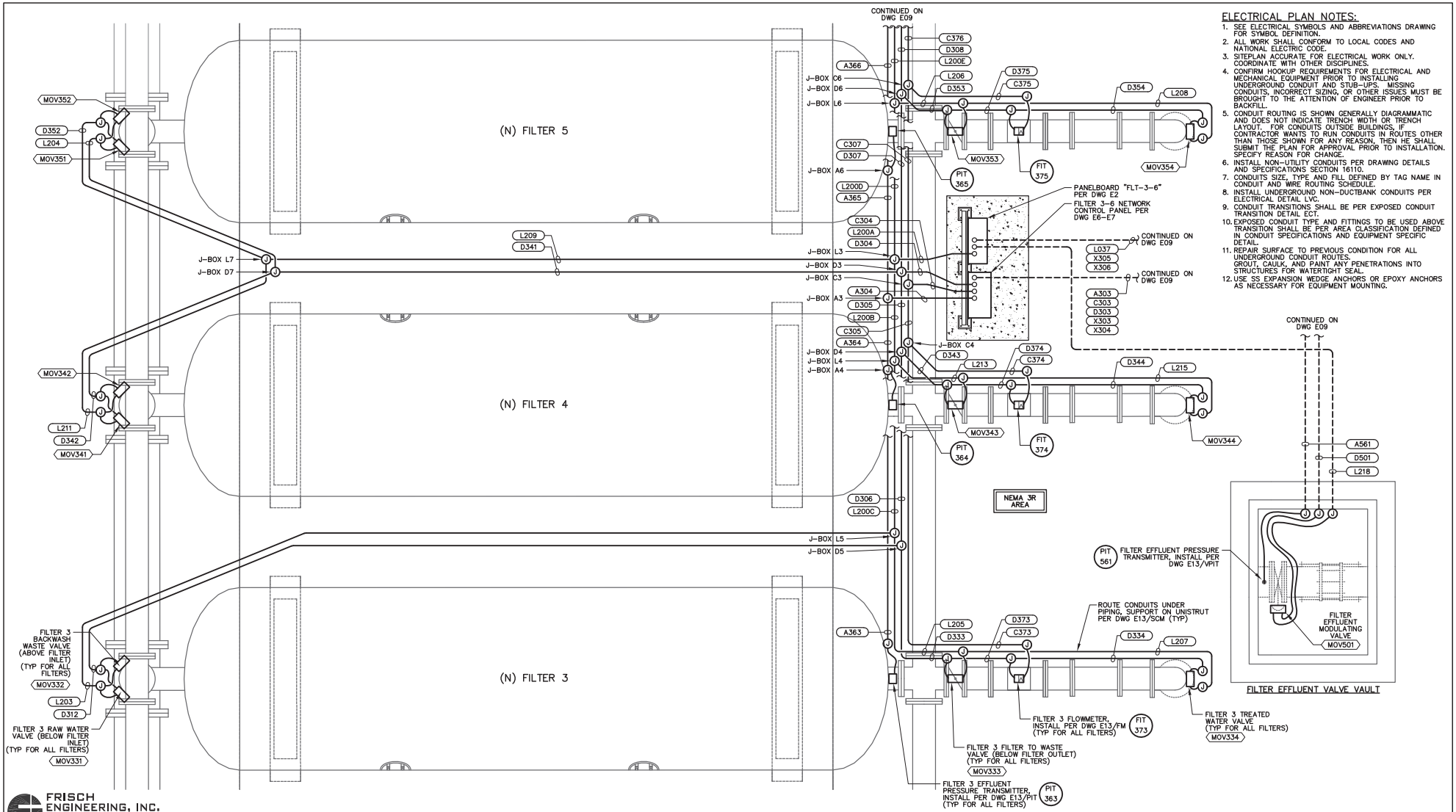
ELECTRICAL

SHEET TITLE:
FILTER SYSTEM ELECTRICAL PLAN FILTERS 1 AND 2

SHEET NAME: E10

SHEET NUMBER: 35 OF 40

6/1/23



ELECTRICAL PLAN NOTES:

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FRISCH ENGINEERING, INC.
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DATE: MAY 18, 2023 TIME: 3:44:43PM

0 2 4
(Approximate Scale in Feet)

FILTERS 3, 4 AND 5 ELECTRICAL PLAN

SCALE: 1/2" = 1'

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

PROFESSIONAL ENGINEER — THOMAS P. FRISCH — No. E15761 — ELECTRICAL — STATE OF CALIFORNIA

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT

MANGANESE TREATMENT EXPANSION

SCALE:

ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

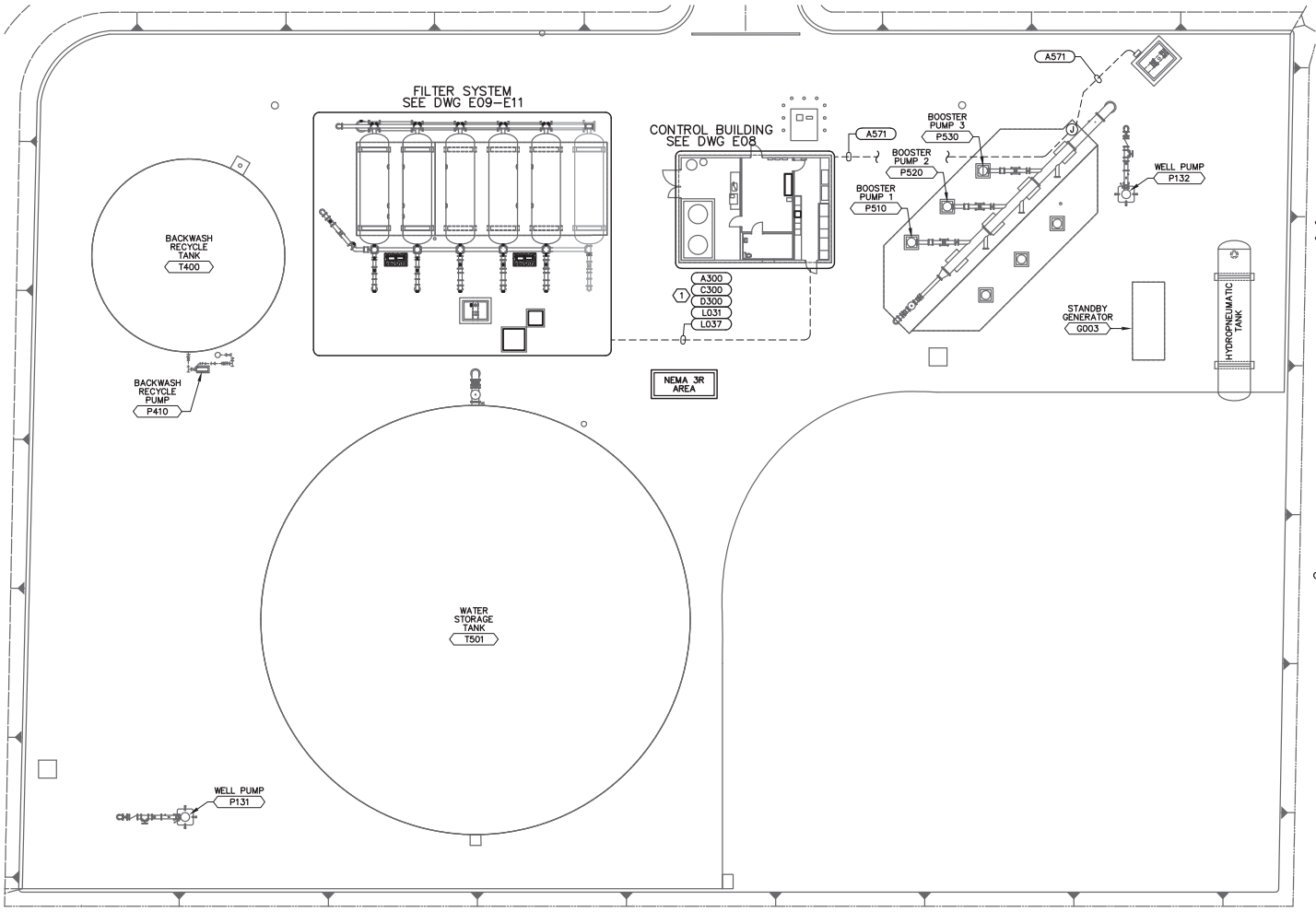
ELECTRICAL

SHEET TITLE:
FILTER SYSTEM ELECTRICAL PLAN FILTERS 3, 4, AND 5

SHEET NAME: E11

SHEET NUMBER: 36 OF 40

6/1/23



ELECTRICAL PLAN NOTES:

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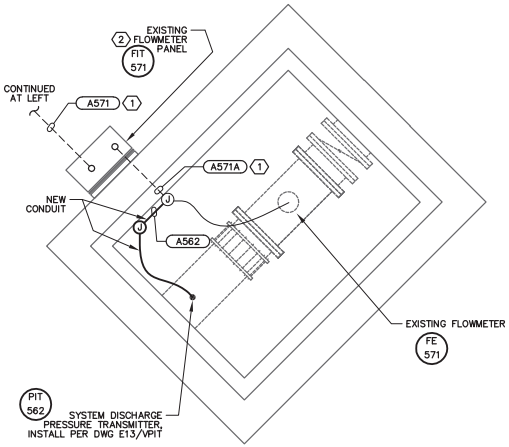
12. USE SS EXPANSION WEDGE ANCHORS OR EPOXY ANCHORS AS NECESSARY FOR EQUIPMENT MOUNTING.

DRAWING REFERENCED NOTES:

(1) EXISTING CONDUIT, CONDUIT FILL PER SCHEDULE.
(2) ROUTE NEW WIRE FOR PRESSURE TRANSMITTER THROUGH FLOWMETER PANEL, WIRE PER CONDUIT SCHEDULE.



N

0 16 32
(Approximate Scale in Feet)

ELECTRICAL SITE PLAN
SCALE: 1/16" = 1'

DISCHARGE FLOWMETER VAULT
SCALE: 1/2" = 1'
REVISE EXISTING CONDUIT LAYOUT AS SHOWN.

0 2 4
(Approximate Scale in Feet)

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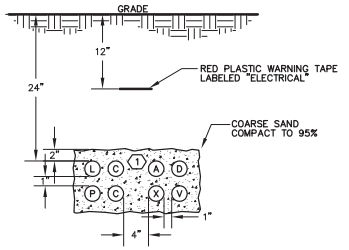
CONSULTING ELECTRICAL ENGINEERS
PH 916.353.1025
WWW.FRISCHENGINEERING.COM
FILE: 2208A-E08.DWG
DATE: MAY 18, 2023 TIME: 3:44:52PM

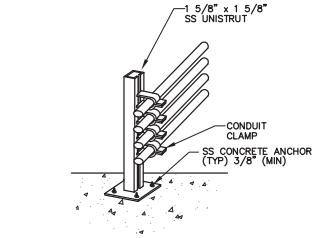
CONSULTANT:				CLIENT:	PROJECT:	SCALE:	ELECTRICAL	SHEET NAME:
AFFINITY ENGINEERING 3433 Mardi Gras Court, Rancho Cordova, CA, 95670 www.affinityengineering.com	PROFESSIONAL ENGINEER THOMAS P. FRISCH No. E15761 ELECTRICAL STATE OF CALIFORNIA	NO.	REVISION DESCRIPTION / BY / DATE	Olivehurst Public Utility District 1970 9th Avenue, Olivehurst, CA 95961	PLUMAS LAKE WATER PLANT MANGANESE TREATMENT EXPANSION	ATTENTION LINE IS 2" AT FULL SIZE (SCALE ACCORDINGLY)	SHEET TITLE: ELECTRICAL SITE PLAN	E12 SHEET NUMBER: 37 OF 40 6/1/23



LVC – LOW VOLTAGE NON-DUCT BANK SECTION

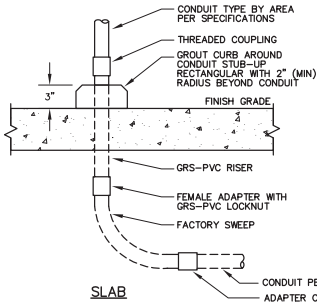
NOT TO SCALE

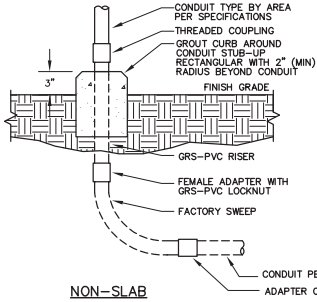
NOTES:
1. NUMBER OF CONDUITS PER PLANS AND SCHEDULE. MAXIMUM DEPTH OF TRENCH SHALL BE 42". DESIGN TRENCH DESIGN AND INSTALL TRENCH TO MAINTAIN 6" VERTICAL CLEARANCE AND 12" HORIZONTAL CLEARANCE FROM PIPES.
2. P, L, OR C DESIGNATION FOR POWER OR CONTROL CONDUITS.
3. A, D, V, OR X DESIGNATION FOR COMMUNICATION (TELEPHONE, DATA, VIDEO, OR INSTRUMENTATION) CONDUITS.
4. USE CONDUIT SPACERS TO SUPPORT CONDUITS AND MAINTAIN SPACING (3' INTERVALS)

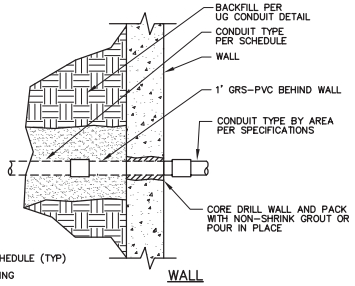


SCM – SURFACE CONDUIT MOUNTING

NOT TO SCALE

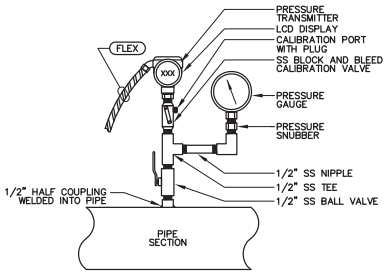






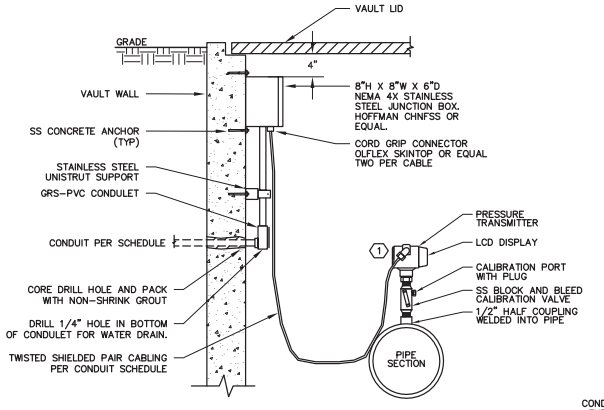
ECT – EXPOSED CONDUIT TRANSITION DETAIL

NOT TO SCALE



PIT – PRESSURE TRANSMITTER DETAIL

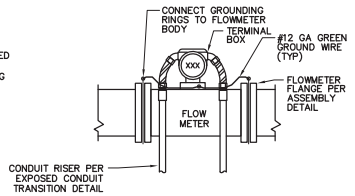
NOT TO SCALE



VPIT – VAULT PRESSURE TRANSMITTER DETAIL

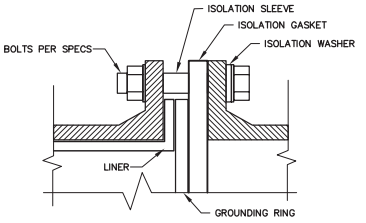
NOT TO SCALE

NOTES:
1. USE PIPE DOPE TO SEAL TRANSMITTER ELECTRICAL AND PROCESS THREADED CONNECTIONS. CORD GRIP CONNECTION SHALL BE WATER-TIGHT IN CASE OF ACCIENTAL SUBMERGENCE.



FM – FLOWMETER DETAIL

NOT TO SCALE



FLG – FLOWMETER FLANGE ASSEMBLY

NOT TO SCALE

FRISCH ENGINEERING, INC.
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PH 916.353.1025
WWW.FRISCHENGINEERING.COM

FILE: 2208AE13.DWG
DATE: MAY 18, 2023 TIME: 3:44:59PM

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

THOMAS P. FRISCH — No. E15761 — REGISTERED PROFESSIONAL ENGINEER — ELECTRICAL — STATE OF CALIFORNIA

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE:
NO SCALE
ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

ELECTRICAL

SHEET TITLE:
ELECTRICAL DETAILS

SHEET NAME: E13
SHEET NUMBER: 38 OF 40
6/1/23

CONDUIT & WIRE ROUTING SCHEDULE

REV	CONDUIT DETAILS TAG NO.	FROM	TO	QTY	SIZE	TYPE	POWER WIRE QTY	POWER WIRE SIZE	CONTROL WIRE QTY	CONTROL WIRE SIZE	GROUND SIZE	NOTES
	A262	J-BOX A1	PIT-262	1	3/4"	SPEC	–	–	1	#18 TSPR	#14	
	A300	CONTROL PANEL	(E) PULLBOX PB-S1	1	2"	(E)	–	–	7	#18 TSPR	#14	RELABEL PLC100-31
	A301	(E) PULLBOX PB-S1	FILTER 1-2 NETWORK CONTROL PANEL	1	2"	(E)	–	–	2	#18 TSPR	#14	RELABEL PLC100-31 AFTER PULLBOX PB-S1 NEW CONDUIT AFTER INTERCEPT POINT
	A302	FILTER 1-2 NETWORK CONTROL PANEL	J-BOX A1	1	3/4"	SPEC	–	–	3	#18 TSPR	#14	
	A303	(E) PULLBOX PB-S1	FILTER 3-6 NETWORK CONTROL PANEL	1	1"	SPEC	–	–	4	#18 TSPR	#14	
	A304	FILTER 3-6 NETWORK CONTROL PANEL	J-BOX A3	1	1"	SPEC	–	–	3	#18 TSPR	#14	
	A361	J-BOX A1	PIT-361	1	3/4"	SPEC	–	–	1	#18 TSPR	#14	
	A362	J-BOX A1	PIT-362	1	3/4"	SPEC	–	–	1	#18 TSPR	#14	
	A363	J-BOX A4	PIT-363	1	3/4"	SPEC	–	–	1	#18 TSPR	#14	
	A364	J-BOX A3	J-BOX A4, PIT-364	1	3/4"	SPEC	–	–	2	#18 TSPR	#14	
	A365	J-BOX A3	J-BOX A6, PIT-365	1	3/4"	SPEC	–	–	1	#18 TSPR	#14	
	A366	J-BOX A6	(F) FILTER 6	1	3/4"	SPEC	–	–	–	–	–	STUB AND CAP
	A561	(E) PULLBOX PB-S1	FILTER EFFLUENT PRESSURE PIT-561	1	3/4"	SPEC	–	–	1	#18 TSPR	#14	
	A562	(E) SYSTEM DISCHARGE FLOWMETER FIT-57	(N) SYSTEM DISCHARGE PRESSURE PIT-562	1	3/4"	SPEC	–	–	1	#18 TSPR	#14	
	A571	CONTROL PANEL	(E) FLOWMETER PANEL	1	1"	(E)	–	–	2	#18 TSPR	#14	RELABEL PLC100-16 PULL NEW TSPR FOR PIT-562
	A571 A	(E) FLOWMETER PANEL	(E) SYSTEM DISCHARGE FLOWMETER FIT-571	1	1"	(E)	–	–	1 1	MFG CABLE #18 TSPR	#14	RELABEL PLC100-16 PULL NEW TSPR FOR PIT-562
	C300	CONTROL PANEL	(E) PULLBOX PB-S1	1	2"	(E)	–	–	8	#12	#12	RELABEL PLC100-38
	C301	(E) PULLBOX PB-S1	FILTER 1-2 NETWORK CONTROL PANEL	1	2"	(E)	–	–	2	#12	#12	RELABEL PLC100-29, NEW CONDUIT AFTER INTERCEPT POINT
	C302	FILTER 1-2 NETWORK CONTROL PANEL	J-BOX C1	1	3/4"	SPEC	–	–	4	#14	#14	
	C303	(E) PULLBOX PB-S1	FILTER 3-6 NETWORK CONTROL PANEL	1	3/4"	SPEC	–	–	2	#12	#12	
	C304	FILTER 3-6 NETWORK CONTROL PANEL	J-BOX C3	1	3/4"	SPEC	–	–	6	#14	#14	
	C305	J-BOX C3	J-BOX C4	1	3/4"	SPEC	–	–	4	#14	#14	
	C307	J-BOX C3	J-BOX C6	1	3/4"	SPEC	–	–	2	#14	#14	
	C371	J-BOX C1	FIT-371	1	3/4"	SPEC	–	–	2	#14	#14	
	C372	J-BOX C1	FIT-372	1	3/4"	SPEC	–	–	2	#14	#14	
	C373	J-BOX C4	FIT-373	1	3/4"	SPEC	–	–	2	#14	#14	
	C374	J-BOX C4	FIT-374	1	3/4"	SPEC	–	–	2	#14	#14	
	C375	J-BOX C6	FIT-375	1	3/4"	SPEC	–	–	2	#14	#14	
	C376	J-BOX C6	(F) FILTER 6	1	3/4"	SPEC	–	–	–	–	–	STUB AND CAP
	C471	(E) PULLBOX PB-S1	FILTER TO WASTE FIT-471	1	3/4"	SPEC	–	–	2	#12	#12	
	D300	CONTROL PANEL	(E) PULLBOX PB-S1	1	2"	(E)	–	–	10	CAT 5E	–	RELABEL PLC100-39, BELDEN 7919A
	D301	(E) PULLBOX PB-S1	FILTER 1-2 NETWORK CONTROL PANEL	1	2"	(E)	–	–	2	CAT 5E	–	RELABEL PLC100-28 NEW CONDUIT AFTER INTERCEPT POINT, BELDEN 7919A
	D302	FILTER 1-2 NETWORK CONTROL PANEL	J-BOX D1	1	1"	SPEC	–	–	10	CAT 5E	–	BELDEN 7919A
	D303	(E) PULLBOX PB-S1	FILTER 3-6 NETWORK CONTROL PANEL	1	1"	SPEC	–	–	4	CAT 5E	–	BELDEN 7919A
	D304	FILTER 3-6 NETWORK CONTROL PANEL	J-BOX D3	1	1"	SPEC	–	–	15	CAT 5E	–	BELDEN 7919A
	D305	J-BOX D3	J-BOX D4	1	1"	SPEC	–	–	8	CAT 5E	–	BELDEN 7919A
	D306	J-BOX D4	J-BOX D5	1	1"	SPEC	–	–	5	CAT 5E	–	BELDEN 7919A
	D307	J-BOX C3	J-BOX C6	1	1"	SPEC	–	–	3	CAT 5E	–	BELDEN 7919A
	D308	J-BOX C6	(F) FILTER 6	1	3/4"	SPEC	–	–	–	–	–	STUB AND CAP
	D311	J-BOX D1	J-BOX D2	1	3/4"	SPEC	–	–	4	CAT 5E	–	BELDEN 7919A
	D312	J-BOX D2	MOV-311, MOV-312	1	3/4"	SPEC	–	–	2	CAT 5E	–	BELDEN 7919A
	D312	J-BOX D5	MOV-331, MOV-332	1	3/4"	SPEC	–	–	2	CAT 5E	–	BELDEN 7919A
	D313	J-BOX D1	MOV-313	1	3/4"	SPEC	–	–	3	CAT 5E	–	BELDEN 7919A
	D314	FIT-371	MOV-314	1	3/4"	SPEC	–	–	1	CAT 5E	–	BELDEN 7919A
	D322	J-BOX D2	MOV-321, MOV-322	1	3/4"	SPEC	–	–	2	CAT 5E	–	BELDEN 7919A

NOTES PERTAINING TO CONDUIT SCHEDULE:

1. CONDUIT TYPE "SPEC" IS AS DEFINED IN SPECIFICATIONS SECTION [CONDUIT AND BOXES] FOR NON-EXPOSED AND EXPOSED PORTIONS OF CONDUIT RUN.
2. SEE SPECIFICATIONS AND EXPOSED TRANSITION DETAIL OR EQUIPMENT SPECIFIC DETAIL FOR CONDUIT TRANSITION MATERIALS AND METHODS FROM BELOW GROUND TO EXPOSED PORTIONS OF RUN.
3. CONDUITS OVER 15 FT LENGTH (EITHER EMPTY OR WITH CONDUCTORS SIZED LESS THAN #8 AWG), SHALL INCLUDE A POLY PULL STRING. STRING SHALL BE TIED OFF AT EACH END.
4. FITTINGS, CONDULETS, BOXES AND COVERS SHALL MATCH DUTY OF ADJACENT PIPE, SEE SPECIFICATIONS [CONDUIT AND BOXES.]
5. WIRE SIZING IN TABLE IS BASED ON COPPER CONDUCTORS, THHN INSULATION, WITH TYPE C STRANDING. OTHER CONDUCTOR TYPES, IF ALLOWED OR REQUIRED PER SPECIFICATION, MAY REQUIRE CONDUITS TO BE UPSIZED BY CONTRACTOR AND SUBMITTED FOR APPROVAL.

FRISCH ENGINEERING, INC.
CONSULTING ELECTRICAL ENGINEERS
PH 916.353.1025
WWW.FRISCHENGINEERING.COM

FILE: 2208AE14.DWG
DATE: MAY 18, 2023 TIME: 3:45:08PM

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

REGISTERED PROFESSIONAL ENGINEER — THOMAS P. FRISCH — No. E15761 — ELECTRICAL — STATE OF CALIFORNIA

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT
MANGANESE TREATMENT EXPANSION

SCALE: NO SCALE

ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

ELECTRICAL

SHEET TITLE:
ELECTRICAL CONDUIT SCHEDULE

SHEET NAME: E14

SHEET NUMBER: 39 OF 40

6/1/23

CONDUIT & WIRE ROUTING SCHEDULE

REV	CONDUIT DETAILS TAG NO.	FROM	TO	QTY	SIZE	TYPE	POWER WIRE QTY	POWER WIRE SIZE	CONTROL WIRE QTY	CONTROL WIRE SIZE	GROUND SIZE	NOTES
	D323	J-BOX D1	MOV-323	1	3/4"	SPEC	–	–	3	CAT 5E	–	BELDEN 7919A
	D324	FIT-372	MOV-324	1	3/4"	SPEC	–	–	1	CAT 5E	–	BELDEN 7919A
	D333	J-BOX D5	MOV-333	1	3/4"	SPEC	–	–	3	CAT 5E	–	BELDEN 7919A
	D341	J-BOX D3	J-BOX D7	1	3/4"	SPEC	–	–	4	CAT 5E	–	BELDEN 7919A
	D342	J-BOX D7	MOV-341, MOV-342	1	3/4"	SPEC	–	–	2	CAT 5E	–	BELDEN 7919A
	D343	J-BOX D4	MOV-343	1	3/4"	SPEC	–	–	3	CAT 5E	–	BELDEN 7919A
	D334	FIT-373	MOV-334	1	3/4"	SPEC	–	–	1	CAT 5E	–	BELDEN 7919A
	D344	FIT-374	MOV-344	1	3/4"	SPEC	–	–	1	CAT 5E	–	BELDEN 7919A
	D352	J-BOX D7	MOV-351, MOV-352	1	3/4"	SPEC	–	–	2	CAT 5E	–	BELDEN 7919A
	D353	J-BOX C6	MOV-353	1	3/4"	SPEC	–	–	3	CAT 5E	–	BELDEN 7919A
	D354	FIT-375	MOV-354	1	3/4"	SPEC	–	–	1	CAT 5E	–	BELDEN 7919A
	D371	MOV-313	FIT-371	1	3/4"	SPEC	–	–	2	CAT 5E	–	BELDEN 7919A
	D372	MOV-323	FIT-372	1	3/4"	SPEC	–	–	2	CAT 5E	–	BELDEN 7919A
	D373	MOV-333	FIT-373	1	3/4"	SPEC	–	–	2	CAT 5E	–	BELDEN 7919A
	D374	MOV-343	FIT-374	1	3/4"	SPEC	–	–	2	CAT 5E	–	BELDEN 7919A
	D375	MOV-353	FIT-375	1	3/4"	SPEC	–	–	2	CAT 5E	–	BELDEN 7919A
	D401	(E) PULLBOX PB-S1	FILTER TO WASTE MOV-401	1	3/4"	SPEC	–	–	1	CAT 5E	–	BELDEN 7919A
	D471	(E) PULLBOX PB-S1	FILTER TO WASTE FIT-471	1	3/4"	SPEC	–	–	1	CAT 5E	–	BELDEN 7919A
	D501	(E) PULLBOX PB-S1	FILTER EFFLUENT MOV-501	1	3/4"	SPEC	–	–	1	CAT 5E	–	BELDEN 7919A
	L031	EXISTING PANELBOARD LP-A	PANELBOARD FLT-1-2	1	1"	(E)	3	#6	–	–	#10	SEE REFERENCE NOTE 1 NEW CONDUIT AFTER INTERCEPT POINT
	L037	EXISTING PANELBOARD LP-A	PANELBOARD FLT-3-6	1	1"	(E)	3	#6	–	–	#10	SEE REFERENCE NOTE 2 NEW CONDUIT AFTER PB-E1
	L100	PANELBOARD FLT-1-2	J-BOX L1	1	1"	SPEC	16	#12	–	–	#12	
	L101	J-BOX L1	J-BOX L2	1	3/4"	SPEC	8	#12	–	–	#12	
	L103	J-BOX L2	MOV-311, MOV-312	1	3/4"	SPEC	4	#12	–	–	#12	
	L104	J-BOX L2	MOV-321, MOV-322	1	3/4"	SPEC	4	#12	–	–	#12	
	L105	J-BOX L1	MOV-313	1	3/4"	SPEC	4	#12	–	–	#12	
	L106	J-BOX L1	MOV-323	1	3/4"	SPEC	4	#12	–	–	#12	
	L107	MOV-313	MOV-314	1	3/4"	SPEC	2	#12	–	–	#12	
	L108	MOV-323	MOV-324	1	3/4"	SPEC	2	#12	–	–	#12	
	L118	PANELBOARD FLT-1-2	FILTER TO WASTE MOV401	1	3/4"	SPEC	2	#12	–	–	#12	
	L200A	PANELBOARD FLT-3-6	J-BOX L3	1	1"	SPEC	24	#12	–	–	#12	
	L200B	J-BOX L3	J-BOX L4	1	1"	SPEC	12	#12	–	–	#12	
	L200C	J-BOX L4	J-BOX L5	1	3/4"	SPEC	8	#12	–	–	#12	
	L200D	J-BOX L3	J-BOX L6	1	3/4"	SPEC	4	#12	–	–	#12	
	L200E	J-BOX L6	(F) FILTER 6	1	3/4"	SPEC	–	–	–	–	–	STUB AND CAP
	L203	J-BOX L5	MOV-331, MOV-332	1	3/4"	SPEC	4	#12	–	–	#12	
	L204	J-BOX L7	MOV-351, MOV-352	1	3/4"	SPEC	4	#12	–	–	#12	
	L205	J-BOX L5	MOV-333	1	3/4"	SPEC	4	#12	–	–	#12	
	L206	J-BOX L6	MOV-353	1	3/4"	SPEC	4	#12	–	–	#12	
	L207	MOV-333	MOV-334	1	3/4"	SPEC	2	#12	–	–	#12	
	L208	MOV-353	MOV-354	1	3/4"	SPEC	2	#12	–	–	#12	
	L209	J-BOX L3	J-BOX L7	1	3/4"	SPEC	8	#12	–	–	#12	
	L211	J-BOX L7	MOV-341, MOV-342	1	3/4"	SPEC	4	#12	–	–	#12	
	L213	J-BOX L4	MOV-343	1	3/4"	SPEC	4	#12	–	–	#12	
	L215	MOV-343	MOV-344	1	3/4"	SPEC	2	#12	–	–	#12	
	L218	PANELBOARD FLT-3-6	FILTER EFFLUENT MODDULATING VALVE MOV-501	1	3/4"	SPEC	2	#12	–	–	#12	
	X303	(E) PULLBOX PB-S1	FILTER 3-6 NETWORK CONTROL PANEL	1	1"	SPEC	–	–	–	–	–	PULL ROPE
	X304	(E) PULLBOX PB-S1	FILTER 3-6 NETWORK CONTROL PANEL	1	1"	SPEC	–	–	–	–	–	PULL ROPE
	X305	(E) PULLBOX PB-E1	PANELBOARD FLT-3-6	1	1"	SPEC	–	–	–	–	–	PULL ROPE
	X306	(E) PULLBOX PB-E1	PANELBOARD FLT-3-6	1	1"	SPEC	–	–	–	–	–	PULL ROPE

NOTES PERTAINING TO CONDUIT SCHEDULE:

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5. WIRE SIZING IN TABLE IS BASED ON COPPER CONDUCTORS, THHN INSULATION, WITH TYPE C STRANDING. OTHER CONDUCTOR TYPES, IF ALLOWED OR REQUIRED PER SPECIFICATION, MAY REQUIRE CONDUITS TO BE UPSIZED BY CONTRACTOR AND SUBMITTED FOR APPROVAL.

REFERENCE NOTES:

1. USE EXISTING CONDUIT PREVIOUSLYFEEDING FLT111 VALVES (CKT 31) TO FEED PANELBOARD FLT-1-2. REMOVE EXISTING WIRE AND PULL NEW WIRE PER CONDUIT SCHEDULE. LABEL CONDUIT L031.
2. USE EXISTING CONDUIT PREVIOUSLY FEEDING FLT112 VALVES (CKT 33) TO FEED PANELBOARD FLT-3-6. REMOVE EXISTING WIRE AND PULL NEW WIRE PER CONDUIT SCHEDULE. LABEL CONDUIT L037.

FRISCH ENGINEERING, INC.
CONSULTING ELECTRICAL ENGINEERS
PH 916.353.1025
WWW.FRISCHENGINEERING.COM

FILE: 2208AE15.DWG
DATE: MAY 18, 2023 TIME: 3:45:14PM

CONSULTANT:
AFFINITY ENGINEERING
3433 Mardi Gras Court, Rancho Cordova, CA, 95670
www.affinityengineering.com

REGISTERED PROFESSIONAL ENGINEER — THOMAS P. FRISCH — No. E15761 — ELECTRICAL — STATE OF CALIFORNIA

NO.	REVISION DESCRIPTION	BY	DATE

CLIENT:
Olivehurst Public Utility District
1970 9th Avenue,
Olivehurst, CA 95961

PROJECT:
PLUMAS LAKE WATER PLANT

MANGANESE TREATMENT EXPANSION

SCALE: NO SCALE

ATTENTION
LINE IS 2" AT FULL SIZE
(SCALE ACCORDINGLY)

ELECTRICAL

SHEET TITLE:
ELECTRICAL CONDUIT SCHEDULE

SHEET NAME: E15

SHEET NUMBER: 40 OF 40

6/1/23

AFFINITY ENGINEERING

Olivehurst Public Utility District
Plumas Lake Water Treatment Plant
Manganese Treatment Expansion Project
Olivehurst, CA

Technical Specifications
Bid Set
June 1, 2023

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Table of Contents

Invitation to Bid

All Prospective Bidders,

I would like to invite you to bid on the Olivehurst Public Utility District (District) Manganese Treatment Expansion Project (Project) at the Plumas Lake Water Treatment Plant.

Sealed bids will be received for construction of the Project at the Bid Submittal Location until the Bid Deadline.

Bid Submittal Location: 1970 9th Ave, Olivehurst, CA 95961(District Office)
Bid Deadline: **2:00 p.m. Pacific Time (PDT), on July 14,2023**.

The sealed bids will be opened and bid amounts read publicly at the District Office shortly after 2:30 p.m. on July 14,2023.

Bidders and other interested parties are invited to be present at the opening. An apparent low bidder will be determined at that time.

All bids shall be completed in conformance with Section 00 21 13 – Instructions to Bidders. The scope of work contemplated is summarized in Section 01 11 01 – Summary of Work.

The Contract Documents for the Project may be examined at the District Office.

A Dropbox folder has been created for this project that will contain Adobe PDF copies of the plans, specifications, responses to bidder inquiries, and addenda. These files can be downloaded at no cost to bidders by requesting a Dropbox link from James Carson at jcarson@affinityengineering.com.

Alternatively, plans and specifications can be obtained from the following building exchanges and/or plan rooms:

Builders Exchange	**E-Mail**	**Phone**
McGraw Hill Construction Dodge	diana.boyles@mhfi.com	(530) 674-2805
Sacramento Regional Builders Exchange	yelenam@sacregionbx.com	(916) 442-8991
Shasta Builders Exchange	planroom@shastabe.com	(530) 221-5556
Placer County Contractors Assoc.	planroom@placerbx.com	(530) 889-3953
Nevada County Contractors Assoc.	ncrecep@pacbell.net	(530) 274-1919
El Dorado Builder's Exchange	director@goodbuilders.org	(530) 672-2955
Contra Costa Builders Exchange	aprilh@ccbx.com	(925) 685-8630
Builders Exchange of Stockton	jluna@besonline.com	(209) 478-1000

Bidders are hereby notified that in accordance with Public Contract Code Section 22300, securities may be substituted for any monies that the District may withhold pursuant to the terms of this Contract to ensure performance.

The successful bidder will be required to furnish a Performance and Payment Bonds as per Section 00 61 13 Payment and Performance Bonds.

The District affirmatively identifies this project as a "public works project" as that term is defined by Labor Code Section 1720. Therefore the project is subject to prevailing wage requirements under Labor Code Section 1771.

Contractor and its subcontractors shall fully comply with all the provisions of the California Labor Code governing the performance of public works contracts including, but not limited to, payment of prevailing wages, limitations on time worked, compliance with apprentice requirements, maintenance of payroll records, posting of wages at the job site, and prohibitions against discrimination. The prevailing wage rates may be obtained on the internet at:

https://www.dir.ca.gov/OPRL/dprewagedetermination.htm

The prevailing wage rates obtained from the above internet link are hereby incorporated in this Contract and made a part hereof.

The contractor and all subcontractors will be required to submit certified payrolls and labor compliance documentation at the discretion of, and in the manner specified, by the District. Certified payroll records may entail data entry of weekly payroll information including employee identification labor classification, total hours worked, and hours worked on this project, wage and benefit rates paid, etc. This requirement will also be required of every lower-tier subcontractor and vendor obligated to provide labor compliance documentation.

The Board reserves the right to reject any or all bids, to waive any informality in any bid, and to determine which bid, in the judgment of the Board, is the lowest responsive bid. The District may extend the time to award the Contract for a period which shall not exceed 60 days from the bid opening date, or not award the contract at all.

Questions concerning the Project during may be directed as follows:

James D. Carson, Affinity Engineering Inc.
Phone: (916) 613-7582
E-mail: jcarson@affinityengineering.com

Questions or correspondence shall be received no later than 5 business days prior to the date of the bid opening. Questions shall be submitted in writing and transmitted via e-mail only. Acknowledgement of receipt of questions will be sent to the originator of the question. Responses to questions will be made by addendum to all bidders.

Invitation to Bid

By order the General Manager of the Olivehurst Public Utility District dated _____, 2023.

_____

John Tillotson, P.E., General Manager

****END OF SECTION****

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Instructions to Bidders

1. Introduction

Each bid shall be in accordance with these Instructions to Bidders.

2. Contract Documents

Copies of Contract Documents shall be available as stated in Section 00 11 16 – Invitation to Bid.

3. Local Conditions

3.1 The quantities of work or material stated in the unit price items of the Bid Schedule are given only as a basis for the comparison of Bids. The District does not represent or warrant that the actual amount of work or material will correspond therewith, but reserves the right to increase or decrease the quantity of any unit price item of the work as may be deemed necessary or expedient by the Engineer.

3.2 The Bidder shall examine, carefully, the site of the work contemplated in the Contract Documents. The submission of a Bid shall be conclusive evidence that the Bidder has investigated and is satisfied as to the conditions to be encountered, as to the character, quality and quantities of work to be performed and the materials to be furnished, and as to the requirements of the Contract Documents. Bidders shall thoroughly examine and be familiar with the Contract Documents.

3.3 The failure of any Bidder to receive or examine any form, instrument, addendum, or other document, or to visit the site and acquaint themselves with conditions there existing shall in no way relieve the Bidder from any obligation with respect to its Bid or to the Contract. The Plans for the work show conditions as they are supposed or believed by the District, the Engineer, or their representatives to exist; but it is neither intended nor to be inferred that the conditions as shown therein constitute a representation by the District, the Engineer, or their representatives that such conditions are actually existent, nor shall the District, the Engineer, or their representatives be liable for any loss sustained by the Contractor as a result of any inference or extrapolation drawn by the Bidder between conditions as shown on the Plans and the actual conditions revealed during the progress of work, or otherwise. The Bidder's attention is directed to the possible existence of obstructions and public or private improvements which may be within the limits of the work or adjacent thereto, which may or may not be shown on the Plans.

4. Preparation of the Bid

4.1 A complete Bid requires submission of the following fully completed and executed documents:

- Section 00 41 43 – Bid Schedule
- Section 00 43 13 – Bid Guarantee

Incomplete documents may result in the Bid being rejected as nonresponsive.

4.2 On the Bid Schedule, the Bidder shall state in figures the unit prices or the specific sums, for which he proposes to supply the labor, materials, supplies tools or equipment, and perform the work required by the Contract Documents. All figures shall include all applicable taxes.

4.3 The phraseology of the Section 00 41 43 – Bid Schedule must not be changed, and no additions shall be made to the items mentioned therein. Unauthorized conditions, limitations or provisions attached to a bid may render it nonresponsive and may cause its rejection. If erasures, interlineations, or other changes appear on the Bid Schedule, each erasure, interlineation, or change must be initialed by the person signing the Bid Schedule.

4.4 If the Bid is made by an individual, it shall be signed by its full name and address shall be given; if it is made by a partnership, it shall be signed with the partnership name by a member of the partnership, who shall also sign his own name, and the name and address of each member of such partnership shall be given; and, if it is made by a corporation the name of the corporation shall be given and it shall be signed by its duly authorized officer or officers, the name(s) and title(s) of all signing officers, of the corporation shall be given, and the address of the corporation and the state in which incorporated shall be stated.

4.5 Bidder inquiries regarding the meaning or interpretation of any of the Contract Documents must be received by the District's Engineer in writing or by e-mail 5 business days prior to the Bid Deadline as stated in Section 00 11 16 – Invitation to Bid. Any such explanations or interpretations will be made only in the form of addenda to the documents and will be furnished to all bidders who shall submit all addenda with their Bids. Neither the Engineer nor any representative of the District is authorized to give oral explanations or interpretations of Contract Documents, and a submission of a Bid constitutes agreement

by the Bidder that he has placed no reliance on any such oral explanation or interpretation. However, the Engineer may, upon inquiry by Bidder, orally direct the Bidder's attention to specific provisions of the Contract Documents which cover the subject of the inquiry.

4.6 The Bidder shall review the Plans and Specifications prior to submission of their bid and shall report any errors and omissions noted by the Bidder to the District prior to such submission.

5. Modification of Bids

A Bidder may modify its Bid by written communication provided such communication is received by the District prior to the Bid Deadline. The written communication should not reveal the Bid price but should state the addition or subtraction or other modification so that the final prices or terms will not be known by the District until the sealed bid is opened.

6. Withdrawal and Return of Bids

Bids may be withdrawn without prejudice by written or e-mailed requests received from the Bidder prior to the time for opening of Bids, and Bids so withdrawn will be returned to bidders unopened. No Bid may be withdrawn after the Bid Deadline without rendering the accompanying Bid Guarantee subject to retention as liquidated damages in like manner as in the case of failure to execute the Contract after award, as provided in the Contract Documents. Negligence on the part of the Bidder preparing its Bid shall not constitute a right to withdraw the Bid after the opening of Bids. Any Bid received after the Bid submission deadline shall be returned to the Bidder unopened.

7. Submission of Bids

7.1 Each Bidder shall submit their Bid in a sealed envelope at the District Office no later than the Bid Deadline stated in Section 00 11 16 – Invitation to Bid.

7.2 The District shall not consider any Bid received after the Bid Deadline or received at any place other than the District Office.

7.3 No oral, telephonic, e-mail, facsimile or telegraphic Bid or modification of a Bid will be considered.

7.4 Bids will be considered only from persons licensed as required under applicable provisions of the Contractor's License Law (California Business and Professions Code section 7000, et seq.) and rules and regulations adopted pursuant thereto.

8. Discrepancies

In the case of discrepancy between unit prices and totals, unit prices will prevail. In case of discrepancy between words and figures, words will prevail.

9. Servicing and Maintenance

Each Bidder must, if requested, furnish evidence that there is an efficient service organization which regularly carries a stock of repair parts for the proposed equipment to be furnished and installed in the work and that the organization is conveniently located for prompt service.

10. Disqualification of Bidders

10.1 More than one Bid from an individual, firm, partnership, or corporation under the same or different names will not be considered. Reasonable grounds for believing that any individual, firm, partnership or corporation is interested in more than one Bid for the work contemplated may cause the rejection of all Bids in which the individual, firm, partnership, or corporation is interested. If there is reason for believing that collusion exists among the bidders, any or all Bids may be rejected. Bids in which the price is obviously unbalanced may be rejected.

10.2 All bidders are put on notice that any collusive agreement fixing the prices to be bid to control or affect the awarding of this Contract is in violation of the competitive bidding requirements applicable to the District and may render void any contract let under such circumstances.

11. Award of Contract

11.1 The time for award will be thirty (30) days after opening of Bids unless the time period is extended in Section 00 11 16 – Invitation to Bid. The District will provide a written notice of award to the lowest responsible and responsive Bidder. Accompanying the District's notice of award will be the Standard Contract (Agreement) as provided in Section 00 52 13.

11.2 The District reserves the right to accept or reject any and all Bids during the time for awarding the Contract, and to waive any informality or

irregularity in any Bid. No Bid can be withdrawn during the time for awarding the Contract.

11.3 Before a Bid is considered for award, the District may require the apparent low bidder or their subcontractors submit a statement of facts including but not limited to the following:

- Details of the business
- Technical organization
- Financial resources
- Equipment available for the project
- Evidence that other work completed by the bidder is of comparable magnitude and type.

11.4 The District expressly reserves the right to reject any Bid if it determines that any requested statement of facts show the Bidder or their subcontractors are not qualified for the work bid upon and, therefore, justifies such rejection.

11.5 The award of the Contract, if it is awarded, will be to the lowest responsible and responsive Bidder (successful Bidder) where their Bid complies with the requirements of the Contract Documents.

12. Contract Bonds

12.1 The successful Bidder shall furnish Performance and Payment Bonds shall be furnished for the full amount of the contract price as per Section 00 61 13 – Payment and Performance Bonds.

12.2 The Payment Bond shall comply with California Civil Code sections 3247 and 3248 and applicable provisions of the California Bond and Undertaking Law (California Code of Civil Procedure section 995.010 et seq.).

12.3 The bonds shall be obtained from a responsible corporate surety (or sureties) acceptable to the District, who is (or are) in good standing with and duly admitted by the Insurance Commissioner of the State of California to act as surety upon bonds and undertakings. The surety (or sureties) shall furnish reports as to its financial condition from time to time as requested by the District. The premiums for the bonds shall be paid by the successful Bidder.

12.4 If any surety becomes unacceptable to the District, is deemed insolvent, is no longer an admitted surety in California, or fails to furnish reports as to its financial condition as requested by the District, the Contractor shall promptly furnish such additional security as may be required from time to time to protect the interests of the District and of persons supplying labor or materials in the prosecution of the work contemplated by this Contract.

12.5 In the event of any conflict between the terms of the Contract and the terms of the bonds, the terms of the Contract shall control, and the bonds shall be deemed to be amended thereby. Without limiting the foregoing, the District shall be entitled to exercise all rights granted to it by the Contract in the event of default, without control thereof by the surety, provided that the District gives the surety notice of such default at the time or before the exercise of any such right by the District, and, regardless of the terms of the bonds, the exercise of any such right by the District shall in no manner affect the liability of the surety under the bonds.

13. Execution of Contract

Within ten (10) days following receipt of notice of award of Contract (paragraph 12.1), the successful Bidder will be required to execute and return the three (3) original contracts, together with the performance and payment bonds, and the required certificates and proof of insurance documents (see Section 00 72 43), to the District. Failure to do so shall be just cause for annulment of the award and for forfeiture of the Bid Guarantee which shall be retained as liquidated damages, and it is agreed that the Bid Guarantee sum is a fair estimate of the amount of damages that the District will sustain by reason of such failure.

The District will promptly determine whether such Contract, bonds and insurance are as required by the Contract Documents, and upon such determination will forward a fully executed copy of the Contract and a Notice to Proceed with the work to the successful Bidder. Signature by both parties constitutes execution of the Contract. In the event of failure of the lowest responsible responsive Bidder to sign and return the Contract with acceptable bonds and insurance as prescribed herein, the District may award the Contract to the next lowest responsible responsive Bidder, and, in the event that Bidder fails to sign and return the Contract with acceptable bonds and insurance, the District may award the Contract to the then next lowest responsible responsive Bidder, etc.

14. Return of Bid Guarantees

All Bid Guarantees will be held until the Contract has been finally executed, after which all Bid Guarantees, other than any Bid Guarantees which have been forfeited, will be returned to the respective bidders whose Bids they accompanied, but in no event shall non-forfeited bonds be held by the District beyond 60 days from the date that the District awards the Contract.

15. Power of Attorney

The Attorney-in-Fact (resident agent) who executes the Performance Bond and Payment Bond on behalf of the surety company must attach a copy of his Power of Attorney as evidence of his authority. A notary public shall acknowledge the power as of the date of the execution of the bond which it covers.

16. Delivery

The time allowed for the completion of the work is stated in Section 01 00 00 – Delivery Time and Liquidated Damages. Delays and extensions of time may be allowed in accordance with the provisions of the General Conditions.

17. Prevailing Wages

The prevailing rates may be obtained on the internet at:

https://www.dir.ca.gov/OPRL/dprewagedetermination.htm

The prevailing wage rates obtained from the internet link are hereby incorporated in this Contract and made a part hereof. The Contractor shall post at each job site a copy of the determination of the Director of Industrial Relations of the prevailing rate of per diem wages.

18. Bid Protests

Any bid protest must be submitted in writing to the District before 4:00 p.m. of the seventh day following the bid award. The party filing the protest must have actually submitted a bid for the work. A subcontractor of a bidder may not submit a bid protest.

23.1 The bid protest shall be in the form of a letter or memorandum, and it shall include the following: a complete statement of the basis or bases for the protest, including any supporting documents; a reference to the specific portion(s) of the Contract Documents which form(s) the basis for

the protest; and, the name, address, and telephone number of the person representing the protesting bidder.

23.2 The Bidder filing the protest shall concurrently transmit a copy of the protest document and any attached documentation to all other bidders with a direct financial interest who may be adversely affected by the outcome of the protest, including all other bidders who appear to have a reasonable prospect of receiving an award depending upon the outcome of the protest.

23.3 The District will issue a prompt decision on the protest. If the District determines that a protest is frivolous, the party originating the protest may be determined to be irresponsible and that party may be determined to be ineligible for future contract awards.

23.4 The procedure and time limits set forth in this section are mandatory and are the bidder's sole and exclusive remedy in the event of a bid protest. Failure to comply with these procedures shall constitute a waiver of any right to further pursue the bid protest, including filing a Government Code claim, lawsuit, or other legal proceeding.

23.5 For purposes of this section, a "bid protest" means any protest, objection, complaint, or challenge to, concerning, or against (a) a rejection of a bidder for any reason, (b) a contract award to the apparent low bidder, (c) another bidder's bid, or (d) the legality or enforceability of the Bid documents.

19. Ineligible Contractors and Subcontractors

The District shall not accept a bid from a bidder who is ineligible to bid or work on, or be awarded, a public works project pursuant to California Labor Code section 1777.1 or 1777.7. Bidders and the Contractor who is awarded the project contract shall not utilize, or allow work by, any subcontractor who is ineligible to bid or work on, or be awarded, a public works project pursuant to California Labor Code section 1777.1 or 1777.7. (See California Public Contract Code section 6109.) The California Division of Labor Standards Enforcement publishes a list of debarred contractors and subcontractors on the Internet at:

www.dir.ca.gov/DLSE/debar.html.

20. Audit of Bid Documents

The District shall have the right to audit all (including review, obtain and copy upon reasonable notice) documents that comprise or relate to a bidder's bid in connection with any request, claim of contention raised by any bidder, including, but not limited to, Public Contract Code Sections 4000, et seq., or 5000, et seq., or any bid protest. The term "records" and the term "documents" as used herein shall include, but not be limited to, original estimates, subcontracts, bids, proposals, purchase orders, books, documents, accounting records, papers, correspondence, project files and scheduling information, including the original Bid and all documents related thereto and to its preparation, the as-planned construction schedule, and any related documents.

21. Substitutions During Bidding

Manufacturers or suppliers of materials and equipment may offer an alternative product to the Contractor, except where alternatives or substitutes are specifically excluded, and request that alternatives to specified products be considered equal. Inclusion of such alternatives in the Bid is the responsibility of the Contractor. Inclusion should only be considered if the Contractor believes 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 substitution as provided under General Conditions Section 00 72 43, subsection 26 (Trade Names and Alternatives). Inclusion or offers of alternative products will not be reviewed or processed during the bidding period.

****END OF SECTION****

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Bid Schedule

TO: Olivehurst Public Utility District
1970 9th Ave
Olivehurst, CA 95961

The undersigned states and declares as follows:

That the Bidder has carefully examined the location of the proposed work; that the Bidder has examined the Contract Documents entitled: OPUD Plumas Lake WTP Manganese Treatment Expansion Project; that the Bidder has read the accompanying Instructions to Bidders; that the Bidder hereby proposes to begin work and complete the project in accordance with the schedule and deadlines in the Contract Documents; that the Bidder hereby proposes to furnish all labor, materials, tools, and equipment, and to perform all the work required, complete in place, in accordance with the Contract Documents; and that the Bidder will take in full payment for such work the prices set forth in the accompanying Bid Form.

The Bidder acknowledges that the following quantities are approximate only, being given as a basis for the comparison of Bids, that the District does not expressly or by implication agree that the actual amount of work will correspond therewith, and that the District reserves the right to increase or decrease the amount of any class or portion of the work, as may be deemed necessary or advisable by the Engineer.

The maximum allowed for Mobilization and Demobilization is 10 percent of the total project cost. Where lump sum prices are in the bidding schedule, they shall include all labor, materials, and equipment necessary to produce a complete and finished job. When no specific item is listed in the bidding schedule for work required, the cost of such work shall be included in the price bid for the item which most appropriately covers the work.

The following surety or sureties have agreed to furnish payment and performance bonds to the Bidder if it is awarded the contract:

Performance Bond: _____

Payment Bond: _____

The undersigned hereby acknowledges the receipt and review of Addenda Nos.:

_____

Bid Schedule

Contractor's License No.: _____

Expiration Date: _____

Type of License: _____

Name under which license is held: _____

Status of License: _____

Executed on [DATE] _____

The Bidder's authorized officer identified below hereby declares that the representations in this Bid are true and correct and of my own personal knowledge, and that these representations are made under penalty of perjury under the laws of the State of California.

Bidder

_____ (Company/Firm Name)

_____ (Company Type, e.g., corporation {include state of incorporation}, sole proprietor, partnership)

_____ (Authorized Signature)

_____ (Printed Name)

_____ (Title)

Address: _____

_____

_____

Phone No.: _____

E-mail: _____

Bid Schedule

Bid Form

Item No.	Est. Qty	Description	Cost Type	Unit Price	Extended Cost
1	1	Mobilization/demobilization	L.S.	N.A.	
2	1	Insurance and bonds	L.S.	N.A.	
3	1	Demolition of 6, 12& 14-inch piping including the surface wash pump	L.S.	N.A.	
4	1	10 & 12-inch filter piping, valves, MOVs, valves & meters	L.S.	N.A.	
5	1	16-inch MOV, vault & piping	L.S.	N.A.	
6	1	16-inch filter piping and fittings	L.S.	N.A.	
7	1	24-inch filter piping and fittings	L.S.	N.A.	
8	1	Concrete pad, filter footings, and asphalt repair	L.S.	N.A.	
9	1	Instrumentation	L.S.	N.A.	
10	1	Factory and field testing, and startup	L.S.	N.A.	
11	1	Control Panels	L.S.	N.A.	
12	1	Electrical – conduit, wire, and appurtenances	L.S.	N.A.	
13	1	Disinfection and pressure Testing	L.S.	N.A.	
14	1	Operational testing and commissioning	L.S.	N.A.	
15	1	Training	L.S.	N.A	

Bid Schedule

TOTAL BID PRICE = _____
(NUMBERS)

TOTAL BID PRICE = _____
(WORDS)

Note: In the event that the product of a unit price and an estimated quantity does not equal the extended amount stated, the unit price will govern, and the correct product of the unit price and the estimated quantity shall be deemed to be the bid amount.

L.S. = Lump Sum
U.C. = Unit Cost
N.A. = Not Applicable

****END OF SECTION****

All Bids shall be accompanied by a Bid Guarantee made payable to the District. The bid guarantee shall be made in the form of a Bid Bond or a cashier's check that must be enclosed in the same envelope with the Bid. The amount of the Bid Bond or cashier's check shall be not less than 10 percent of the total amount of the Bid.

If a bond is utilized, the Attorney-in-Fact (resident agent) who executes the Bid Bond on behalf of the surety company must attach a copy of his Power of Attorney as evidence of his authority. A notary shall acknowledge the power as of the date of execution of the surety bond which it covers. A bond will be accepted only if it is made out on either the Bid Bond form included in this Section or on a form which substantially conforms to it.

Bid Bond Form

KNOW ALL MEN BY THESE PRESENTS, THAT WE, THE UNDERSIGNED _____ , Contractor as Principal; and

_____, as Surety, are hereby held and bound unto Olivehurst Public Utility District, hereinafter called the District, in the sum of $ _____ , which sum is equal to at least ten percent of the total amount of the Bid, payment of which sum, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

The condition of the above obligation is such that whereas the Principal has submitted to the District a certain Bid, attached hereto and hereby made a part hereof, to enter into a Contract in writing, for the construction of the following public works project:

Plumas Lake WTP Manganese Treatment Expansion

NOW, THEREFORE,

a) If the Bid is rejected, or in the alternate,
b) If the Bid is accepted and the Principal shall sign and deliver a Contract, in the form of the Contract attached hereto and shall execute and deliver Performance and Payment Bonds in the forms attached hereto and shall deliver proof of insurance (all completed in accordance with the Contract Documents), and shall in all other respects perform the agreement created by the acceptance of the Bid;

Then, this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all default of the Principal hereunder shall be the amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of the time within which the District may accept such Bid, and said Surety does hereby waive notice of any such extension.

IN WITNESS THEREOF, the above-bounded parties have executed this instrument under their several seals this ____ day of _____2022, the name and corporate seal of each corporate party being hereto affixed and those presents duly signed by its undersigned representative, pursuant to authority of its governing body.

_____

(Contractor as Principal)

(Seal) By: _____

_____ [Name]

_____ [Title]

_____

(Surety)

(Seal) By: _____

_____ [Name]

_____ [Title]

****END OF SECTION****

Designation of Subcontractors

1. Subcontractor List

1.1 Each Bidder shall set forth in its Bid a list of Subcontractors and additional information required on the form in Paragraph 3 of this Section in accordance with the provisions of California Public Contract Code section 4100, et seq.: (a) The name and the location of the place of business of each subcontractor who will perform work or labor or render service to the Contractor in or about the construction of the work or improvement, and of each subcontractor who, under subcontract to the Contractor, is to specifically fabricate and install or provide a portion of the work or improvement according to the Contract Documents, in any amount in excess of ½ of 1 percent of the Contractor's total Bid; and (b) The portion of the work that will be done by each such subcontractor. Only one subcontractor shall be listed for each such portion of the work as defined in the Bid.

1.2 If the Bidder fails to specify a subcontractor for any portion of the work to be performed under the Contract, it shall be deemed to have agreed to perform such portion itself, and it shall not be permitted to subcontract that portion of the work except under the conditions hereinafter set forth.

1.3 Subletting or subcontracting of any portion of the work in excess of ½ of 1 percent of the Contractor's total bid as to which no subcontractor was designated in the original bid shall only be permitted in cases of public emergency or necessity, and then only after a finding reduced to writing as a public record of the District setting forth the facts constituting the emergency or necessity.

2. Subcontracting Limits

The Contractor shall perform with its own organization work amounting to not less than 50 percent of the original total contract price, except that any designated "Specialty Items" may be performed by subcontract and the amount of any such "Specialty Items" so performed may be deducted from the original total contract price before computing the amount of work required to be performed by the Contractor with its own organization. When items of work in the Bid schedule are preceded by the letter (S), such items shall be deemed designated "Specialty Items." Where an entire item is subcontracted, the value of work subcontracted will be based on the contract item bid price. When a portion of an item is subcontracted; the value of work subcontracted will be based on the estimated percentage of

the contract item bid price, determined from information submitted by the Contractor, subject to approval by the Engineer.

3. Subcontractor List

Subcontractor (Name & Location)	Description of Subcontractor Work	Portion of Work ($)

* Attach additional pages if necessary

****END OF SECTION****

Certification of Qualifications

To be eligible for an award of Contract, the successful Contractor and each of their subcontractor(s) listed in section 00 43 36 must submit to Owner, within five (5) business days after the receipt of bids, this signed Certification of the Qualifications (Certification). If the Contractor does not list a subcontractor, then the Contractor must submit to Owner within five (5) business days after the receipt of bids this signed Certification to self-perform the work.

Failure to provide the Certification within five (5) business days as required herein will cause the bid to be disqualified and rejected unless otherwise specified by the Owner.

A. Requirements

Contractor/subcontractor(s) shall meet the following requirements:

1. Possess current licenses and insurance as required in the specifications
2. Contractor's license shall not have been revoked at any time in the last ten (10) years
3. No surety has been used to complete a contract on the Contractor or subcontractor(s)' behalf, or paid for completion due to termination by the project owner within the last ten (10) years
4. Contractor or subcontractor(s) (including its owners, officers, or subcontractors) have not 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
5. Any other qualifications requirements included in contract documents

B. Experience

The Contractor/subcontractor shall list below three (3) successfully completed municipal projects of similar or greater size and complexity in the last five (5) years that demonstrate experience and qualifications to construct this or any portion of this project. One of the completed projects must have a value equal to or greater than 75% of the value of the Contractor/subcontractor bid amount.

Certification of Qualifications

The Contractors/subcontractor(s) shall provide the following information as an attachment to this qualification form for three projects:

Project name
Contract/subcontract cost
Construction time in months
Owner's representative
Owner's representative's telephone number
Date of substantial completion

Contractor/subcontractor declares the foregoing is true and correct.

_____[Company/firm name]

_____[Authorized signature]

_____[Name]

_____[Date]

**** END OF SECTION ****

PART 1 – GENERAL

1.01 Standard Contract (Agreement)

The following is Standard Contract (Agreement) that will be required to be executed between the District and the successful bidder:

STANDARD CONTRACT (AGREEMENT)

OLIVEHURST PUBLIC UTILITY DISTRICT

THIS AGREEMENT, made this_____ day of_____ ,_____, by and between **Olivehurst Public Utility District** (hereinafter called "OWNER"), (Name of Owner), (an Individual) and _____ doing business as (Name of Contractor) (an individual,) or (a partnership.) or (a corporation) hereinafter called "Contractor".

The aforementioned parties agree as follows:

I

The Contractor agrees to furnish for the total sum of (includes bid additives) _____ Dollars, all labor, materials, tools, and equipment and perform all the work required to construct and complete in a good workmanlike manner all improvements and work mentioned, described, delineated, shown and referred to in the plans and specifications, general conditions and special conditions Including any bid additives. Plans and specifications are included within this contract by reference as if set forth in full.

II

Contractor agrees to furnish all necessary tools, equipment, supplies, labor and materials required for the performance and completion of said work and improvement, all to the satisfaction of Owner, and subject to the requirements of the Engineer.

Owner hereby fixes the time for the commencement of said work and improvements under this Agreement to be within 20 calendar days, and such work and improvements shall be prosecuted with diligence from day to day thereafter for a completion date of _____. It is agreed and stipulated between Owner and the Contractor that damage will be sustained by the Owner from any delays in the performance of this contract, and it is currently contemplated by the parties and estimated by the parties, that it will

be impracticable and extremely difficult to fully ascertain and determine the actual damage which the Olivehurst Public Utility District will sustain by such delays. The parties agree that they shall be deemed to have jointly studied and attempted to estimate the damages suffered by the Olivehurst Public Utility District by such a delay under these circumstances and to agree and stipulate by this contract the sum of $_____. Dollars per day for each and every day's delay beyond the time prescribed to complete the work which has been agreed to by the parties as a fair estimate of the damage to be suffered by the Olivehurst Public Utility District from and as a direct result of such delay.

Contractor agrees to provide proof to Olivehurst Public Utility District of insurance naming Olivehurst Public Utility District and Engineer and employees as named insured in amounts of no less than coverage for $1,000,000 per person and $1,000,000 per occurrence and property damage

up to $1,000,000 and a standard broad form comprehensive and automobile liability policy form. Contractor further agrees to insure that every subcontractor employed by Contractor shall have insurance of equal character and limits of $1,000,000 per person and $1,000,000 per each occurrence and property damage up to $1,000,000 per each occurrence and to provide certificates to Olivehurst Public Utility District of such insurance prior to allowing such subcontractor to commence work upon the project.

Contractor further agrees to provide prior to commencement of work and to require every subcontractor to provide prior to the commencement of work, a certificate pursuant to Labor Code Section 3700 et.seq. which will state as follows:

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

Contractor agrees to comply with each and every provision of the Section 1770 through Section 1780 of the Labor Code relating to prevailing wages. The Contractor shall be required to forfeit to Owner the amount of Fifty Dollars ($50) for each calendar day, or portion thereof, for each workman paid less than the prevailing wages as determined for the work done herein. The difference between prevailing wage rate and the amounts paid to each workman for each calendar day or portion thereof for which each workman was paid less than the prevailing wage rate shall be paid to each workman by the Contractor.

Contractor further agrees to comply with each and every provision of Section 1777.5 of the labor Code of the State of California relating to apprenticeship

standards and the employment of apprentices upon project and to comply with each and every provision of Section 1810 through 1815 of the Labor Code relating to the employment of workmen in excess of eight (8) hours in violation of the Labor Code.

Is the contractor registered with the Department of Industrial Relations in accordance with California Labor Code section 1725.5 et seq.*? _____

*As of July 1, 2014, the District cannot enter into a Public Works Contract with a contractor that is not registered with the Department of Industrial Relations in accordance with California Labor Code section 1725.5 et seq..

III

Contractor agrees to pay to Olivehurst Public Utility District, or to make at its' own expense all repairs, replacements or payments necessitated by defects in materials or workmanship supplied under the terms of this contract which exist within one (1) year after the date of final acceptance of the work. This Agreement shall cover defects which shall be in existence during such one (1) year period. This Agreement shall apply to all defects which exist in the first year whether or not discovered within the first year. The Contractor shall be fully responsible for all direct and indirect damages and expenses to Olivehurst Public Utility District proximately causes by such defects in materials or workmanship, including defects and materials which bear a guarantee or warranty in writing or by law for a period longer than one (1) year, Contractor hereby stipulates and agrees that such guarantees shall be inure for the benefit of Olivehurst Public utility District for such longer periods. The effective date for the start of the guarantee or warranty for equipment qualifying as substantially complete, shall be upon the time Olivehurst Public utility District takes possession and operation of equipment or materials. In any case the warranty period described in this contract shall not limit the applicable statute of limitations for breach of a written contract and legal provisions for the District. Certain items in the project specifications may have specific warranty periods and provisions specified and the longer of the specified or contractual warranty period shall prevail.

The Contractor also agrees to hold the Olivehurst Public Utility District harmless from liability, both direct and indirect, of any kind arising from damage due to such defects. The Contractor shall make all repairs, replacements, or payments promptly upon receipt of written order for the same from the Olivehurst Public Utility District. If Contractor fails to make the repairs or replacements or payments within the time specified by Owner, then, subject to the sole discretion of Olivehurst Public utility District, District may do the work in any manner it sees fit, and the Contractor and his surety shall be liable for the cost thereof, including all costs of engineers or consultants

required to do said work and all cost related to the expedition of said work. Any additional requirements for the project relative to the collection for defective work after final acceptance are provided for hereafter in this Agreement.

Contractor shall provide a faithful performance bond in the amount of one hundred percent (100%) of the contract price, and a labor and materials bond in the amount of one hundred percent (100%) of the contract price on the attached forms. Said bonds shall be issued by an admitted surety insurer within the State of California and will be supported by the information and certifications required under California Code of Civil Procedure Section 995.660.

IV

The complete Contract consists of the following documents to wit: The notice to Contractors, the General Provisions, the Technical Provisions, the Proposal (Bid), the form of Contract (Agreement), the Labor and Material Bond, the Performance Bond, all specifications and drawings, and all modifications made or incorporated in any of those documents. All of the above documents are intended to be complementary, so that any work called for in one and not mentioned in the other is to be executed the same as if mentioned in all of said documents. Similarly, any contract provision appearing in one shall be binding as if it appeared in all said documents.

V

Contractor shall be financially responsible for claims (including claims of OSHA or other agency with jurisdiction over the job), liens, or stop notices, including preliminary notices that are filed on the job. In lieu of retention of payment by the DISTRICT, CONTRACTOR may elect to deposit certain securities equivalent to the amount to be withheld into a District approved escrow account.

CONTRACTOR shall be solely responsible for all construction under this contract, including the technique, sequences, procedures, and means, and for coordination of all work. CONTRACTOR shall supervise and direct the work to the best of CONTRACTOR'S ability and give all attention necessary for such proper supervision and direction. Contractor shall have full control over the site and shall be responsible to take all required steps, and implement all required procedures, required for the safety of employees and the public. Contractor shall be aware of and obey all OSHA regulations pursuant to the work he is engaged in for this project.

CONTRACTOR has the duty of providing for and overseeing all safety orders, precautions, and programs necessary to the reasonable safety of the work. In this connection, CONTRACTOR shall take reasonable precautions for the safety

of all work employees and all other persons that the work might affect, all work and materials incorporated in the project, and all property improvements on the construction site and adjacent to the site, and comply with all applicable laws, ordinances, rules, regulations, and orders. Contractors' cost of work includes the costs of all required safety measures including sheeting, shoring and trenching for the protection of life and limb.

Owner:

_____ _____

Signature Name

Attest:

_____

Contractor:

_____ _____

Signature Name

Attest:

_____

**** END OF SECTION ****

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Payment and Performance Bonds

The successful Bidder shall furnish Payment and Performance Bonds each in the full amount of the contract price. These bonds shall be furnished on the following forms or on substantially similar forms acceptable to the District.

1. Payment Bond

KNOW ALL MEN BY THESE PRESENTS,

THAT, WHEREAS, the Olivehurst Public Utility District, hereinafter designated as the "District," has awarded to _____ _____ hereinafter designated as the "Contractor" a Contract for the work described the **Plumas Lake WTP Manganese Treatment Expansion Project** as described in the contract documents,

WHEREAS, the Contractor is required by the Contract and by the provisions of Division Third, Part 4, Title 15, Chapter 7 of the Civil Code to furnish a bond in connection with the Contract, as hereinafter set forth.

WHEREAS, the Contract by this reference is made a part hereof;

NOW, THEREFORE, we, _____ the undersigned Contractor, as Principal, and _____ _____, a corporation organized and existing under the laws of the State of duly authorized and in good standing to transact business under the laws of the State of California, as an admitted Surety, are held and firmly bound unto the District in the sum of $ _____the sum being not less than one hundred percent (100%) of the total Contract amount payable by the District, under the terms of the Contract, for which payment well and truly to be made, we bind ourselves, our heirs, executors and administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, THAT, if the Contractor, its heirs, executors, administrators, successors, assigns or subcontractors shall fail to pay for any materials, provisions, provender or other supplies or teams, implements or machinery used in, upon, for or about the performance of the work contracted to be done, or shall fail to pay for any work or labor thereon of any kind, or shall fail to pay any of the persons named in Civil Code Section 3181, or shall fail to pay for amounts due under the Unemployment Insurance Code with respect to such work or labor as required by the provisions of Division Third, Part 4, Title 15, Chapter 7 of the Civil Code, or shall fail to pay for any amounts required to be deducted, withheld, and paid over to the

Employment Development Department from the wages of employees of the Contractor and subcontractors pursuant to Section 13020 of the Unemployment Insurance Code with respect to such work or labor, and provided that the claimant shall have complied with the provisions of that Code, the Surety or Sureties hereon will pay for the same in amount not exceeding the sum specified in the Contract, otherwise the above obligation shall be void. In case suit is brought upon this bond, the Surety will pay a reasonable attorney's fee to the prevailing party to be fixed by the court. This bond shall inure to the benefit of any and all persons, companies and corporations entitled to file claims under Section 3181 of the Civil Code, so as to give a right of action to them or to their assigns in any suit brought upon this bond. And the Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the work or to the specifications.

The address or addresses at which the principal and surety(ies) may be served with notices, papers and other documents under the California Bond and Undertaking Law (Code of Civil Procedure section 995.010 et seq.) is the following:

Payment and Performance Bonds

IN WITNESS WHEREOF, we have hereunto set our hands and seals this _____day of _____, 2022.

_____

(Contractor as Principal)

(Seal) By: _____

_____ [Name]

_____ [Title]

_____

(Surety)

(Seal) By: _____

_____ [Name]

_____ [Title]

2. Performance Bond

KNOW ALL MEN BY THESE PRESENTS,

THAT, WHEREAS, Olivehurst Public Utility District, hereinafter designated as the "District," entered into a Contract with _____ _____, hereinafter designated as the "Contractor" for the work described as the **Plumas Lake WTP Manganese Treatment Expansion Project** as described in the contract documents.

WHEREAS, the Contractor is required under terms of the Contract to furnish a bond for the faithful performance of the Contract;

WHEREAS, the Contract is by reference made a part hereof;

NOW, THEREFORE, we, the undersigned Contractor, as Principal, and _____ _____ (corporate surety), a corporation organized and existing under the laws of the State of_____, and duly authorized and in good standing to transact business under the laws of the State of California, as an admitted Surety, are held and firmly bound unto the District in the penal sum of $_____ , the sum being not less than one hundred percent (100%) of the total Contract amount, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, THAT, if the above bounden Contractor, its heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions, and agreements in the Contract and any alterations thereof made as therein provided, on its part, to be kept and performed at the time and in the manner therein specified, and in all respects according to their true intent and meaning, and shall indemnify and save harmless the District, its directors, officers, employees and agents, as therein stipulated, then this obligation shall become null and void; otherwise it shall be and remain in full force and effect.

As a condition precedent to the satisfactory completion of the said Contract, the above obligation in above-stated amount shall hold good for a period of one (l) year after the recording of the notice of completion, during which time if the Contractor, its heirs, executors, administrators, successors or assigns shall fail to make full, complete, and satisfactory repair and replacements or totally protect the District from loss or damage made evident during the period of one

(1) year from the date of recording of the notice of completion, and resulting from or caused by defective materials or faulty workmanship in the prosecution of the work done, the above obligation in the above-stated amount shall remain in full force and effect. However, anything in this paragraph to the contrary notwithstanding, the obligation of the Surety hereunder shall continue so long as any obligation of the Contractor remains.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or the specifications accompanying the same shall, in any way, affect its obligations on this bond and it does hereby waive notice of any such change, extension of time, alteration, or addition to the terms of the Contract or to the work or to the specifications. The Surety hereby waives the provisions of Sections 2819 and 2845 of the Civil Code of the State of California.

In the event suit is brought upon this bond by the District and judgment is recovered, the Surety shall pay all costs incurred by the District in such suit, including, but not limited to, administrative and consultant costs, and reasonable attorneys' fees to be fixed by the Court.

The address or addresses at which the principal and surety(ies) may be served with notices, papers and other documents under the California Bond and Undertaking Law (Code of Civil Procedure section 995.010 et seq.) is the following:

Payment and Performance Bonds

IN WITNESS WHEREOF, we have hereunto set our hands and seals this _____ day of _____, 2022.

_____

(Contractor as Principal)

(Seal) By: _____

_____ [Name]

_____ [Title]

_____

(Surety)

(Seal) By: _____

_____ [Name]

_____ [Title]

****END OF SECTION****

Abbreviations and Definitions

PART 1 – GENERAL

1.01 General

Whenever the following terms, titles, or abbreviations are used in these Specifications, or in any document or instrument where these Specifications govern, the intent and meaning shall be as herein defined. Working titles having a masculine gender, such as "workman" and "journeyman" and the pronoun "he", are utilized in the specifications for the sake of brevity and are intended to refer to persons of either gender.

1.02 Abbreviations

AA	Aluminum Association
AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
AC	Asphalt Concrete
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
APA	American Plywood Association
ASA	American Standards Association
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWG	American Wire Gage
AWS	American Welding Society
AWWA	American Water Works Association
BW	Backwash
BWS	Backwash Supply
Cal-OSHA	California Occupational Safety and Health Administration
Caltrans	California Department of Transportation
CL	Centerline
CSI	Construction Specifications Institute
CY	Cubic Yards
DDW	California State Water Resources Division of Drinking Water
DI	Drop Inlet
DIP	Ductile Iron Pipe
District	Olivehurst Public Utility District

Abbreviations and Definitions

EA	Each
EP	Edge of Pavement
FS	Federal Specifications
FTW	Filter to Waste
Inv	Invert
ISA	International Society of Arboriculture
LB	Pound
LF	Linear Feet
LS	Lump Sum
MTS	Manganese Treatment Supplier
NBFU	National Board of Fire Underwriters
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
OPUD	Olivehurst Public Utility District
OSHA	Occupational Safety and Health Act
PCC	Portland Cement Concrete
PVC	Polyvinyl Chloride Pipe
RW	Raw Water
PLC	Programmable Logic Controller
SD	Storm Drain
D	Drain
SF	Square Foot/Feet
S/O	Slip On
SS	Sanitary Sewer
STA	Station
Title 8	Title 8 (Construction Safety Orders) of the California Code of Regulations
Title 19	Title 19 (Public Safety) of the California Code of Regulations
Title 22	Title 22 (California Drinking Water – Related Laws)
Title 24	Title 24 (Building Standards) of the California Code of Regulations
TOC	Top of Curb
TOS	Top of Slab
Typ.	Typical
UL	Underwriters' Laboratories, Inc.
UBC	Uniform Building Code (latest edition adopted by District)

USBR	United States Bureau of Reclamation
UMC	Uniform Mechanical Code (latest edition adopted by District)
UPC	Uniform Plumbing Code (latest edition adopted by District)
WCLA	West Coast Lumbermen's Association
WIC	Woodwork Institute of California
WTP	Plumas Lake Water Treatment Plant

1.03 Definitions

Abandonment of Work: Defined as, but not limited to, becoming unresponsive to time restraints as defined in the project schedule or leaving the site unsecured for more than one day.

Acceptance: means the formal written acceptance by the District of the entire Contract which has been completed in all respects in accordance with the Specifications and any approved modifications.

Agreement: The written contract (Contract) signed by the District and the Contractor covering the Work and the furnishing of labor, materials, tools, and equipment in the construction of the Work.

As Approved: shall be understood to be followed by the words “by the Engineer," unless otherwise qualified.

As Shown, Etc.: Where "as shown", "as latest indicated", "as detailed", or words of similar import are used, the reference is to the Contract unless specifically stated otherwise. Where "as directed", "as permitted", "approved", or words of similar import are used, they shall mean the direction, permission, or approval of the District.

Bid: When submitted on the prescribed bid form, properly signed and guaranteed, the Bid constitutes the offer of the Bidder to complete the Work at the price shown on the Bidder’s bid form.

Bid Guarantee: Cash, cashier's check, certified check, or bidder's bond accompanying the bid submitted by the bidder, as a guarantee that the bidder will enter into a Contract with the District for the performance of work herein described.

Bidder: Any person, persons, firm, partnership, joint venture, corporation, or combination thereof, submitting a Bid for the Work, acting directly or through a duly authorized representative.

Bid Documents: The sum of the documents that comprise the Bid by a Bidder to perform the Work.

Abbreviations and Definitions

Board of Directors: The Olivehurst Public Utility District Directors. Also referred to as “Board”.

Bid Opening: The event conducted by the District during which the sealed Proposals submitted by Bidders to perform the Work are opened and publicly read.

Board Of Supervisors: The Board of Supervisors of the County of Yuba, a political subdivision of the State of California. Also referred to as “Board”.

Calendar Day: Every day shown on the calendar. When the Contract Time is stated in Calendar Days, every day will be charged toward the Contract Time.

Change Order: A Contract amendment approved by the District that includes, but is not limited to, alterations, deviations, additions to, or deletions from, the Contract which are required for the proper completion of the Work.

Contract: See Agreement, Section 00 52 13.

Contract Documents: Any or all of the documents listed in the Agreement.

Contractor: The person or persons, firm, partnership, joint venture, corporation, or combination thereof, private or municipal, who (that, has, have) entered into a Contract, as defined in these Specifications, with the District.

Contract Time: The time stated in the Contract for completion of the Work. The Contract Time may be a single allotment of time, a group of times specific to portions of the Work, or a combination of the two, or a specified completion date.

County: The County of Yuba, a political subdivision of the State of California.

District: The Olivehurst Public Utility District (OPUD), acting through its authorized representatives.

Date of the Contract: The date on which the Contract is signed by the District's authorized representative.

Days: Calendar days unless otherwise designated.

Engineer: Affinity Engineering acting in the capacity of consultant to the District. The Engineer shall issue directions to the Contractor only through the District. When the Specifications require that approval be obtained from the Engineer, such approval shall be requested from and be given by the District.

Estimated Quantities: The list of items of work and the estimated quantities associated with the Work. The Estimated Quantities provide the basis for the Bid.

Abbreviations and Definitions

General Manager: The General Manager of OPUD who has full authority over the project.

He: Includes "she" and "it" and his shall include "her" and "its."

Inspector: The person or persons authorized to act as agent(s) for the District in the inspection of the Work.

Legal Holidays: The following days are recognized as “legal holidays” by the District:

New Year’s Day	January First*
Martin Luther King, Jr. Day	Third Monday in January
President’s Day	Third Monday in February
Cesar Chavez Day	March Thirty-first*
Memorial Day	Last Monday in May
Independence Day	July Fourth
Labor Day	First Monday in September
Veteran’s Day	November Eleventh*
Thanksgiving Day	Fourth Thursday in November
Thanksgiving Friday	Friday after Thanksgiving
Christmas Eve	December Twenty-forth*
Christmas	December Twenty-fifth*
New Year’s Eve	December Thirty-first

* Note: If the holiday falls on a Saturday, then the holiday is recognized on the Friday before. If the holiday falls on a Sunday, then the holiday is recognized on the Monday after.

Notice To Contractors: The written notice whereby interested parties are informed of the date, location, and time of the Bid Opening of a proposed District Project and the terms and conditions of submitting Bids to perform the Work.

Notice To Proceed: The written authorization by the District to the Contractor specifying the date the Work may begin and any conditions regarding the beginning of the Work.

OPUD: means Olivehurst Public Utility District and is also referred to as the District.

Or Equal: The term "or equal" shall be understood to indicate that the "equal" product be the same or better than the product named in function, performance, reliability, quality, and general configuration. Determination of

equality in reference to the project design requirements will be made by the Engineer.

Plans or Drawings: The plans, drawings, profiles, cross sections, Working Drawings, and Supplemental Drawings, or reproductions thereof, approved by the District, which show the locations, character, dimensions, and details of the Work.

Project: Shall mean the Work.

Proposal: Shall mean “Bid”.

Record Drawings: Drawings prepared by the Contractor that document changes to, additions to, or deductions from the Plans, and which represent the Work as constructed.

Schedule of Values: A statement furnished by the Contractor to the District reflecting the portions of the Total Contract Price allotted for the various parts of the Work for each work activity contained on the project schedule. Unless otherwise indicated in the Specifications, the total of the Schedule of Values shall equal the full cost of the Work, including all labor, material, equipment, overhead, and profit. For lump sum contracts, the Schedule of Values is the basis for reviewing the Contractor's application for progress payments.

Special Provisions: The Special Provisions are specific clauses setting forth conditions or requirements peculiar to the Work and supplementary to the Standard Construction Specifications.

Standard Construction Specifications: The directions, provisions, and requirements contained herein. When the term “Standard Specifications" or "Specifications" is used, it means the provisions as set forth herein, together with any amendments or revisions that may be set forth in the Special Provisions. The Standard Specifications are comprised of “General

Provisions” and “Technical Provisions”. Where standard specifications, such as those of "ASTM", "AASHO", etc. have been referred to, the applicable portions of such standard specifications shall become a part of these Contract Documents.

Standard Drawings: The Standard Drawings of the District, which are incorporated into the Standard Construction Specifications, and made a part of the Plans by reference to one or more specific Standard Drawings.

State: The State of California.

State Specifications: The version of the State of California Standard Specifications for Construction of Local Streets and Roads, issued by the California Department of Transportation, in effect at the time of Notice to Contractors.

State Plans: The version of the State of California Standard Plans for Construction of Local Streets and Roads, issued by the California Department of Transportation, in effect at the time of Notice to Contractors.

Subcontractor: A properly licensed party under contract to and responsible to the Contractor for performing a specified part of the Work; or a properly licensed party under contract and responsible to a Subcontractor of the Contractor.

Supplemental Drawing: Supplemental Drawings define the Plans or Specifications in greater detail by providing additional information that may have not been specifically or clearly shown or called out on the Plans or in the Specifications.

Technical Provisions: The provisions of the Standard Construction Specifications that describe the technical aspects of the Work.

Time Limits: all time limits stated in the Contract Documents are of the essence of the Contract.

Total Contract Price: The total price for the Work as bid by the Contractor, including any additions or subtractions made via Contract Change Orders.

Work: All actions which the Contractor is contractually required to do as specified, indicated, shown, contemplated, or implied in the Contract to construct the Work, including all alterations, amendments, or extensions made by Contract Change Order or other written orders or directives of the District. Unless specified otherwise in the Contract, the Work includes furnishing all materials, supplies, equipment, tools, labor, transportation, supervision, and all incidentals necessary to complete the Work.

Working Day: Any day except: (a) Saturdays, Sundays, and legal holidays; (b) days on which the Contractor is specifically required by the Special Provisions or by law to suspend construction operations; or (c) days on which the Contractor is prevented from proceeding with the current controlling operation or operations of the Work for at least five (5) hours per day due to inclement weather, or conditions resulting immediately therefrom.

Working Drawing: Working Drawings detail a particular item of work and the manner in which it is to be accomplished or performed. Working Drawings are prepared by the Contractor as a submittal or a portion of a submittal and may be specifically requested by the District or required in the Contract or a Field Instruction or other written directive.

Whenever in the Contract Documents or upon the Drawings the words DIRECTED, REQUIRED, PERMITTED, ORDERED, DESIGNATED,

PRESCRIBED, or words of like import are used, it shall be understood that the direction, requirement, permission, order, designation or prescription of the Engineer is intended, and similarly the words APPROVED, ACCEPTABLE, SATISFACTORY, or words of like import, shall mean approved or acceptable to, or satisfactory to the Engineer, unless otherwise expressly stated.

****END OF SECTION****

Legal Regulations and Responsibility to the Public

SECTION 6

Laws to be Observed

The Contractor shall keep himself fully informed of all existing State and National laws and all municipal ordinances and regulations which in any manner affect those engaged or employed in the work, or the materials used in the work, or which in any way affect the conduct of the work, and of all such orders and decrees of bodies or tribunals having any jurisdiction or authority over the same.

Permits and Licenses

The Contractor shall procure all permits and licenses, pay all charges and fees, and give all notices necessary and incidental to the due and lawful prosecution of the work.

Existing Facilities

The Contractor shall exercise due care to avoid injury or damage to existing improvements or facilities, utilities, adjacent property, monuments, and roadside trees and shrubbery that are not to be removed or relocated. Existing mail boxes, signs, shrubbery, lawn, trees, markers, or any other facility or improvement which must be removed shall be replaced with the undamaged original or a new facility equal to the original at the Contractor's expense if damaged by reason of the Contractor's operations, to the satisfaction of the property owner.

Utilities

The plans and specifications identify certain existing utilities as known to the Engineer. It shall be the Contractor's responsibility to exactly locate those facilities and to protect those facilities from damage as a result of his operations. The attention of the Contractor is called to the fact that there may be other unlocated utilities within the project area. Prior to making any such excavation, Contractor shall attempt to identify the location of any such utilities. It shall be the duty of the Contractor to protect any such utilities from damage, provided however, the Contractor shall be compensated for any costs of locating any such additional utilities and shall be further compensated if damage shall occur to any utilities not located upon the plans and

Specifications which damages are not caused in any part by the failure of the Contractor to exercise reasonable care and discretion in removing or relocating utility facilities not indicated in the plans and specifications. The Contractor shall not be assessed any liquidated damages for any delays in completion of the project necessarily and reasonably incurred when such delay was proximately caused by the failure of the public agency or the owner of the utility to provide for the removal or relocation of such utility facilities. The Contractor's specific attention is called to the fact that existing service laterals and appurtenances to those service laterals exist within the project area and such laterals are not shown on the plans and specifications but can be reasonably inferred from the presence of other visible facilities such as building, meters, junction boxes, adjacent to the site of construction. No additional compensation shall be paid for any damages or delay caused to such service lateral facilities and it is the Contractor's sole and exclusive obligation to provide for the protection, replacement, and repair of any such facilities. If the Contractor, while performing the contract, discovers any utility facilities not identified by the public agency, other than the existing service laterals or appurtenances, he shall immediately notify the Engineer.

New Facilities

Until the formal acceptance of the complete work by Olivehurst Public Utility District, the Contractor shall have the charge of and care thereof, and shall bear the risk of injury or damage to any part of the work by the action of the elements or others. The contractor, at Contractor's cost, shall rebuild, repair, restore and make good all such damages to any portion of the work occasioned by any of such causes before its acceptance.

Clear-Up

Prior to final acceptance and payment, the Contractor shall clean all roads or streets, borrow pits and all areas occupied by the forces during the construction of the improvement facilities, remove all refuse, excess material, temporary structures and equipment; and leave the entire project in a neat and presentable condition.

INSURANCE AND LIABILITY

GENERAL

The Contractor shall not commence any work until he obtains at his own expense, all required insurance from insurance companies acceptable to the Owner. Such insurance must have the approval of the Owner as to limit, form, and amount. The Contractor shall not permit any subcontractor to commence work on this project until the same insurance requirements, as applicable, have been complied with by such subcontractor. Nothing contained in these insurance requirements is to be construed as limiting the extent of the Contractor's responsibility for payment of damages resulting from his operations under this contract. As evidence of specified insurance coverage, the Owner may, in lieu of actual policies, accept certificates issued by the insurance carrier showing such policies in force for the specified period. Each policy or certificate shall bear an endorsement or statement waiving right of cancellation or reduction in coverage without 30 days notice in writing to be delivered by registered mail to the Owner. In case of the breach of any provisions of this article, the Owner, at his option, may take out and maintain at the expense of the Contractor, such insurance as the Owner may deem proper and may deduct the cost of such insurance from any moneys which may be due or become due the Contractor under this contract.

COMPREHENSIVE GENERAL LIABILITY INSURANCE

Before commencement of the work, the Contractor shall submit written evidence that he and all his subcontractors have obtained for the period of the contract, full comprehensive general liability insurance coverage. This coverage shall provide for both bodily injury and property damage. The bodily injury portion shall include coverage for injury, sickness, disease, death, arising directly or indirectly out of, or in connection with, the performance of the work under this contract, and shall provide for a limit of not less than $1,000,000 for all damages arising out of bodily injury, sickness, disease, or death of one person, and a total limit of $1,000,000 for damages arising out of bodily injury, sickness, disease, or death of two or more persons in any one occurrence. The property damage portion shall include "broad form" coverage for a limit of not less than $1,000,000 for all damages arising out of injury to or destruction of property of others arising directly or indirectly out of or in connection with the

performance of work under this contract and in any one occurrence, including explosion, collapse, and underground exposure. Included in such insurance shall be contractual coverage sufficiently broad to insure that provision titled "Indemnity" hereinafter. The comprehensive general liability insurance shall include as additional named insured: the Owner, the Engineer and his consultants, and each of their officers, agents and employees.

WORKMEN'S COMPENSATION INSURANCE

Before the Contract between the Owner and the Contractor is entered into, the Contractor shall submit written evidence that he and all subcontractor's have obtained, for the period of the Contract, full Workmen's Compensation Insurance coverage for all persons whom they employ or may employ in carrying out the work under this contract. This insurance shall be in strict accordance with the requirements of the most current and applicable State Workmen's Compensation Insurance laws. The Contractor will be required to execute a certificate prior to performing the work of the Contract providing as follows: "I am aware of the provisions of Section 3700 of the Labor Code which requires every employer to be insured against liability for Workmen's Compensation or to undertake self insurance in accordance with the provisions of the Code and I will comply with such provisions before commencing the performance of the work of this Contract".

BUILDER'S RISK "ALL RISK" INSURANCE

Unless otherwise modified in the "Supplementary Conditions", the Contractor shall secure and maintain during the life of this Contract, Builder's Risk "All Risk" Insurance coverage for one hundred percent (100%) of the contract amount. Such insurance shall not exclude coverage for earthquake, landslide, flood, collapse, or loss due to the results of faulty workmanship, and shall provide for losses to be paid to the Contractor and the Owner as their interests appear. Such insurance may have a deductible clause not to exceed $250, except that the deductible on earthquake may be in accordance with the underwriter's requirements, provided that it does not exceed five percent (5%) of the contract amount.

INSURANCE COVERAGE FOR SPECIAL CONDITIONS

When the construction is to be accomplished within a public or private right-of-way requiring special insurance coverage, the Contractor shall conform to the particular requirements and provide the required insurance. The Contractor shall include in his liability policy all endorsements that the said authority may require for the protection of its officers, agents, employees and interests.

INDEMNIFY

To the fullest extent permitted by law, the Contractor shall hold harmless, indemnify and defend the Owner, the Engineer and his consultants, and each of their officers and employees and agents, from any and all liability, claims, losses, damages, or costs, including but not limited to attorney's fees, arising or alleged to arise from or during the performance of the work described herein caused by the act or omission of contract, any subcontractor, directly or indirectly employed by them, or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by the party indemnified hereunder, or by the negligence or omission of the party indemnified herein.

NO PERSONAL LIABILITY OF PUBLIC OFFICIALS

In carrying out all the provisions hereof in exercising any authority granted by the contract, there will be no personal liability upon any public official.

Substitution of Security

In lieu of the 5% retention in payment as set forth hereinafter, the contractor may, upon request to the District, substitute in lieu thereof securities in form and content acceptable to the District, pursuant to the provisions of Section 4590 of the Government Code of the State of California. All costs and expense of any escrow or trustee shall be the responsibility of the contractor.

RESOLUTION OF CLAIMS

1. Public Contract Code Section 9204 specifies provisions on resolving contract claims of any size, and Public Contract Code Section 201014, et seq., specifies required provisions on resolving contract claims less than $375,000. Those statutes constitute a part of this Contract. In the event any other Contract provision violates such statutes, the applicable statute controls.

2. Public Contract Code Section 9204 provides:

   a. For the purposes of this section, “Claim” means a separate demand by Contractor for (1) a time extension, (2) payment or money or damages arising from Work done by or on behalf of Contractor arising under the Contract Documents and payment of which is not otherwise expressly provided for or the Claimant is not otherwise entitled to, or (3) an amount the payment of which is disputed by Owner.

   b. Procedure:

      1) Upon receipt of a Claim the Owner shall conduct a reasonable review of the Claim and within 45 days, or if Owner’s governing body must approve Owner’s response to the Claim and the governing body has not met within the 45 days then within three (3) days of the governing body’s meeting, shall provide Contractor with a written statement identifying what portion of the claim is disputed and what portion is undisputed. Should Owner take no action on the Claim within 45 days of submission, it shall be deemed denied.

      2) If the Contractor disputes Owner’s response to its Claim, including a failure to respond, it may submit via registered mail or certified mail, return receipt requested, a written demand for an informal conference to meet and confer for settlement of the issues in dispute. Owner shall schedule such a meet and confer conference within 30 days for settlement of the dispute. Within ten (10) days of the meet and confer conference Owner shall provide Contractor with a written statement identifying the portion of the Claim that remains in dispute and the portion that is undisputed. If the Contractor disputes Owner’s statement it shall inform Owner and they shall mutually agree to a mediator within 10 business days of the written statement.

      3) Owner shall pay the undisputed portions of the Claim within 60 days of the issuance of a written statement identifying an undisputed portion.

      4) Any disputed portion of the Claim, as identified by the Contractor in writing, shall be submitted to nonbinding

mediation, with the Owner and the claimant sharing the associated costs equally. The Owner and claimant shall mutually agree to a mediator within 10 business days after the disputed portion of the claim has been identified in writing. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator. If mediation is unsuccessful, the parts of the Claim remaining in dispute shall be subject to applicable procedures outside this section.

5) For claims under $375,000, unless the parties agree otherwise in writing, mediation pursuant to these provisions shall excuse the mediation obligation under Public Contracting Code section 20104.4(a).

6) The parties may mutually agree, in writing, to waive the mediation requirements of this subsection and proceed to the commencement of a civil action or binding arbitration, as applicable.

7) Failure by the Owner to respond to a Claim from a Contractor within the time periods described in this subdivision or to otherwise meet the time requirements of this section shall result in the claim being deemed 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.

9) If a Subcontractor or a lower tier subcontractor lacks legal standing to assert a claim against Owner because privity of contract does not exist, the Contractor may present to the Owner a claim on behalf of a Subcontractor or lower tier subcontractor. A Subcontractor may request in writing,

either on his or her own behalf or on behalf of a lower tier subcontractor, that the Contractor present a claim for work which was performed by the Subcontractor or by a lower tier subcontractor on behalf of the Subcontractor. The Subcontractor requesting that the Claim be presented to the public entity shall furnish reasonable documentation to support the claim. Within 45 days of receipt of this written request, the Contractor shall notify the Subcontractor in writing as to whether the Contractor presented the claim to the Owner and, if the original Contractor did not present the claim, provide the Subcontractor with a statement of the reasons for not having done so.

10) Nothing in this section shall impose liability upon an Owner that makes loans or grants available through a competitive application process, for the failure of an awardee to meet its contractual obligations.

11) This section shall remain in effect only until January 1, 2020, and as of that date is repealed, unless a later enacted statute, that is enacted before January 1, 2020, deletes or extends that date.

3. To the extent applicable, Public Contract Code Section 20104, et seq., provide.

   a. For the purposes of this section, "Claim" means a separate demand by Contractor of $375,000 or less for (1) a time extension, (2) payment or money or damages arising from Work done by or on behalf of Contractor arising under the Contract Documents and payment of which is not otherwise expressly provided for or the Claimant is not otherwise entitled to, or (3) an amount the payment of which is disputed by Owner. Separate Contractor Claims that together total more than $375,000 do not qualify as a "separate demand of $375,000 or less," as referenced above, and are not subject to this section.

   b. Caution. This section does not apply to tort claims, and nothing in this section is intended nor shall be construed to change the time periods for filing tort claims or actions specified by Chapter 1 and Chapter 2 of Part 3 of Division 3.6 of Title 1 of the Government Code.

c. Procedure:

1) The Claim must be in writing, submitted in compliance with all requirements set forth in this document, without limitation, the time prescribed by and including the documents necessary to substantiate the Claim. Nothing in this section is intended to extend the time limit or supersede notice requirements for the filing of claims as set forth elsewhere in the Contract Documents.

2) For Claims of fifty thousand dollars ($50,000) or less, Owner shall respond in writing within forty-five (45) days of receipt of the Claim, or Owner may request in writing within thirty (30) days of receipt of the Claim, any additional documentation supporting the Claim or relating to any defenses or claims Owner may have against Claimant. If additional information is thereafter required, it shall be requested and provided in accordance with this section upon mutual agreement of Owner and Claimant. Owner's written response to the Claim, as further documented, shall be submitted to Claimant within fifteen (15) days after receipt of further documentation or within a period of time no greater than taken by Claimant in producing the additional information, whichever is greater.

3) For Claims over Fifty Thousand Dollars ($50,000) and less than or equal to $375,000: Owner shall respond in writing within sixty (60) days of receipt of the Claim, or Owner may request in writing within thirty (30) days of receipt of the Claim, any additional documentation supporting the Claim or relating to any defenses or claims Owner may have against Claimant. If additional information is thereafter required, it shall be requested and provided in accordance with this section, upon mutual agreement of Owner and Claimant; Owner's written response to the Claim, as further documented, shall be submitted to Claimant within thirty (30) days after receipt of further documentation or within a period of time no greater than taken by Claimant in producing the additional information, whichever is greater.

4) Meet and Confer: If Claimant disputes Owner's written response, or Owner fails to respond within the time prescribed above, Claimant shall notify Owner, in writing,

either within fifteen (15) days of receipt of Owner's response or within fifteen (15) days of Owner's failure to timely respond and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon demand Owner will schedule a meet and confer conference within thirty (30) days for settlement of the dispute.

5) Following the meet and confer conference, if the Claim or any portion remains in dispute, Claimant may file a claim as provided in Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled from the time Claimant submits its written claim as set forth herein, until the time that Claim is denied as a result of the meet and confer process, including any period of time utilized by the meet and confer process.

**** END OF SECTION ****

General Conditions

Table of Contents

1. Intent of Contract Documents; Means and Methods

1.1 The intent of the Contract Documents is to prescribe the details for the construction and completion of the work which the Contractor undertakes to perform in accordance with the terms of the Agreement. Where the Specifications and Plans describe portions of the work in general terms, but not in complete detail, it is understood that only the best general practice is to prevail and that only materials and workmanship of the first quality are to be used. Unless otherwise specified, the Contractor shall furnish all labor, materials, tools, equipment and incidentals and do all the work involved in performing the Agreement in a satisfactory and workmanlike manner.

1.2 The technical specifications are presented in sections for convenience. However, this presentation does not necessarily delineate trades or limits of responsibility. All sections of the Specifications and Plans are interdependent and applicable to the project as a whole.

1.3 The Contract Documents are complementary, and what is called for in any one shall be as binding as if called for in all.

1.4 It is expressly stipulated that the drawings, specifications and other Contract Documents set forth the requirements as to the nature of the completed work and do not purport to control the method of performing work except in those instances where the nature of the completed work is dependent on the method of performance.

1.5 Except as provided elsewhere in the Contract Documents, neither the District nor the Engineer will be responsible for or have control or charge of construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the work. Except as provided elsewhere in the Contract Documents, neither the District nor the Engineer will be responsible for or have control or charge over the acts or omissions of the Contractor, or any of their subcontractors, agents or employees, or any other persons performing any of the work. Any general control of the work exercised by the District or its authorized representatives shall not make the Contractor an agent of the District, and the liability of the Contractor for all damages to persons and/or to public or private property arising from the Contractor's execution of the work shall not be lessened because of such general control.

2. Contractor's Understanding

It is understood and agreed that the Contractor has, by careful examination, satisfied itself as to the nature and location of the work, the conformation of the ground, the character, quality and quantity of the materials to be encountered, the character of equipment and facilities needed preliminary to and during the prosecution of the work, the general and local conditions, and all other matters which can in any way affect the work under this Agreement. No verbal agreement or conversation with any officer, agent or employee of the District, either before or after the execution of this Agreement, shall affect or modify any of the terms or obligations herein contained.

3. Changes in the Work

3.1 General:

The District reserves the right to make such alterations, deviations, additions to, deletions or omissions from the plans and specifications, including the right to increase or decrease the quantity of any item or portion of the work, as may be deemed by the Engineer to be necessary or advisable and to require such extra work as may be determined by the Engineer to be required for the proper completion or construction of the whole work contemplated. Such changes, no matter how many, shall be within the contemplation of this Agreement and shall not be the basis for a compensable delay or a claim for lost profits.

3.2 Minor Changes:

The Engineer shall have the authority to order minor changes in the work not involving any increase or decrease in the Contractor's cost of, or time required for, performance of the Agreement. Such minor changes shall be effected by written order of the Engineer, and the Contractor shall carry out such written orders promptly. If the Contractor disagrees with the Engineer's determination that the minor change does not involve any increase or decrease in the Contractor's cost of, or time required for, performance of the Agreement, then the Contractor may file and pursue a claim pursuant to subsection 4. The written claim must be submitted to the Engineer within 15 days after the date of the Engineer's written order. If the Contractor believes that any such work is beyond the scope of the contract documents, the Contractor shall provide a written "Daily Extra Work Report" documenting the alleged extra work, which will be submitted to and verified by the Engineer or the District's representative at the end of the day the work was performed.

3.3 Change Procedures

The Engineer may issue to the Contractor a Request for Proposal which includes a detailed description of a proposed change with supplementary or revised drawings and specifications. The Contractor will prepare and submit an estimate within 15 working days. The estimate shall contain a detailed breakdown of the labor, equipment, material, subcontract, equipment rental, contingencies, overhead, and profit costs associated with the requested change. The estimate shall also include any requested adjustments to Contract Times including the window of time the District has to render a decision on the matter.

3.4 Change Orders:

If any change in the work ordered by the Engineer causes an increase or decrease in the Contractor's cost of, or time required for, performance of the Agreement, an adjustment and modification of the Agreement will be made in the form of a Change Order which will set forth (a) the changes, additions and/or deductions in the work to be done, (b) the increase or decrease in compensation due the Contractor, if any, or the method by which the increase or decrease, if any, will be calculated, and (c) the adjustment in the time of completion of the work, if applicable. A Change Order may be issued to the Contractor at any time.

3.5 Change Order-Cost Adjustment:

The compensation to be paid for any work addressed in a Change Order shall be determined in one or more of the following ways as shown in the Change Order by:

Unit prices;
An agreed-upon lump sum; or
The cost plus basis determined pursuant to subsection 3.9.

3.6 Cost Records:

Contractor shall keep full and complete records of the cost of any work addressed in a Change Order in the form and manner prescribed by the Engineer and shall permit the Engineer to have access to such records as may be necessary to assist in the determination of the compensation payable for such work.

3.7 Cost Reduction for Deductive Change Order:

With respect to a Change Order involving the deletion or reduction of work, the Engineer shall determine the appropriate reduction in the Agreement price based on the lump sum and/or per unit prices in the

bid schedule for the items of work deleted or reduced by the Change Order. The Contractor shall not be entitled to claim damages for anticipated profits on any portion of the work that may be deleted.

3.8 Proposed Change Order:

Upon receipt of a Change Order signed by the Engineer, the Contractor shall forthwith proceed with the ordered work, unless otherwise directed by the Engineer. If the Contractor agrees with the terms and conditions of the Change Order, then they shall sign the Change Order and return the original to the Engineer.

3.9 Contractor Protest Against Change Order:

Should the Contractor disagree with any terms or conditions set forth in a proposed Change Order, it shall submit a written protest to the Engineer within 15 days after the receipt of the proposed Change Order. The protest shall state the points of disagreement, addressing, if applicable, the quantities and cost involved and the adjustment of time for completion.

3.8.1 If a written protest is not timely submitted by the Contractor, then the proposed Change Order, including all cost and time adjustment provisions, if any, that was submitted to the Contractor shall be deemed final and acceptable to the Contractor even if not signed by the Contractor. Any payment under an unprotested Change Order's cost adjustment provisions shall constitute full compensation for all work included in or required by the Change Order.

3.8.2 If the Contractor timely protests a proposed Change Order, it shall nevertheless proceed with the ordered work pending resolution of the protest.

3.8.3 If the Contractor timely protests a proposed Change Order, the Engineer shall render in writing its determination of the protest. If the Contractor disputes the determination, then the Contractor may file and pursue a claim pursuant to subsection 4. The written claim must be submitted to the Engineer within 15 days after the date of the Engineer's written determination on the protest. If the Contractor does not timely file a claim, then the proposed Change Order (as may have been revised by the Engineer's determination on the protest), including all cost and time adjustment provisions, if any, shall be deemed final and acceptable to the Contractor even if not signed by the Contractor. Any payment under such

a Change Order's cost adjustment provisions shall constitute full compensation for all work included in or required by the Change Order.

3.8.4 If the Contractor refuses to accept a Change Order, the District may issue it unilaterally. The Contractor shall comply with the requirements of the Change Order. The District shall provide for an equitable adjustment to the Agreement, and compensate the Contractor accordingly. If the Contractor does not agree that the adjustment is equitable, it may submit a claim in accordance with subsection 4 below.

3.10 Cost Plus Basis of Payment on Change Orders:

The following shall constitute the cost plus basis of payment:

3.9.1 Direct Labor Cost - Charges for all of the labor furnished and used by the Contractor shall be made for manual classifications up to and including general foreman. It will not include charges for assistant superintendents, superintendents, office personnel, timekeepers and maintenance mechanics. The time charged to work shall be subject to the daily approval of the Engineer and evidence of such approval shown on approved Daily Extra Work Reports in a format acceptable to the Engineer shall be submitted with the billing. Labor rates used to calculate the costs shall be those basic wages including current employer contributions for fringe benefits and federal and state surcharges and including applicable subsistence and travel allowances, all as actually paid to workers under collective bargaining agreements or as a regular practice of the employer. No time or charges will be allowed except when the workers are actually engaged in the proper, efficient and diligent performance or completion of the work as authorized. Overtime shall not be worked without prior approval of the Engineer.

3.9.2 Equipment Cost - Charges for the rental and operation of the equipment furnished and used by the Contractor shall be made for all prime construction and automotive equipment. It shall not include charges for listed equipment or major tools with a new cost of $500 or less. Equipment time charges shall be itemized on a Daily Extra Work Report in a format acceptable to the Engineer, subject to the daily approval of the Engineer and evidence of such daily approval shall be

submitted with the billing. The equipment rental and operation rates used shall be those agreed upon by the Engineer and the Contractor prior to commencement of the work and shall include an approved allowance for depreciation. The cost for each type of approved equipment (active or standby) shall be no greater than the amount allowed in the latest edition of the Caltrans Standard Equipment Rates. Time and charges shall be allowed only when equipment is actually being used for the proper and efficient performance or completion of the work as authorized.

3.9.3 Material Costs - Charges for the cost of materials furnished by the Contractor shall be made, provided such furnishing was specifically authorized in the change order and the actual use verified by the Engineer. Charges shall be net cost to the Contractor delivered at the job, including all applicable sales taxes; and a vendor's invoice must accompany the billing along with verification of use of such materials by the Engineer.

3.9.4 Tools, Supplies, Supervision, Overhead and Profit - A charge for major tools, supplies, overhead, supervision and profit will be allowed in the amount of 15% of the total direct labor costs, equipment costs, and material costs, as defined above at subsections 3.9.1 to 3.9.3.

3.9.5 Work by Subcontractor - When all or any part of work is performed by any of the Contractor's subcontractors, the markup percentage established in subsection 3.9.4 shall be applied to the subcontractor's actual cost of such work (determined as above at subsections 3.9.1, 3.9.2 and 3.9.3), to which a markup of 5% on the subcontracted portion of the extra work may be added by the Contractor.

3.11 Lump Sum Change Orders:

Lump sum change orders shall include all work and costs associated with the change work item(s) and shall be agreed to and signed by both the Contractor and the District prior to commencing the work.

3.11.1. Tools, Supplies, Supervision, Overhead and Profit - A charge for major tools, supplies, overhead, supervision and profit will be allowed in an amount of 15% of the total direct labor, equipment, and material costs.

3.11.2. Work by Subcontractor - When all or any part of work is performed by any of the Contractor's subcontractors, the markup percentage established in Section 3.10.1 shall be applied to the subcontractor's actual cost of such work, to which a markup of no greater than 5% on the subcontracted portion of the extra work may be added by the Contractor.

3.12 Effect of Change on Bond Sureties:

The consent of the Contractor's bond sureties shall not be required as to any change or extra work ordered by the District, and the liability of the Contractor's bonds and sureties shall be increased or decreased accordingly without notice to the sureties.

3.13 Right to Use Other Contractors:

The District reserves the right to contract with any person or firm other than the Contractor for any or all extra work.

3.14 Increased Quantity of Agreement Items:

If the total pay quantity of any item of work required under the Agreement to be paid at a unit price exceeds the item as bid by more than 25 percent, then in the absence of an executed contract change order specifying the compensation to be paid, the work in excess of 125 percent of such estimate may, at the District's discretion, be paid for by a cost plus basis of payment as described in subsection 3.9, instead of at the unit price.

3.15 Differing Site Conditions:

Any extra work related to differing site conditions pursuant to Public Agreement Code Section 7104 shall be addressed in accordance with this subsection.

3.14.1 In the event that site conditions are materially different than shown on the plans or observable from public right-of-ways during the bidding period, the Contractor shall promptly notify the Engineer in writing. The Engineer shall investigate the conditions, and if he finds that such conditions do materially differ and cause an increase or decrease in the Contractor’s cost of, or the time required for, performance of any part of the Work under this contract, the Engineer will recommend to the District that an equitable adjustment be made by modifying the Contract by Change Order to account for differing site conditions.

3.14.2 No claim of the Contractor under this clause or any other shall be allowed unless the Contractor has given notice required under A., above.

3.14.3 No claim of the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment under this Contract.

4. Contractor Claims for Extra Costs and Time Extensions

4.1 General:

The parties intend by this section that differences between the parties, arising under and by virtue of the Agreement, be brought to the attention of the Engineer at the earliest possible time in order that such matters may be settled, if possible, or other appropriate action promptly taken.

4.2 Waiver:

Contractor agrees that it shall not be entitled to any additional time to complete work or the payment of any additional compensation for any claim, cause, act, failure to act, or happening of any event, thing or occurrence, unless it shall have given the Engineer timely and due written notice of the claim pursuant to this subsection 4, provided, however, that compliance with this section shall not be a prerequisite as to matters within the scope of the protest provisions in subsection 3.8. The Contractor shall not be entitled to any additional compensation for claimed extra work until and unless either a Change Order has been issued pursuant to subsection 3 or a claim has been timely filed and approved pursuant to this subsection 4. If the Contractor fails to file a written claim within the claim deadline of subsection 4.5, then the Contractor agrees that it shall have waived any right or remedy to thereafter pursue the claim against the District in any administrative, arbitration or litigation proceeding.

4.3 Definition:

A claim for purposes of this subsection 4 means a separate demand by the Contractor for (a) a time extension, (b) payment of money or damages arising from work done by, or on behalf of, the Contractor and payment of which is not otherwise expressly provided for or the claimant is not otherwise entitled to, or (c) an amount the payment of which is disputed by the District.

4.4 Informal Claims Resolution:

The parties agree to strive to resolve all disputes amicably and in an informal manner. Any dispute resolved informally shall be documented by the Engineer, and if the dispute resolution involves a change in the contract work, increase or decrease in the compensation due the contractor, and/or adjustment in the time of completion of the work, then the informal dispute resolution shall be confirmed by a Change Order pursuant to subsection 3. Informal discussions and/or negotiations with the Engineer or other District representatives concerning informal resolution of a dispute shall not toll or suspend the claim filing deadlines provided below, unless so provided by the Engineer in writing.

4.5 Deadlines for Filing of Claim:

Subject to the terms, conditions and deadlines of this subsection 4; the Contractor may file a claim with the Engineer. A claim must be submitted to the Engineer as follows:

4.5.1 if a deadline is set forth in the Contract Documents for filing of the particular claim, then the claim must be filed by the specified time;

4.5.2 if the claim relates to extra, additional or unforeseen work for which the Contractor intends to demand additional compensation or a time extension, notice shall be given to the Engineer prior to the time that the Contractor commences performance of the work giving rise to the potential claim for additional compensation or time extension, and Contractor shall not proceed with said work until so directed by the Engineer; and

4.5.3 for all other claims not included within subsections 4.5 (a) and (b), the claim must be filed on or before 15 days after occurrence of the event giving rise to the claim. In no event shall claims be filed later than the date of final payment.

4.6 Emergency Work:

In the event of an emergency endangering life or property, the Contractor shall act as provided by subsection 54.7. After completion of the necessary emergency work the Contractor shall present to the Engineer an accounting of labor, materials and equipment in connection therewith. The procedure for any payment that may be due for emergency work will be as specified in section 3 for a Change Order.

4.7 Tort Claims:

The provisions of subsections 4 and 6 apply only to contract claims and they do not apply to tort claims, and nothing in these sections is intended nor shall be construed to change the time periods for filing tort claims or actions specified by Chapter 1 (commencing with section 900) and Chapter 2 (commencing with section 910) of part 3 of Division 3.6 of title 1 of the Government Code.

4.8 Required Contents of Claim:

The claim must be in writing and shall set forth in detail the reasons for which the Contractor believes additional compensation or a time extension will or may be due, the nature of the costs involved, and, insofar as possible, the amount of the claim. The claim shall also include the documents necessary to substantiate the claim.

4.9 Work Pending Claim Resolution:

Unless otherwise directed in writing by the Engineer; pending resolution of a claim under this subsection 4, the Contractor shall continue to diligently prosecute the work in accordance with the Contract Documents and the instructions of the Engineer.

4.10 Processing of Claims by District – Generally:

Except as otherwise specifically provided in the Contract Documents, the Engineer will initially decide all claims of the Contractor and all disputes arising under and by virtue of the Agreement. All such decisions of the Engineer shall be final unless disputed by the Contractor in accordance with subsection 4.12 or 6.2, as appropriate. If the Contractor fails to dispute the Engineer's decision on the matter in accordance with subsection 4.12 or subsection 6.2, then the Engineer's decision shall be final, conclusive and binding, and the Contractor shall be deemed to have waived all its rights to further protest, judicial or otherwise. Any claim for a time extension or claim for money or damages of less than $375,000 (i.e., any claim subject to Public Agreement Code section 20104) shall be processed by the District and resolved in accordance with subsections 4.11 through 4.13 and subsection 5. Any claim for money or damages of more than $375,000 (i.e., any claim not subject to Public Agreement Code section 20104) shall be processed by the District and resolved in accordance with subsection 6.

4.11 District Response to Claim:

4.11.1 For a claim for a time extension or claim for money or damages of less than $50,000, the Engineer shall respond in writing to any written claim within 45 days of receipt of the

claim by the Engineer, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim the District may have against the Contractor. If additional information is thereafter required, it shall be requested and provided pursuant to this section, upon mutual agreement of the Engineer and the Contractor. The Engineer's written response to the claim, as further documented, shall be submitted to the Contractor within 15 days after receipt of the further documentation or within a period of time no greater than that taken by the Contractor in producing the additional information, whichever is greater.

4.11.2 For claims of over $50,000 and less than or equal to $375,000, the Engineer shall respond in writing to all written claims within 60 days of receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim the District may have against the Contractor. If additional information is thereafter required, it shall be requested and provided pursuant to this section, upon mutual agreement of the Engineer and the Contractor. The Engineer's written response to the claim, as further documented, shall be submitted to the Contractor within 30 days after receipt of the further documentation, or within a period of time no greater than that taken by the Contractor in producing the additional information or requested documentation, whichever is greater.

4.12 Meet and Confer:

If the Contractor disputes the Engineer's written response, or the Engineer fails to respond within the time prescribed, the Contractor may so notify the District, in writing, either within 15 days of receipt of the Engineer's response or within 15 days of the Engineer's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon a demand, the District shall schedule a meet and confer conference within 30 days for settlement of the dispute.

4.13 Government Code Claim:

Following the meet and confer conference, if the claim or any portion remains in dispute, the Contractor may file a claim as provided in Chapter 1 (commencing with section 900) and Chapter 2 (commencing

with section 910) of part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled from the time the Contractor submits a timely written claim pursuant to subsection 4.5 until the time that the claim is denied as a result of the meet and confer process, including any period of time utilized by the meet and confer process; provided that if the Contractor fails to demand a meet and confer conference within the applicable 15 day period, then the Contractor shall be deemed not to dispute the Engineer's written response to the claim and any tolling of the running of the period of time within which a Government Code claim must be filed (see Public Agreement Code section 20104.2(e)) shall cease upon expiration of the applicable 15 day period.

5. Special Litigation Provisions

The following procedures shall apply to all civil actions filed to resolve claims subject to Public Agreement Code section 20104 (i.e., any claim for a time extension or claim for money or damages of less than $375,000).

5.1 Mediation:

Within 60 days, but no earlier than 30 days, following the filing of responsive pleadings, the court shall submit the matter to non-binding mediation unless waived by mutual stipulation of both parties. The mediation process shall provide for the selection within 15 days by both parties of a disinterested third person as mediator, shall be commenced within 30 days of the submittal, and shall be concluded within 15 days from the commencement of the mediation unless a time requirement is extended upon a good cause showing to the court or by stipulation of both parties. If the parties fail to select a mediator within the 15-day period, any party may petition the court to appoint the mediator.

5.2 Arbitration:

5.2.1 If the matter remains in dispute, the case shall be submitted to judicial arbitration pursuant to chapter 2.5 (commencing with section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure, notwithstanding section 1141.11 of that code. The Civil Discovery Act of 1986 (article 3 (commencing with section 2016) of Chapter 3 of Title 3 of Part 4 of the Code of Civil Procedure) shall apply to any proceeding brought under this subdivision consistent with the rules pertaining to judicial arbitration.

5.2.2 Notwithstanding any other provision of law, upon stipulation of the parties, arbitrators appointed for purposes of this article shall be experienced in construction law, and, upon stipulation of the parties, mediators and arbitrators shall be paid necessary and reasonable hourly rates of pay not to exceed their customary rate, and such fees and expenses shall be paid equally by the parties, except in the case of arbitration where the arbitrator, for good cause, determines a different division. In no event shall these fees or expenses be paid by state or county funds.

5.2.3 In addition to Chapter 2.5 (commencing with section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure, any party who after receiving an arbitration award requests a trial de novo but does not obtain a more favorable judgment shall, in addition to payment of costs and fees under that Chapter, pay the attorney's fees of the other party arising out of the trial de novo.

5.3 Witnesses:

The court may, upon request by any party, order any witnesses to participate in the mediation or arbitration process.

5.4 Payment of Undisputed Claims:

The District shall not fail to pay money as to any portion of a claim that is undisputed except as otherwise provided in the Contract Documents.

5.5 Interest:

In any suit filed under this subsection, the District shall pay interest at the legal rate on any arbitration award or judgment. The interest shall begin to accrue on the date the suit is filed in a court of law.

6. Large Claim Resolution

For any claim for money or damages of more than $375,000 (i.e., any claim not subject to California Public Agreement Code section 20104), the following requirements apply:

6.1 District Response to Claim:

The Engineer shall respond in writing to the written claim within 60 days of receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim that the District may have

against the Contractor. If additional information is thereafter required, it shall be requested and provided pursuant to this section, upon mutual agreement of the Engineer and the Contractor. The Engineer's written response to the claim, as further documented, shall be submitted to the Contractor within 30 days after receipt of the further documentation.

6.2 Meet and Confer:

If the Contractor disputes the Engineer's written response, or the Engineer fails to respond within the time prescribed, the Contractor may so notify the District, in writing, either within 15 days of receipt of the Engineer's response or within 15 days of the Engineer's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon a demand, the District shall schedule a meet and confer conference within 30 days for settlement of the dispute.

6.3 Lawsuit on the Claim:

Following the meet and confer conference, if the claim or any portion remains in dispute, the Contractor may, within six (6) months from the date of the last meet and confer conference, file a lawsuit on the claim. If the Contractor fails to demand a meet and confer conference as described in subsection 6.2, the Contractor may, within six (6) months from the date of the Engineer's written response, file a lawsuit on the claim. If the Contractor fails to file a lawsuit within whichever six-month period is applicable, then the District's written response to the claim shall be final, conclusive and binding on the Contractor, and the Contractor agrees that it thereafter shall be barred from filing a lawsuit on the claim.

7. Guarantee

7.1 In addition to warranties, representations and guarantees stated elsewhere in the Contract Documents, or implied-in-fact or in-law, the Contractor unconditionally guarantees all materials and workmanship furnished hereunder, and agrees to repair or replace or both at its sole cost and expense, and to the satisfaction of the Engineer and the District, any and all materials which may be defective or improperly installed for a period of one year from Acceptance.

7.2 The Contractor shall repair or replace to the satisfaction of the Engineer any or all such work that may prove defective in workmanship or materials, ordinary wear and tear excepted, together with any other

work which may be damaged or displaced in so doing. Contractor shall leave the site of any such repair or replacement work in satisfactory working order and condition.

7.3 In the event of failure to comply with the above stated conditions within a reasonable time, the District is authorized to have the defect repaired and made good at the expense of the Contractor who will pay the costs and charges therefor immediately upon demand, including any reasonable management and administrative costs, and engineering, legal and other consultant fees incurred to enforce this section.

7.4 The signing of the Agreement by the Contractor shall constitute execution of the above guarantees. Except as otherwise provided in this Agreement, the guarantees and warranties shall remain in effect for one year from the date of recording a notice of completion. This guarantee does not excuse the Contractor from breaches of contract causing defects that occur or are discovered more than one year after the notice of completion. In addition, the warranty and guaranty period for repaired or replaced work or part shall be one year from the date of Acceptance of said repaired or replaced work or part, but not less than the remaining warranty period of the original work.

8. Authority of the Engineer

8.1 The Engineer is the representative of the District and has full authority to interpret the Contract Documents, to conduct the construction review and inspection of the Contractor's performance, and to decide questions which arise during the course of the work; and its decisions on these matters shall be final and conclusive. The Engineer has the authority to reject all work and materials that do not conform to the Contract Documents, and has the authority to stop the work whenever such stoppage may be necessary to insure the proper execution of the Agreement.

8.2 If at any time the Contractor's work force, tools, plant or equipment appear to the Engineer to be insufficient or inappropriate to secure the required quality of work or the proper rate of progress, the Engineer may order the Contractor to increase their efficiency, improve their character, to augment their number or to substitute other personnel, new tools, plant or equipment, as the case may be, and the Contractor shall comply with such order. Neither the failure of the Engineer to demand such increase of efficiency, number; or improvement, nor the compliance by the Contractor with the demand, shall relieve the

Contractor of its obligation to provide quality work at the rate of progress necessary to complete the work within the specified time.

8.3 The Engineer shall have the authority to make minor changes in the work, not involving extra costs, and not inconsistent with the purposes of the work.

8.4 Any order given by the Engineer, not otherwise required by the Contract Documents to be in writing shall, on request of the Contractor, be given or confirmed by the Engineer in writing.

8.5 Whenever work, methods of procedure, or any other matters are made subject to direction or approval, such direction or approval will be given by the Engineer.

9. Conformed Contract Documents

9.1 The Engineer shall provide a conformed set of Contract Documents to reflect addenda that were provided during bidding. The Conformed Contract Documents shall be made available to the Contractor at the District Office on a flash drive in Adobe .PDF format.

9.2 If the Contractor, in the course of the work, finds any discrepancy between the Conformed Contract Documents and the physical condition of the locality, or any errors or omissions, it shall be its duty to inform the Engineer in writing, and the Engineer will promptly verify the same. Any work done after such discovery, until authorized, will be done at the Contractor's risk.

10. Construction Staking and Surveys

The Engineer will provide the Contractor with drawings showing benchmarks and reference points as it deems necessary to establish lines and grades required for the completion of the site work specified in the Contract Documents. The Contractor shall make or furnish all surveys and set all construction stakes necessary for the completion of the work.

11. Permits and Regulations

Permits and licenses, of a temporary nature, necessary for the prosecution of the work shall be secured and paid for by the Contractor. Permits, licenses and easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by the District unless otherwise specified.

12. Conformity with Contract Documents

Work and materials shall conform to the lines, grades, cross sections, dimensions and material requirements, including tolerances, shown on Contract Documents. Although measurement, sampling, and testing may be considered evidence as to such conformity, the Engineer shall be the sole judge as to whether the work or materials deviate from the Specifications and plans, and his decision as to any allowable deviations therefrom shall be final and conclusive.

13. Coordination and Interpretation of Contract Documents

13.1 The Contract Documents are complementary and a requirement occurring in one is as binding as though occurring in all.

13.2 In the event of conflict between the Plans and the Specifications, the Specifications shall govern, except that, where items are shown on the Plans and are not specifically included in the Specifications, the Plans shall govern.

13.3 Should it appear that the work to be done or any of the matters relative thereto are not sufficiently detailed or explained in the Specifications and Plans, the Contractor shall apply to the Engineer for such further explanations as may be necessary and shall conform to them as part of the Agreement. In the event of any doubt or question arising respecting the true meaning of the Specifications and Plans, reference shall be made to the Engineer, whose decision thereon shall be final and conclusive.

13.4 In the event of any discrepancy between any Plans and the figures written thereon, the figures shall be taken as correct. Detailed drawings shall prevail over general drawings.

13.5 Any reference made in the Specifications or on the Plans to any specification, standard, method, or publication of any scientific or technical society or other organization shall, in the absence of a specific designation to the contrary, be understood to refer to the Specification, standard, method, or publication in effect as of the date that the work is advertised for Bids.

13.6 Requests for Information

13.6.1 General

Contractor shall prepare a Request for Information (RFI) when additional information, clarification, or interpretation of the

Agreement is required. RFI's may also be used for apparent conflicts, inconsistencies, ambiguities, or omissions.

RFI's shall be submitted to the Engineer sufficiently in advance of the work to permit time for investigation and preparation of a response. Any work undertaken prior to receipt of a response to an RFI will be at the Contractor's risk. RFI's shall not be used for submittals or for substitution of material or equipment, or for waiving of requirements.

13.6.2 RFI Procedure

An RFI shall be submitted on an approved form as defined at the preconstruction meeting and shall be numbered consecutively. A status log shall be prepared and updated by the Contractor and reviewed with the Engineer at each progress meeting. Each RFI shall deal with only one topic, item, issue, or system.

The RFI shall clearly describe and specifically state what is being requested. Relevant portions of the Agreement shall be cited, marked-up, and attached.

The Contractor shall review each RFI before submittal and compare it with the Contract Documents to verify that a response is required. RFI's will only be accepted from the Contractor and not from Subcontractors or suppliers. A recommendation or proposed solution may be included when appropriate or expedient.

RFI's that are not clear or RFI's for which a response is clearly identified in the Contract Documents will not be accepted.

13.6.3 Response

The Engineer will normally respond within fifteen (15) Working Days. The Engineer will provide a written response, and that response shall control.

The Contractor shall indicate a priority for responses to RFI's if more than five (5) RFI's are pending at the same time. In case of a dispute between the Contractor and the Engineer, protest may be made as provided in subsection 3.8.

Subsequent resubmittals of an RFI shall be identified with the same RFI number and a letter designation. Resubmittals shall clearly state the reason for the resubmittal.

14. Subcontracts

14.1 The attention of the Contractor is directed to California Public Agreement Code section 4100, et seq., regarding subcontracting and said provisions are by this reference incorporated herein and made a part hereof.

14.2 Each subcontract shall contain a suitable provision for the suspension or termination thereof should the work be suspended or terminated or should the subcontractor neglect or fail to conform to every provision of the Contract Documents insofar as such provisions are relevant. No subcontractor or supplier will be recognized as such, and all persons engaged in work will be considered as employees of the Contractor, and the Contractor will be held responsible for their work, which shall be subject to the provisions of the Contract Documents. The Contractor shall be fully responsible to the District for the acts or omissions of its subcontractors and of the persons either directly or indirectly employed by them. Nothing contained in the Contract Documents shall create any contractual relationship between any subcontractor and the District. If a legal action, including arbitration and litigation, against the District is initiated by a subcontractor or supplier, the Contractor shall reimburse the District for the amount of legal, engineering and all other expenses incurred by the District in defending itself in said action.

14.3 The District and the Engineer reserve the right to approve all subcontractors. Such approval shall be a consideration to the awarding of the Agreement and unless notification to the contrary is given to the Contractor prior to the signing of the Agreement, the list of subcontractors that is submitted with its proposal will be deemed to be acceptable.

15. Cooperation of Contractors

15.1 Should construction be under way by other forces or by other contractors within or adjacent to the limits of the work specified or should work of any other nature be under way by other forces within or adjacent to said limits, the Contractor shall cooperate with all such other contractors or other forces to the end that any delay or hindrance to their work will be avoided. The right is reserved by the District to perform other or additional work at or near the site (including material sources) at any time, by the use of other forces.

15.2 When two or more contractors are employed on related or adjacent work, each shall conduct its operation in such a manner as not to cause any unnecessary delay or hindrance to the other. Each contractor shall be responsible to the other for all damage to work, to persons or property caused to the other by its operations, and for loss caused the other due to its unnecessary delays or failure to finish the work within the time specified for completion.

16. Superintendence

16.1 The Contractor shall designate in writing before starting work an individual as authorized representative who shall have the authority to represent and act for the Contractor. This authorized representative shall be present at the site of the work at all times while work is actually in progress on the Agreement. When work is not in progress and during periods when work is suspended, arrangements acceptable to the Engineer shall be made for any emergency work that may be required.

16.2 The Contractor is solely responsible, at all times, for the superintendence of the work and for its safety and progress.

16.3 Whenever the Contractor or its authorized representative is not present on any particular part of the work where it may be desired to give direction, orders will be given by the Engineer, which shall be received and obeyed by the superintendent or foreman who may have charge of the particular work in reference to which the orders are given.

16.4 Any order given by the Engineer, not otherwise required by the Contract Documents to be in writing, will on request of the Contractor, be given or confirmed by the Engineer in writing.

17. Inspection of Work

17.1 Unless otherwise provided, all equipment, materials, and work shall be subject to inspection and testing by the Engineer or an independent 3rd party testing firm hired by the Contractor where required in the Contract Documents. The Engineer will observe the progress and quality of the work and determine, in general, if the work is proceeding in accordance with the intent of the Contract Documents. He shall not be required to make comprehensive or continuous inspections to check the quality of the work, and he shall not be responsible for construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the work. Visits and

observations made by the Engineer shall not relieve the Contractor of its obligation to conduct comprehensive inspections of the work and to furnish proper materials, labor, equipment and tools, and perform acceptable work, and to provide adequate safety precautions, in conformance with the intent of the Agreement.

17.2 Whenever the Contractor varies the period during which work is carried on each day, it shall give due notice to the Engineer so that proper inspection may be provided. Any work done in the absence of the Engineer shall be subject to rejection. Proper facilities for safe access for inspection to all parts of the work shall at all times be maintained for the necessary use of the Engineer and other agents of the District, and agents of the Federal, State, or local governments at all reasonable hours for inspection by such agencies to ascertain compliance with laws and regulations.

17.3 One or more inspectors may be assigned to observe the work and to act in matters of construction under this Agreement. Such inspection shall not relieve the Contractor of its obligation to conduct comprehensive inspections of the work, to furnish proper materials, labor, equipment and tools, and perform acceptable work, and to provide adequate safety precautions in conformance with the intent of the Agreement.

17.4 The Engineer and his representatives shall at all times have access to the work wherever it is in preparation or progress; and the Contractor shall provide safe and convenient facilities for such access and for inspection. If the Specifications, the Engineer's instructions, laws, ordinances, or any public authority require any material, equipment or work to be specifically tested or approved, the Contractor shall give the Engineer timely notice of its readiness for inspection, and if the inspection is by an authority other than the District, of the time fixed for inspection. Inspections by the Engineer will be made promptly and, where practicable, at the source of supply.

17.5 Work performed without inspection may be required to be removed and replaced under proper inspection and the entire cost of removal and replacing, including the cost of District-furnished materials used in the work, shall be borne by the Contractor, regardless of whether or not the work exposed is found to be defective. Examination of questioned work, other than that installed without inspection, may be ordered by the Engineer and, if so ordered, the work must be uncovered by Contractor. If such work is found to be in accordance with the Contract Documents, the District will pay the cost of re-examination and replacement. If such work is found to be not in accordance with the

Contract Documents, the Contractor shall pay such cost unless it can show that the defect in the work was caused by another contractor not associated with the contractor, and in that event the District will pay such costs.

17.6 The inspection of the work shall not relieve the Contractor of its obligation to fulfill the Agreement as herein prescribed, or in any way alter the standard of performance provided by the Contractor; and defective work shall be made good and unusable materials may be rejected, notwithstanding that such work and materials have been previously overlooked by the Engineer and accepted or estimated for payment. If the work or any part thereof shall be found defective, Contractor shall, within ten (10) calendar days, make good such defect in a manner satisfactory to the Engineer. If the Contractor shall fail or neglect to make ordered repairs of defective work or to remove the condemned materials from the work within ten (10) calendar days after direction by the Engineer in writing, the District may make the ordered repairs, or remove the condemned materials, and deduct the cost thereof from any monies due the Contractor.

17.7 The Contractor shall furnish promptly without additional charge all facilities, labor and materials reasonably needed by the Engineer for performing all inspection and tests. Contractor shall be charged with any additional cost of inspection when material and workmanship are not ready at the time specified by the Contractor for its inspection.

17.8 Where any part of the work is being done under an encroachment permit or building permit, or is subject to Federal, State, County or City codes, laws, ordinances, rules or regulations, representatives of the government agency shall have full access to the work and shall be allowed to make any inspection or tests in accordance with such permits, codes, laws, ordinances, rules, or regulations. If advance notice of the readiness of the work for inspection by the governing agency is required, the Contractor shall furnish such notice to the appropriate agency.

17.9 The Engineer may inspect the production of material, or the manufacture of products at the source of supply. Plant inspection, however, will not be undertaken until the Engineer is assured of the cooperation and assistance of both the Contractor and the material producer. The Engineer or his authorized representative shall have free entry at all times to such parts of the plant as concerns the manufacture or production of the materials. Adequate facilities shall be

furnished free of charge to make the necessary inspection. The District assumes no obligation to inspect materials at the source of supply.

18. Tests

The Contractor shall perform at its expense all tests specified or required by the Contract Documents. The Engineer will perform such tests as he deems necessary to determine the quality of work or compliance with Contract Documents. The Contractor shall furnish promptly without additional charge all facilities, labor, and material reasonably required for performing safe and convenient tests as may be required by the Engineer. All tests by the Engineer will be performed in such a manner as will not unnecessarily delay the work. The Contractor shall not be required to reimburse the District for tests performed by the District or Engineer. If samples of materials are submitted which fail to pass the specified tests, the Contractor shall pay for all subsequent tests.

19. Removal of Rejected/Unauthorized Work and Materials

19.1 All work or materials which have been rejected shall be remedied, or removed and replaced by the Contractor in an acceptable manner and no compensation will be allowed it for such removal, replacement, or remedial work.

19.2 Any work done beyond the lines and grades shown on the Plans or established by the Engineer or any extra work done without written authority will be considered as unauthorized work and will not be paid for. Upon order of the Engineer, unauthorized work shall be remedied, removed, or replaced at the Contractor's expense.

19.3 Upon failure of the Contractor to comply with any order of the Engineer made under this Section, the District may cause rejected or unauthorized work to be remedied, removed, or replaced, and may deduct the costs therefor from any monies due or to become due the Contractor.

20. Deduction for Uncorrected Work

If the Engineer deems it inexpedient to correct work damaged or not done in accordance with the Contract Documents, an equitable deduction from the Agreement price shall be made therefor; and such sum may be withheld by District from Contractor's payment.

21. Equipment and Plants

21.1 Only equipment and plants suitable to produce the quality of work and materials required will be permitted to operate on the project.

21.2 Plants will be designed and constructed in accordance with general practice for such equipment and shall be of sufficient capacity to insure the production of sufficient material to carry the work to completion within the time limit.

21.3 The Contractor shall provide adequate and suitable equipment and plants to meet the above requirements, and when ordered by the Engineer, shall remove unsuitable equipment from the work and discontinue the operation of unsatisfactory plants.

21.4 The Contractor shall identify each piece of its equipment, other than hand tools, by means of an identifying number plainly stenciled or stamped on the equipment at a conspicuous location, and shall furnish to the Engineer a list giving the description of each piece of equipment and its identifying number. In addition, the make, model number and empty gross weight of each unit of compacting equipment shall be plainly stamped or stenciled in a conspicuous place on the unit. The gross weight shall be either the manufacturer's rated weight or the scale weight.

21.5 In the case of termination of this Agreement before completion from any cause whatever, the Contractor, if notified to do so by the District, shall promptly remove any part or all of its equipment and supplies from the property of the District. If the Contractor fails to do so, the District shall have the right to remove such equipment and supplies at the expense of the Contractor.

22. Character of Worker

If any subcontractor or person employed by the Contractor or any subcontractor shall be incompetent or act in a disorderly or improper manner, that subcontractor or person shall be removed from the Work immediately, and such subcontractor or person shall not again be employed on the Work. Such discharge shall not be the basis for any claim for compensation or damages against the District, the Engineer or any of their officers, directors, employees or agents.

23. Separate Contracts

23.1 The District reserves the right to let other contracts in connection with this work. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and coordinate its work with the other contractor's work.

23.2 If any part of the Contractor's work depends for proper execution or results upon the work of any other contractor, the Contractor shall inspect and promptly report to the Engineer any defects in such work that render it unsuitable for such proper execution and results. The Contractor's failure to inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for the reception of the Contractor's work, except as to defects that may develop in the other contractor's work after the execution of its work. To insure the proper execution of its subsequent work, the Contractor shall measure work already in place and shall at once report to the Engineer any discrepancy between the executed work and the drawings.

24. Materials

24.1 Unless otherwise specifically stated in the Specifications, the Contractor shall furnish all materials necessary for the execution and completion of the work. Unless otherwise specified, all materials shall be new and shall be manufactured, handled, and installed in a workmanlike manner to insure completion of the work in accordance with the Contract Documents. The Contractor shall, upon request of the Engineer, furnish satisfactory evidence as to the kind and quality of materials.

24.2 Where materials are to be furnished by the District, the type, size, quantity and location at which they are available will be stated in the Contract Documents.

24.3 Manufacturers' and suppliers' warranties, guarantees, operating manuals, instruction sheets and parts listed, which are furnished with certain articles or materials incorporated in the work, shall be delivered to the Engineer before final acceptance of the Agreement work.

25. Storage of Materials; Storage Areas

25.1 Articles or materials to be incorporated in the work shall be stored in such a manner as to insure the preservation of their quality and fitness for the work, and to facilitate inspection.

25.2 The Contractor's work and storage areas on site are limited by the property, right-of-way, and temporary fence lines as indicated on the Plans. The plant facilities are to be installed in property or easements owned by the District as shown on the Plans. The District shall be specifically exempted in any agreement from any liability incurred from the use of private property for construction purposes. The Contractor shall make arrangements and pay for property off-site as required for storage, offices, work assembly areas, etc. The Contractor shall take all responsibility for storage of materials.

26. Trade Names and Alternatives

For convenience in designation in the Specifications and Plans, certain articles or materials to be incorporated in the work may be designated under a trade name or the name of a manufacturer and its catalog information. The use of an alternative article or material that is of equal quality and of the required characteristics for the purpose intended will be permitted, subject to the following requirements:

26.1 The burden of proof as to the quality and suitability of alternatives shall be upon the Contractor and it shall furnish all information necessary as required by the Engineer. The Engineer shall be the sole judge as to the quality and suitability of alternative articles or materials and his decision shall be final.

26.2 Whenever the Specifications and Plans permit the substitution of a similar or equivalent material or article, no tests or action relating to the approval of such substitute material or article will be made until the request for substitution is made in writing by the Contractor accompanied by complete data as to the equality of the material or article proposed. Such request by the Contractor must be made within thirty-five (35) days after award of Agreement.

27. Certificates of Compliance

27.1 A Certificate of Compliance shall be furnished prior to the use of any materials for which the Specifications require that such a certificate be furnished. In addition, when so authorized in the Specifications, the

Engineer may permit the use of certain materials or assemblies prior to sampling and testing if accompanied by a Certificate of Compliance. The Certificate shall be signed by the manufacturer of the material or the manufacturer of assembled materials and shall state that the materials involved comply in all respects with the requirements of the Contract Documents. A Certificate of Compliance shall be furnished with each lot of material delivered to the work and the lot so certified shall be clearly identified in the Certificate.

27.2 All materials used on the basis of a Certificate of Compliance may be sampled and tested at any time. The fact that material is used on the basis of a Certificate of Compliance shall not relieve the Contractor of responsibility for incorporating material in the work which conforms to the requirements of the Contract Documents and any such material not conforming to such requirements will be subject to rejection whether in place or not.

27.3 The District reserves the right to refuse to permit the use of material on the basis of a Certificate of Compliance.

27.4 The form of the Certificate of Compliance and its disposition shall be as directed by the Engineer.

28. Assignment

The Contractor shall not assign the Agreement or sublet it as a whole or in part without the written consent of the District, nor shall the Contractor assign any monies due, or to become due to it hereafter, without the prior written consent of the District.

29. District Entry on Work Site; Right to Operate Unsatisfactory Equipment or Facilities

29.1 The District may, at any time, and from time to time, during the performance of the work, enter the work site for the purpose of installing any necessary work by District labor or other contracts, and for any other purpose in connection with the installation of facilities. In doing so, the District shall endeavor not to interfere with the Contractor and the Contractor shall not interfere with other work being done by or on behalf of the District.

29.2 The District reserves the right, prior to completion and final acceptance, to occupy, or use, any completed part or parts of the work, providing these areas have been approved for occupancy by the District. The exercise of this right shall in no way constitute an

acceptance of such parts, or any part of the work, nor shall it in any way affect the dates and times when progress payments shall become due from the District to the Contractor or in any way prejudice the District's rights in the Agreement, or any bonds guaranteeing the same. The Agreement shall be deemed completed only when all the work contracted has been duly and properly performed and accepted by the District.

Prior to such occupancy or use, the District and Contractor shall agree in writing regarding the responsibilities assigned to each of them for payments, security, maintenance, heat, utilities, damage to the work, insurance, the period for correction of the work, and the commencement of warranties required by the Contract Documents.

In exercising the right to occupy or use completed parts of the work prior to the completion thereof, the District shall not make any use which will materially increase the cost to the Contractor, without increasing the Agreement Amount, nor materially delay the completion of the Agreement, without extending the time for completion.

29.3 If, following installation of any equipment or facilities furnished by the Contractor, defects requiring correction by the Contractor are found, the District shall have the right to operate such unsatisfactory equipment or facilities and make reasonable use thereof until the equipment or facilities can be shutdown for correction of defects without injury to the District.

30. Lands for Work; Right-of-Way; Construction Roads; Temporary Utility Services

30.1 The District will provide the lands, easements and rights-of-way necessary for the performance of the work. The Contractor shall provide the encroachment permits or other rights to enter and work on lands necessary for the performance of the work. Other permits and licenses are addressed by subsection 11. Should the Contractor find it advantageous to use any additional land for any purpose whatever, the Contractor shall provide for the use of such land at its expense. The Engineer shall be furnished with a copy of written agreements or otherwise be notified in writing of additional working space which is acquired. Nothing herein contained and nothing marked on the Plans shall be interpreted as giving the Contractor exclusive occupancy of the territory provided by the District. When two or more contracts are being executed at one time on the same or adjacent land in such a manner that work on one contract may interfere with that on another,

the Engineer shall decide which contractor shall cease work, and which shall continue, or whether the work on both contracts shall progress at the same time and in what manner; and the decision of the Engineer shall be final and binding. When the territory of one contract is the necessary or convenient means of access for the performance of another contract, such privilege of access or any other reasonable privilege may be granted by the Engineer to the contractor so desiring, to the extent, amount, in the manner, and at the time permitted. No such decision as to the method or time of conducting the work or the use of territory shall be the basis of any claim for delay or damage.

30.2 Lands, easements or rights-of-way to be furnished by the District for construction operations will be specifically shown on the Plans.

30.3 The Contractor shall construct and maintain all roads necessary to reach the various parts of the work and for the transportation thereto of construction material and personnel. The cost of constructing and maintaining such roads shall be borne by the Contractor.

30.4 The Contractor shall make its own arrangements for any utility services it may require during the life of this project. The Contractor shall make its own arrangements for telephone service which it will require for its field office.

31. Progress Schedule

31.1 The Contractor shall submit within 10 days after Date of the Agreement a schedule or schedules which shall show the dates at which the Contractor will start and complete the several parts of the Work. This schedule shall conform to the completion time specified in the Agreement. The Contractor shall review and, if necessary, revise the progress schedule at least once per month, and in any event shall submit a current schedule to the Engineer at his request at any time during the contract period.

31.2 The Engineer shall be advised in advance by the Contractor when any part of the Work is scheduled and the days when no Work will take place. If the Contractor fails to notify the Engineer in advance of the day or days when no Work will be done, the Contractor will be charged the cost of inspection for that day or days and such charges may be deducted from any payment due the Contractor.

31.3 When, in the judgment of the Engineer, it is necessary to accelerate any part of the Work ahead of schedule, the Contractor shall, when directed, concentrate its efforts on such part of the Work.

32. Commencement and Progress of the Work; Time of Completion; Construction Sequence; Delays

32.1 The Contractor shall commence the Work covered by this Agreement within fifteen (15) days after date of issuance of Notice to Proceed from the District to proceed with the Work. Work will be considered to have commenced when the Contractor begins ordering materials and equipment or starts site work. The Contractor shall not commence work or incur any expenses in connection therewith, before it is notified to proceed with the work. The time allowed for completion includes an allowance for working time lost due to normal inclement weather. A Pre-Construction conference will be scheduled by the Engineer prior to the Contractor starting work.

32.2 The Contractor shall give the Engineer written notice not less than two (2) working days in advance of the actual date on which the work will be started. The Contractor shall be entirely responsible for any delay in the work that may be caused by this failure to give such notice. The Engineer shall have the right to specify the locations where the Contractor shall start and proceed with the work.

32.3 The Contractor shall diligently pursue the work and complete the work as specified within the time limits as set forth in the Contract Documents.

32.4 When the Contractor foresees a delay in the prosecution of the work and, in any event, immediately upon the occurrence of a delay, the Contractor shall notify the Engineer in writing of the probability of the occurrence and the estimated extent of the delay, and its cause. The Contractor shall take immediate steps to prevent, if possible, the occurrence or continuance of the delay. The Contractor agrees that no claim shall be made for delays that are not called to the attention of the Engineer at the time of their occurrence.

32.5 Non-excusable delays in the prosecution of the work shall include delays which could have been avoided by the exercise of care, prudence, foresight, and diligence on the part of the Contractor or its subcontractors, at any tier level, or suppliers.

32.6 Excusable delays in the prosecution or completion of the work shall include delays which result from causes beyond the control of the Contractor and District and which could not have been avoided by the exercise of care, prudence, foresight, and diligence on the part of the Contractor or its subcontractors, at any tier level, or suppliers.

32.7 Delays caused by acts of god, fire, unusual storms, floods, tidal waves, earthquakes, strikes, labor disputes, and freight embargoes, shall be considered as excusable delays insofar as they prevent the Contractor from proceeding with at least seventy-five (75) percent of the normal labor and equipment force for at least five (5) hours per day toward completion of the current critical activity item(s) on the latest favorably reviewed progress schedule.

32.8 Should inclement weather conditions or the conditions resulting from weather prevent the Contractor from proceeding with seventy-five (75) percent of the normal labor and equipment force engaged in the current critical activity item for a period of at least five (5) hours per day toward completion of such operation or operations, and the crew is dismissed as a result thereof, it shall be a weather delay day.

32.9 Upon the submission of satisfactory proof to the Engineer by the Contractor, shortages of material may be acceptable as grounds for granting a time extension. In order that such proof may be satisfactory and acceptable to the Engineer, it must be demonstrated by the Contractor that the Contractor has made every effort to obtain such materials, or obtain acceptable substitute materials, from all known sources within reasonable reach of the proposed work. Only the physical shortage of material, caused by unusual circumstances, will be considered under these provisions as a cause for extension of time, and no consideration will be given to any claim that material could not be obtained at a reasonable, practical, or economical cost or price, unless it is shown to the satisfaction of the Engineer that such material could have been obtained only at exorbitant prices entirely out of line with current rates, taking into account the quantities involved and usual practices in obtaining such quantities. A time extension for shortage of material will not be considered for material ordered or delivered late or whose availability is affected by virtue of the mishandling of procurement. The above provisions apply equally to equipment to be installed in the work.

32.10 Compensable delays in the prosecution or completion of the work shall include delays that occur through no fault of the Contractor and prevent the Contractor from proceeding with at least seventy-five (75) percent of the normal labor and equipment force for at least five (5) hours per day toward completion of the current critical activity item(s) on the latest favorably reviewed progress schedule due to the following cause(s):

32.10.1 Delays due solely to the actions and/or inactions of the District.

32.10.2 Delays due to differing site conditions as addressed in subsections 3.14.

32.10.3 Delays due to other Contractors employed by the District who interfere with the Contractor's prosecution of the work as defined above.

No delay shall be compensable unless the claimed event or occurrence delays completion of the work beyond the contractual completion date or the completion date shown in the accepted initial or updated schedules, and the delay affects a critical activity while such activity is on the critical path.

32.11 Concurrent delays are those delay periods when the prosecution of the work is delayed during the same period of time. Time extensions will be granted daily regardless of the number of excusable concurrent delays.

32.12 The District may in its sole discretion grant an extension of time for non-excusable delays if the District deems it is in its best interest. If the District grants an extension of time for non-excusable delays, the Contractor agrees to pay the District's actual costs, including charges for engineering, inspection and administration incurred during the extension.

32.13 If the Contractor is delayed in the performance of its work as defined in subsection 32.6 (Excusable delays), or 32.10 (Compensable delays), then the date of Substantial Completion and/or Final Acceptance may be extended by the District for such time that, in the District's and Engineer's determination, the Contractor's completion date will be delayed, provided that the Contractor strictly fulfills the following:

32.13.1 The Contractor shall provide notification, in accordance with subsection 32.4 and as otherwise provided by this Agreement, and submit in writing a request for an extension of time to the Engineer stating at a minimum the probable cause of the delay and the number of days being requested. The time extension request shall be submitted in accordance with the requirements of subsection 3.

32.13.2 If requested by the Engineer, the Contractor shall promptly provide sufficient information to the Engineer to assess the cause or effect of the alleged delay, or to determine if other concurrent delays affected the work.

32.13.3 The Contractor will be granted a non-compensable time extension for weather caused delays above any allowance provided for in the Contract Documents for weather delays.

32.13.4 Should the Contractor fail to fulfill any of the foregoing, which are conditions precedent to the right to receive a time extension, the Contractor waives the right to receive a time extension.

During such extension of time, no extra compensation for engineering, inspection and administration or damages for delay will be charged to the Contractor. It is understood and agreed by the Contractor and District that time extensions due to excusable or compensable delays will be granted only if such delays involve controlling operations which would prevent completion of the whole work within the time allowed for completion.

32.14 Delay Damages

32.14.1 Indirect Overhead - The Contractor shall be reimbursed for indirect overhead expenses for periods of time when the work is delayed as defined in subsection 32.10 (Compensable delays). However, no reimbursement for indirect overhead or any other costs or damages shall be made for compensable delays which occur during a concurrent delay as defined in subsection 32.11 (Concurrent delays). No reimbursement for indirect overhead as covered in this section shall be made for any time extensions granted for Contract change orders as provided in subsection 4. As a condition precedent to any reimbursement, the Contractor must fulfill all conditions as provided in subsection 32.13 (Excusable or Compensable delays). No additional markup for overhead or profit shall be provided for such indirect overhead expenses.

Payment to the Contractor for indirect overhead expenses will be made only if the extended Agreement period granted for the compensable delay(s) is required to complete the work following the depletion of the original contract period and any time extensions granted other than compensable time extensions. Except as provided herein, the Contractor shall have no claim for damage or compensation for any delay including, but not limited to, extended field costs, extended home office overhead costs, impact, inefficiency, unabsorbed home office overhead, under-absorbed home office overhead, hindrance, disruption, or any other damage arising from

delay, no matter how characterized, including delay claims of its subcontractors/suppliers of every tier.

32.14.2 Indirect Field Overhead - For those allowable delay periods as defined in subsection 32.14.1 (Indirect Overhead), the Contractor shall be reimbursed for its indirect field overhead based on:

1. Invoices for all field office equipment.
2. Actual salary for field office staff.
3. Fair rental values acceptable to the Engineer for construction equipment idled due to the delay.

32.14.3 Indirect Home Office Overhead - For those allowable delay periods as defined in subsection 32.14.1 (Indirect Overhead), the Contractor shall be reimbursed for its daily home office overhead based on the following formula:

Daily Home Office Overhead ($/Day) = Agreement Bid Price ($) / (Time Allowed for Final Completion (Business Days) x (0.04))

As it is impractical to determine the actual home office overhead, such reimbursement shall be mutually agreed between the District and Contractor to encompass full payment for any home office overhead expenses for such periods of time for the Contractor and all subcontractors. The Contractor agrees to indemnify, defend and hold the District harmless for any indirect overhead claims from its subcontractors.

33. Suspension of Work

33.1 The Engineer may at any time, by notice in writing to the Contractor, suspend any part of the work for such period of time with or without cause, and the Contractor shall have no claim for damages or additional compensation on account of any such suspension.

33.2 Upon receipt of a written notice to suspend any portion of the work issued by the Engineer, the Contractor shall thereupon discontinue all work suspended except for all operations necessary to prevent loss or damage to work already executed as may be directed by the Engineer. In the event a part of the work is suspended, the Contractor, if the suspension is not through its fault or the fault of its subcontractors or agents, shall be paid in accordance with subsection 3.9 for costs of work performed in accordance with such orders of the Engineer during

such suspension, provided that this shall not include any cost pertaining to work not suspended by the notice to suspend work. Work shall be resumed by the Contractor after such suspension on subsequent written notice to resume work from the District. In the event of suspension of the entire work by the District, the Contractor, if the suspension is not through the fault of the Contractor or the fault of its subcontractors or agents, shall be paid the sum of $50 for each calendar day during which the entire work shall have been suspended. Said sum is hereby mutually agreed upon as fixed and liquidated damages in full settlement of all costs and expenses, losses and damages resulting to the Contractor from such suspension.

33.3 In the event of any suspension of the work in whole or in part under subsection 33.2 above, if the suspension is not through the fault of the Contractor or the fault of its subcontractors or agents, the Contractor shall be entitled to an extension of time wherein to complete the work to the extent of the delay caused the Contractor thereby. If no agreement can be reached as to the time for extension, the Contractor shall submit a claim to the District within fifteen (15) days of a notice from the District that no agreement can be reached. The claim shall be processed in accordance with subsection 4.

33.4 In the event the entire work shall be suspended by order of the District, and shall remain so suspended for a period of ninety (90) consecutive days, through no fault of the Contractor or its subcontractors or agents, and notice to resume the work shall not have been served on the Contractor, Contractor may, at its option, by written notice to the District, terminate the Agreement in the same manner and on the same terms as if the termination had been initiated by the District pursuant to subsection 34, and the District shall have no claim for damages because of such termination of the Agreement.

34. Termination of Agreement

Subject to 5 business days prior notice from the District, the District will have the right to terminate the Agreement with or without cause.

34.1 Upon service of such notice of termination, the Contractor shall discontinue the work in such manner, sequence, and at such times as the Engineer may direct. The Contractor shall have no claim for damages for such discontinuance or termination, nor any claim for anticipated profits on the work thus dispensed with or uncompleted, nor any other claim except for the work actually performed up to the time of termination, including any extra work ordered by the Engineer

to be done, nor for any claim for liquidated damages in accordance with the provisions of subsection 33.

34.2 Upon receipt of notice of termination of the Agreement and/or the suspension of work, the Contractor shall, unless the notice directs otherwise, do the following:

34.2.1 Immediately discontinue the work to the extent specified in the notice.

34.2.2 Place no further orders or subcontracts for materials, equipment, services, or facilities, except as may be necessary for completion of such portion of the work as is not discontinued.

34.2.3 Promptly cancel, on the most favorable terms reasonably possible, all orders and subcontracts to the extent they relate to the performance of the discontinued portion of the work.

34.2.4 Thereafter do only such work as may be necessary to preserve and protect work already in progress and to protect materials, plants, and equipment on the project site or in transit thereto.

34.3 Upon termination of the Agreement, the obligations of the Agreement shall continue as to portions of the work already performed and, subject to the Contractor's obligations under this subsection, as to bona fide obligations assumed by the Contractor prior to the date of termination.

34.4 Upon termination of the Agreement or the suspension of work, the District shall pay to the Contractor the sum of the following:

34.4.1 The amount of the Agreement price allocable to the portion of the work properly performed by the Contractor as of the date of termination, less sums previously paid to the Contractor.

34.4.2 Previously unpaid cost of any item(s) delivered to the project site that was fabricated for subsequent incorporation into the work.

34.4.3 Any proven losses with respect to materials and equipment directly resulting from such termination.

34.4.4 Reasonable demobilization costs.

34.4.5 Reasonable costs of preparing a statement of the aforesaid costs, expenses, and losses in connection with such termination.

34.5 The above payment shall be the sole and exclusive remedy to which the Contractor is entitled in the event of termination of the Agreement by the District and/or the suspension of work pursuant to this subsection; and the Contractor will be entitled to no other compensation or damages and expressly waives same. The District shall have the right to subtract from the above payment such sums as may be deducted consistent with the terms of the Agreement.

34.6 Termination with Cause: Subject to prior notice from the District and the Contractor's cure rights set forth in subsection 34.7, the District will have the right to terminate the Agreement and/or the suspension of work for cause upon the occurrence of any of the following:

34.6.1 Contractor becomes insolvent or files for relief under the bankruptcy laws of the United States.

34.6.2 Contractor makes a general assignment for the benefit of its creditors or fails to pay its debts as the same become due.

34.6.3 A receiver is appointed to take charge of Contractor's property.

34.6.4 The work is not completed within the applicable Contract time, as such Contract time may be adjusted in accordance with this Contract, and Contractor is not diligently prosecuting the completion or correction of the work.

34.6.5 Contractor persistently or repeatedly refuses or fails to supply skilled supervisory personnel, an adequate number of properly skilled workers, proper materials, or necessary equipment to prosecute the work in accordance with the Contract Documents.

34.6.6 Contractor fails to make prompt payment of amounts properly due subcontractors after receiving payment from District.

34.6.7 Contractor disregards applicable laws, regulations or other governmental requirements.

34.6.8 Contractor persistently or materially fails to execute the work in accordance with the Contract Documents.

34.6.9 Contractor persistently or materially fails to comply with applicable safety requirements.

34.6.10 Contractor abandons the work.

34.6.11 Contractor is in default of any other material obligation under the Contract Documents.

34.7 The Contractor has a right to cure within 5 days for termination or suspension of work for cause. Additional time may be granted by the District for cure at the District's sole discretion.

35. Rights of District Upon Termination

35.1 In the event the Agreement is terminated with cause as defined in subsection 34, the District may take over the work and prosecute the same to completion by contract or any other method the District deems expedient, and may take possession of and utilize in completing the work such materials, appliances, equipment and plant for which the District has paid. Whether or not the Contractor's right to proceed with the work is terminated, it and its sureties shall be liable for all damages, including but not limited to, costs of managerial and administrative services, engineering, legal and other consultant fees, sustained or incurred by the District in enforcing the provisions of subsection 34 and in completing or causing to complete the work.

35.2 The rights and remedies of the District provided in this subsection are in addition to any of the rights and remedies provided by law.

36. Failure to Complete the Work in the Time Agreed Upon; Liquidated Damages

36.1 It is agreed by the parties to the Agreement that time is of the essence; and that in case all the work is not completed before or upon the expiration of the time limit as set in Section 01 00 00, or as revised by any time extensions that may have been granted, damage will be sustained by the District; and that it may be impracticable to determine the actual amount of damage by reason of such delay; and it is, therefore, agreed that the Contractor shall pay to the District as damages the amount stated in Section 01 00 00 for each and every day's delay in finishing the work in excess of the number of days specified. The parties expressly agree that this liquidated damage clause is reasonable under the circumstances existing at the time the Agreement was made. The District shall have the right to deduct the amount of liquidated damages from any money due or to become due the Contractor.

36.2 Notwithstanding the above, the parties expressly agree that the liquidated damages specified above do not include the District's legal, engineering, inspection, superintendence and other similar expenses. Accordingly, the District shall have the right to charge to the Contractor and to deduct from the final or progress payments for the work the

actual cost to the District of legal, engineering, inspection, superintendence, loss of revenue due to water delivery interruptions, and other expenses, which are directly chargeable to the Agreement and which accrue during the period of such delay, except that the cost of final inspection and preparation of the final estimate shall not be included in the charges.

37. Clean-Up

During the progress of the work, the Contractor shall maintain the site and related structures and equipment in a clean, orderly condition and free from unsightly accumulation of rubbish. Upon completion of work and before the final estimate is submitted, the Contractor shall at its own cost and expense remove from the vicinity of the work all equipment, temporary offices, temporary storage, rubbish, unused work materials, concrete forms, temporary bridging and other like materials, belonging to him or used under his direction during the construction; and in the event of his failure to do so, the same may be removed by the District after ten (10) calendar days' notice to the Contractor, such removal to be at the expense of the Contractor.

38. Compliance with Laws; Permits; Taxes

38.1 Contractor is an independent contractor and shall at its sole cost and expense do the following: comply with all laws, rules, ordinances and regulations of all federal, state and local agencies having jurisdiction over the work; procure all permits and licenses stated to be obtained by the Contractor, pay all charges and fees, and give all notices necessary and incident to the lawful prosecution of the work; pay all federal, state and local taxes, including manufacturers' taxes, sales taxes, use taxes, processing taxes, and payroll, wage, insurance, social security, and unemployment taxes on wages, salaries or any remuneration paid to Contractor's employees, whether levied under existing or subsequently enacted laws, rules or regulations; and pay all property tax assessments on materials or equipment used until acceptance by the District. If any discrepancy or inconsistency is discovered in the Plans or Specifications, or in this Agreement in relation to any such law, rule, ordinance, regulation, order or decree, the Contractor shall forthwith report the same to the Engineer in writing. The Contractor shall also protect, defend, hold harmless and indemnify the District, the Engineer, and all of the District's officers, directors, agents, and employees against any claim or liability arising from or based upon the violation of any such law, rule, ordinance, regulation, order or decree,

whether by the Contractor itself or by its employees. Particular attention is called to the following:

38.1.1 Without limitation, materials furnished and performance by Contractor hereunder shall comply with Safety Orders of the Division of Occupational Safety and Health ("Cal/OSHA"), State of California, Federal Safety regulations of the Bureau of Labor, Department of Labor; and any other applicable Federal regulations.

38.1.2 The Contractor, upon request, shall furnish evidence satisfactory to the District and Engineer that any or all of the foregoing obligations have been or are being fulfilled. The Contractor warrants to the District that it is licensed by all applicable federal, state and local governmental bodies to perform this Agreement and will remain so licensed throughout the progress of the work, and that it has, and will have, throughout the progress of the work, the necessary experience, skill and financial resources to enable it to perform this Agreement.

39. Prevailing Wage Penalties; Wage Claims Prohibited

39.1 The Contractor shall forfeit as penalty to the District not more than the sum of two hundred dollars ($200) and not less than forty dollars ($40) for each calendar day or portion thereof for each worker (whether employed by the Contractor or subcontractor) paid less than the stipulated prevailing rates for any work done under the Agreement in violation of the provisions of the California Labor Code and in particular, sections 1772 to 1780. The amount of this penalty shall be determined by the Labor Commissioner and shall be based on consideration of the contractor's mistake, inadvertence, or neglect in failing to pay the correct rate of prevailing wages, the previous record of the contractor in meeting its prevailing wage obligations, and a contractor's willful failure to pay the correct rates of prevailing wages. A mistake, inadvertence, or neglect in failing to pay the correct rate of prevailing wages is not excusable if the contractor had knowledge of its obligations under Labor Code sections 1720, et seq. In addition to the aforementioned penalty, each worker shall be paid the difference between the prevailing wage rate and the amount paid to each worker for each calendar day or portion thereof for which said worker was paid less than the prevailing wage.

39.2 The District will not recognize any claims for additional compensation because of the payment of the wages set forth in the Contract Documents. The possibility of wage increases is one of the elements to be considered by the Contractor in determining its Bid, and will not under any circumstances be considered as the basis of a claim against the District or the Engineer.

40. Labor Discrimination

Attention is directed to California Labor Code section 1735 which is applicable to the work under this Agreement and which reads as follows: "A contractor shall not discriminate in the employment of persons upon public works on any basis listed in subdivision (a) of Section 12940 of the Government Code, as those bases are defined in Sections 12926 and 12926.1 of the Government Code, except as otherwise provided in Section 12940 of the Government Code. Every contractor for public works who violates this section is subject to all the penalties imposed for a violation of this chapter."

41. Eight-Hour Day Limitation; Certified Payroll Reports

41.1 In accordance with the provisions of the California Labor Code, and in particular, sections 1810 to 1815, eight hours labor shall constitute a day's work, and no worker, in the employ of the Contractor, or any subcontractor, doing or contracting to do any part of the work contemplated by this Agreement, shall be required or permitted to work more than eight (8) hours in anyone calendar day and forty (40) hours in anyone calendar week in violation of those provisions; provided that subject to Labor Code Section 1815, a worker may perform work in excess of either eight (8) hours per day or forty (40) hours during anyone week upon compensation for all hours worked in excess of eight (8) hours per day or forty (40) hours during anyone week at not less than one and one-half times the basic rate of pay. Except as just provided, the Contractor shall forfeit as a penalty to the District the sum of twenty-five dollars ($25) for each worker employed in the performance of this Agreement by it or by any subcontractor under it for each calendar day during which such worker is required or permitted to labor more than eight (8) hours in anyone calendar day and forty (40) hours in anyone calendar week in violation of sections 1810 through 1815.

41.2 The Contractor shall comply in all respects with the provisions of Labor Code section 1776, whose provisions are incorporated herein by this reference. In accordance with section 1776, the Contractor and each

subcontractor shall keep an accurate record showing the names, addresses, social security numbers, work classifications, and straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by it in connection with the work specified therein, which record shall be open at all reasonable hours at the principal office of the Contractor to the inspection of the District, State and Federal officers and agents. Certified copies of the payroll records shall be furnished or made available for inspection to others as provided in section 1776. These payroll records shall be certified and shall be on forms provided by the State Division of Labor Standards Enforcement, or shall contain the same information as the forms provided by the Division. The Contractor shall file a certified copy of the payroll records with the entity that requested the records within 10 days after receipt of a written request. Any copy of records made available for inspection as copies and furnished upon request to the public or any public agency by the District, the Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement shall be marked or obliterated in a manner so as to prevent disclosure of an individual's name, address, and social security number. The name and address of the Contractor shall not be marked or obliterated. The Contractor shall inform the District of the location of the payroll records, including the street address, city and county, and shall, within five working days, provide a notice of a change of location and address. The Contractor shall have 10 days in which to comply subsequent to receipt of written notice specifying in what respects the Contractor must comply with this section. In the event that the Contractor fails to comply with the 10-day period, he or she shall, as a penalty to the District, forfeit one hundred dollars ($100) for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement, these penalties shall be withheld from progress payments then due.

42. Employment of Apprentices

The Contractor's attention is directed to California Labor Code sections 1777.5, 1777.6 and 1777.7 pertaining to employment of indentured apprentices, which are hereby incorporated by reference into this Agreement. As applicable, the Contractor or any subcontractor employed by it in the performance of the Agreement work shall take such actions as necessary to comply with the provisions of sections 1777.5, 1777.6 and 1777.7.

43. Water Pollution

The project area of disturbance has been determined to be under one acre and therefore the project does not require a storm water pollution prevention plan (SWPPP). The Contractor is responsible to provide erosion control and make every effort to protect the local streams and rivers. The Contractor shall comply with the California Fish and Game code section 5650 and all other applicable statues and regulations relating to the prevention and abatement of water pollution.

44. Patents

The Contractor shall assume all costs arising from the use of patented materials, equipment, devices, or processes used on or incorporated into the work, and agrees to indemnify, defend, protect and save harmless the District, the Engineer, and all of their officers, directors, employees, and other representatives, from all suits at law, or actions of every nature for, or on account of, the use of any patented materials, equipment, devices, or processes.

45. Public Convenience

This subsection defines the Contractor's responsibility with regard to convenience of the public and public traffic in connection with its operations.

45.1 The Contractor shall conduct its operations as to offer the least possible obstruction and inconvenience to the public; and it shall have under construction no greater length or amount of work than it can prosecute properly with due regard to the rights of the public.

45.2 Unless otherwise provided in the Contract Documents, all public traffic shall be permitted to pass through the work with as little inconvenience and delay as possible.

45.3 Spillage resulting from hauling operations along or across any publicly traveled way shall be removed immediately by the Contractor at its expense.

45.4 Construction operations shall be conducted in such a manner as to cause as little inconvenience as possible to abutting property owners.

45.5 Convenient access to the District Office driveways, houses and buildings along the line of the work shall be maintained and temporary approaches to crossings or intersecting highways shall be provided and kept in good condition. When the abutting property owner's access across the right-of-way line is to be eliminated, or to be replaced under

the Agreement by other access facilities, the existing access shall not be closed until the replacement access facilities are usable.

45.6 Water shall be supplied at Contractor's expense if ordered by the Engineer for the alleviation or prevention of dust nuisance as provided in the Contract Documents.

45.7 In order to expedite the passage of public traffic through or around the work, the Contractor shall install signs, lights, flares, barricades, and other facilities for the sole convenience and direction of public traffic. Also, the Contractor shall provide and station competent flag persons whose sole duties shall consist of directing the movement of public traffic through or around the work. The cost of furnishing and installing such signs, lights, flares, barricades, and other facilities, and the cost of providing and stationing such flag persons, all for the convenience and direction of public traffic, will be considered as included in the Agreement price and no additional compensation will be allowed.

45.8 Flag persons and guards, while assigned to traffic control, shall perform their duties and shall be provided with the necessary equipment in accordance with the current "Instructions to Flagmen" of the California Department of Transportation. The equipment shall be furnished and kept clean and in good repair by the Contractor at its expense.

46. Underground Utilities

Prior to conducting any excavation, the Contractor shall contact the appropriate regional notification center as required by and shall otherwise comply with California Government Code section 4216, et seq. In accordance with Government Code section 4215, the Contractor shall be compensated for the costs of locating, repairing damage not due to the failure of the Contractor to exercise reasonable care, and removing or relocating existing main or trunk line utility facilities not indicated in the Agreement Plans and Specifications with reasonable accuracy, and for the equipment on the project necessarily idled during such work; provided that the Contractor shall first notify the Engineer before commencing work on locating, repairing damage to, removing or relocating such utilities.

47. Safety and Trenching

47.1 The Contractor shall be solely and completely responsible for the conditions of the job site, 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 all applicable Federal, State, and local laws, ordinances, and codes, and to the rules and regulations established by Cal/OSHA, and to other rules of law applicable to the work. Any District obligations relating to safety of the Work are separate from and do not alter the Contractor's primary responsibility for safety as provided in this section.

47.2 The services of the Engineer in conducting construction review of the Contractor's performance is not intended to include review of the adequacy of the Contractor's work methods, equipment, bracing or scaffolding or safety measures, in, on, or near the construction site, and shall not be construed as supervision of the actual construction nor make the Engineer or the District responsible for providing a safe place for the performance of work by the Contractor, subcontractors, or suppliers; or for access, visits, use work, travel or occupancy by any person.

47.3 All work and materials shall be in strict accordance with all applicable State, Federal and local laws, rules, regulations, and codes. The Contractor shall carefully instruct all personnel working in potentially hazardous work areas as to potential dangers and shall provide such necessary safety equipment and instruction as is necessary to prevent injury to personnel and damage to property. Special care shall be exercised relative to electrical work, work involving excavation and in pump sump work.

47.4 Nothing in this Agreement is to be construed to permit work not conforming to governing law. When Contract Documents differ from governing law, the Contractor shall furnish and install the higher standards called for without extra charge. All equipment furnished shall be grounded and provided with guards and protection as required by safety codes. When vapor-tight or explosion-proof electrical installation is required by law, this shall be provided.

47.5 Shoring and Trench Safety Plan - Attention is directed to California Civil Code section 832 relating to lateral and subjacent support, and the Contractor shall comply with this law.

47.6 In accordance with California Labor Code section 6705, if the total amount of the contract is in excess of $25,000, the Contractor shall submit to the District for acceptance, in advance of excavation, 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 any trench or trenches 5 feet of more in depth.

47.6.1 The plan shall be prepared by a registered civil or structural engineer. 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.

47.6.2 The District or the 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 provided in an Appendix to the Specifications. The detailed plan showing the design of shoring, etc., which the Contractor is required to submit to the District for acceptance of excavation will be not accepted by the District if the plan is based on subsurface conditions which are more favorable than those revealed by the investigations made by the District or the 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.

47.6.3 The detailed 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.

47.6.4 Nothing contained in this section shall be construed as relieving the Contractor of the full responsibility for providing shoring, bracing, sloping, or other provisions which are adequate for worker protection. Review of the plan by the District 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 therefor.

47.6.5 In accordance with California Public Agreement Code section 7104, in the event that the work involves digging trenches or other excavations that extend deeper than four (4) feet below the surface, the Contractor shall promptly, and before the following conditions are disturbed, notify the District in writing, of any:

1. Material that the Contractor believes may be material that is hazardous waste, as defined in Section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law;
2. Subsurface or latent physical conditions at the site differing from those indicated by information about the site made available to bidders prior to the deadline for submitting bids; or,
3. Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Agreement.

The District shall promptly investigate the conditions, and if it finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the Contractor's cost of, or the time required for, performance of any part of the work shall issue a change order under the procedures described in the Agreement. In the event that a dispute arises between the District and the Contractor whet the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the Contractor's cost of, or time required for, performance of any part of the work, the Contractor shall not be excused from any scheduled completion date provided for by the Agreement, but shall proceed with all work to be performed under the Agreement. The Contractor shall retain any and all rights provided either by Agreement or by law which pertain to the resolution of disputes and protests between the contracting parties.

48. Protection of Person and Property

48.1 The Contractor shall take whatever precautions are necessary to prevent damage to all existing improvements, including above ground and underground utilities, trees, shrubbery that is not specifically shown to be removed, fences, signs, mailboxes; survey markers and monuments, buildings, structures, the District's property, adjacent property, and any other improvements or facilities within or adjacent to the work. If such improvements or property are injured or damaged by reason of the Contractor's operations, they shall be replaced or restored, at the Contractor's expense, to a condition at least as good as the condition they were in prior to the start of the Contractor's operations.

48.2 The Contractor shall adopt all practical means to minimize interference to traffic and public inconvenience, discomfort or damage. The Contractor shall protect against injury to any pipes, conduits or other structures crossing the trenching or encountered in the work and shall be responsible for any injury done to such pipes or structures, or damage to property resulting therefrom. The Contractor shall support or replace any such structures without delay and without any additional compensation to the entire satisfaction of the Engineer. All obstructions to traffic shall be guarded by barriers illuminated at night. The Contractor shall be responsible for all damage to persons and property directly or indirectly caused by its operations and, under all circumstances, it must comply with the laws and regulations of the County and the State of California relative to safety of persons and property and the interruption of traffic and the convenience of the public within the respective jurisdictions.

48.3 The Contractor is cautioned that it must replace all improvements in rights-of-way and within the public streets to a condition equal to what existed prior to its entry onto the job.

48.4 Type and time of construction required at any road subject to interference by Agreement work will be determined by those authorities responsible for maintenance of said road. It shall be the responsibility of the Contractor to determine the nature and extent of all such requirements, including provision of temporary detours as required; however, any construction right-of-way obtained by the District at affected roadways will be adequate for provision of all required detours. As required at any road crossing, the Contractor shall provide all necessary flag persons, guardrails, barricades, signals, warning signs and lighting to provide for the safety of existing roads and detours.

Immediately after the need for temporary detours ceases, or when directed, the Contractor shall remove such detours and perform all necessary cleanup work, including replacement of fences, and removal of pavement. Included shall be all necessary replacement of existing roadway appurtenances, grading work, soil stabilization and dust control measures, as required and directed. The cost of all work specified under this section shall be borne by the Contractor.

48.5 The Contractor shall examine all bridges, culverts, and other structures over which it will move its materials and equipment, and before using them, it shall properly strengthen such structures as necessary for their safe operation and use. The Contractor shall be responsible for any and all injury or damage to such structures caused by reason of its operations.

49. Responsibility for Repair of Facilities

All public or private facilities, including but not limited to canals, structures, telephone, cables, roadways, curbs, gutters, parking lots, private drives, levees and embankments for creeks, ponds and reservoirs disturbed during construction of the work shall be repaired and/or replaced by the Contractor to match facilities existing prior to construction. In addition, the Contractor shall be responsible for any settlement damage to such facilities or adjoining areas for a period of one year after acceptance of such required facilities.

50. District's Repair

In the event the Contractor refuses or neglects to make good any loss or damage for which it is responsible under this Agreement, the District may itself, or by the employment of others, make good any such loss or damage, and the cost and expense of doing so, including any reasonable engineering, legal and other consultant fees, and any costs of administrative and managerial services, shall be charged to the Contractor. Such costs and expenses may be deducted by the District from claims for payment made by the Contractor for work completed or remaining to be completed.

51. Contractor's License Notice

Statement required by California Business & Professions Code Section 7030: "Contractors are required by law to be licensed and regulated by the Contractor's State License Board which has jurisdiction to investigate complaints against contractors if a complaint regarding a patent act or omission is filed within four rears of the date of the alleged violation. A

complaint regarding a latent act or omission pertaining to structural defects must be filed within 10 years of the date of the alleged violation. Any questions concerning a contractor may be referred to the Registrar, Contractor' State License Board, P.O. Box 26000, Sacramento, California 95826."

52. Insurance

52.1 The Contractor shall procure and maintain for the duration of the Agreement the following insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work hereunder by the Contractor, its agents, representatives, employees or subcontractors.

52.2 Minimum Scope of Insurance. Coverage shall be at least as broad as:

52.2.1 Commercial general liability coverage (Insurance Services Office occurrence form CG 000 1), including liability coverage for premises and operations, explosion and collapse hazard, underground hazard, products/completed operations hazard, contractual liability, use of independent contractors, and broad form property damage with completed operations.

52.2.2 Automobile liability coverage (Insurance Services Office form CA 000 1, code 1, any auto).

52.2.3 Workers' compensation insurance as required by the State of California and employer's liability insurance.

52.2.4 Course of construction (also known as builder's risk) insurance

The Contractor shall procure, maintain, and keep in force at all times during the term of the Contract and until the date of transfer of the insurable interest to and acceptance by the District, at the Contractor's sole expense, Builder's Risk insurance with limits of liability equal to one hundred percent (100%) of the replacement cost of the Work.

1. Coverage shall be written on a completed value, non-reporting form, on a replacement cost basis, and shall cover the property against all risks of physical loss or damage including:
    a. Land movement and flood
    b. Loss that ensues from design error, defective materials, or faulty workmanship

c. Mechanical breakdown or electrical damage including testing, magnetic disturbance and changes in temperature or humidity.

The property covered shall include the Work, including any materials, equipment, or other items to be incorporated therein while the same are located at the construction site, stored off site, while in transit or at the place of manufacture. The policy shall contain a provision that both the interests of the District and the Contractor are covered and that any loss shall be payable to the District and the Contractor as their interests may appear.

Builder's Risk insurance shall include Delay in Opening coverage with limits of liability, and for the period of time, as set forth in the Section 01 00 00 Time Allowed for Completion and Liquidated Damages. Coverage shall include debt service, expense, loss of earnings or rental income or other loss incurred by the District, without deduction, due to the failure of the project being completed on schedule.

2. The maximum deductible for land movement and flood allowable under this policy shall be five percent (5%) of replacement value at the time loss or one hundred thousand dollars ($100,000), whichever is less, per occurrence and in the aggregate. The maximum deductible for all other perils allowable under this policy shall be ten thousand dollars ($10,000). All deductibles shall be borne solely by the Contractor, and the District shall not be responsible to pay any deductible, in whole or in part.
3. The District and the Contractor waive all rights against each other and against all other contractors for loss or damage to the extent reimbursed by Builder's Risk insurance or any other property or equipment insurance applicable to the Work, except such rights as they may have to the proceeds of such insurance. If the policies of insurance referred to in this section require an endorsement or consent of the insurance company to provide for continued coverage where there is a waiver of subrogation, the owners of such policies will cause them to be so endorsed to obtain such consent.

4. If not covered by Builder's Risk insurance or any other property or equipment insurance required by this Contract, the Contractor shall procure, maintain, and keep in force at all times during the term of the Contract, at the Contractor's sole expense, property insurance for portions of the Contractor's work and/or equipment to be incorporated therein stored offsite or in transit.

52.2.5 Environmental Liability Insurance

The Contractor shall procure, maintain, and keep in force at all times during the term of the Contract, at the Contractor's sole expense, Environmental Liability insurance which includes coverage for sudden and accidental pollution arising out of the handling of hazardous materials or hazardous wastes, non-hazardous materials or non-hazardous wastes that, when released to the environment, violate regulatory standards of the Federal, State or Local Government. If coverage for Environmental Liability insurance is written on a claims-made form, the following provisions apply:

1. Limit of coverage shall be not less than two million dollars ($2,000,000)
2. The "Retro Date" must be shown, and must be on or before the date of the Contract or the beginning of the Work.
3. Insurance must be maintained and evidence of insurance must be provided for at least one (1) year after completion of the Contract.

If coverage is cancelled or non-renewed, and not replaced with another claims-made policy form with a "Retro Date" prior to the Contract effective date, the Contractor must purchase "extended reporting" coverage for a minimum of one (1) year after completion of the Contract.

52.3 Minimum Limits of Insurance. The Contractor shall maintain coverage limits of not less than:

52.3.1 General Liability: $2,000,000 per occurrence for bodily injury, personal injury and property damage. If commercial general liability insurance or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to this project/location or the general aggregate limit shall be twice the required occurrence limit.

52.3.2 Automobile Liability: $1,000,000 per accident for bodily injury and property damage.

52.3.3 Employer's Liability: $1,000,000 per accident for bodily injury or disease.

52.3.4 Course of construction: Completed value of the project.

The above insurance limits can be met through provision of umbrella or excess policy insurance coverage consistent with the provisions of this subsection 52.

52.4 Deductibles and Self-Insured Retentions. Any deductibles or self-insured retentions must be declared to and approved by the District. At the option of the District, either: the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the District, its officers, officials, employees and volunteers; or the Contractor shall procure a bond guaranteeing payment of losses and related investigations, claim administration and defense expenses. The general or commercial general liability and automobile liability policies shall not provide that any self-insured retention or deductible can only be paid by the Contractor or a subcontractor. Contractor and all subcontractors appoint the District as their agent to pay any self-insured retention or deductible on said policies.

52.5 The general liability and automobile liability policies are to contain, or be endorsed to contain, the following provisions:

52.5.1 The District, its officers, officials, employees, agents and volunteers are to be covered as additional insureds as respects: liability arising out of activities performed by or on behalf of the Contractor, products and completed operations of the Contractor; premises owned, occupied or used by the Contractor; or automobiles owned, leased, hired or borrowed by the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to the District, its officers, officials, employees, agents or volunteers. The additional insured coverage or endorsement shall comply with California Insurance Code section 11580.04.

52.5.2 For any claims related to this project, the Contractor's insurance coverage shall be primary insurance as respects the District, its officers, officials, employees, agents and volunteers. Any insurance or self-insurance maintained by the District, its officers, officials, employees, agents or volunteers

shall be excess of the Contractor's insurance and shall not contribute with it.

52.5.3 Any failure to comply with reporting or other provisions of the policies including breaches of warranties shall not affect coverage provided to the District, its officers, officials, employees, agents or volunteers.

52.5.4 The Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.

52.5.5 Each insurance policy required by this section shall be endorsed to state that coverage shall not be suspended, voided, canceled by either party, or reduced in coverage or in limits except after 30 days' prior written notice by U.S. mail has been given to the District.

52.6 Course of construction policies shall contain, or be endorsed to contain, the following provisions: (a) District shall be named as loss payee; and (b) The insurer shall waive all rights of subrogation against the District.

52.7 Acceptability of Insurers. Insurance is to be placed with insurers with a current A.M. Best's rating of no less than A-:VII or equivalent and that are admitted to do business and in good standing in California, unless otherwise approved by District.

52.8 Verification of Coverage. Prior to commencing work, Contractor shall provide to District the following proof of insurance: (a) certificate(s) of insurance on ACORD Form 25-S (or insurer's equivalent) evidencing the required insurance coverages; and (b) endorsement(s) on ISO Form CG 2010 (or insurer's equivalent), signed by a person authorized to bind coverage on behalf of the insurer(s) and certifying the additional insured coverages, or equivalent additional insured blanket endorsement. The District reserves the right to require complete copies of all required insurance policies and/or endorsements affecting required insurance coverage at any time.

52.9 Subcontractors. The Contractor shall include all actions and activities of its subcontractors as insureds under its policies, or shall require each subcontractor to provide insurance coverage consistent with the foregoing and to furnish separate endorsements or certificates to the District. All coverages for subcontractors shall be subject to all of the requirements stated in this section.

52.10 Any products/completed operations insurance coverage shall be maintained after completion of the project for the full guarantee period.

52.11 The requirements as to the types, limits, and the District's approval of insurance coverage to be maintained by the Contractor are not intended to and shall not in any manner limit or qualify the liabilities and obligations assumed by the Contractor under the Agreement.

52.12 In addition to any other remedy the District may have, if the Contractor or any of the subcontractors fails to maintain the insurance coverage as required, the District may obtain such insurance coverage as is not being maintained, in form and amount substantially the same as required herein, and the District may deduct the cost of such insurance from any amounts due or which may become due the Contractor under this Agreement.

53. Indemnity and Litigation Cost

See Section 00 52 13 Agreement for Indemnity and Litigation Cost.

54. Protection of Work

54.1 The Contractor shall be responsible for the care of all work until its completion and final acceptance; and it shall, at its own expense, replace damaged or lost material and repair damaged parts of the work or the same may be done at its expense by the District and the Contractor and its sureties shall be liable therefor. The Contractor shall make its own provisions for properly storing and protecting all material and equipment against theft, injury, or damage from any and all causes. Damaged material and equipment shall not be used in the work. The Contractor shall take all risks from floods and casualties except as provided by law, and shall make no charge for the restoration of such portions of the work as may be destroyed or damaged by flood or other casualties or because of danger from flood or other casualties or for delays from such causes. The Contractor may, however, be allowed a reasonable extension of time on account of such delays, subject to the conditions hereinbefore specified. The Contractor shall install temporary fencing to separate the project site from the District office and it associated routine operations. With a 24 hour notice, the contractor shall make accessible, District facilities that are within the project site.

54.2 The Contractor shall effectively secure and protect adjacent properties, structures and other vegetation. Where special types of fences are encountered, the Contractor shall install temporary gates made of similar materials and of suitable quality to serve the purposes of the original fences. In all cases when the Contractor removes fences to

obtain work room, it shall provide and install temporary fencing as required, and on completion of construction shall restore the original fence to the satisfaction of the Engineer. All costs of providing, maintaining and restoring gates and fencing shall be borne by the Contractor. The Contractor shall provide and maintain all passageways, guard fences, lights and other facilities for protection required by public authority or local conditions.

54.3 The Contractor shall use care during construction to prevent damage from dust to adjacent properties. The Contractor, at its own expense, shall provide adequate dust control for the right-of-way and take other preventative measures as directed by the Engineer at no additional cost to the District.

54.4 The Contractor shall be responsible for all damage to any property resulting from trespass by the Contractor or its employees in the course of their employment, or subcontractors or their employees in the course of their employment, or anyone directly or indirectly employed by any of them, whether such trespass was committed with or without the consent or knowledge of the Contractor.

54.5 The Contractor shall see that the worksite is kept drained and free of all groundwater and any other water which may impede the progress or execution of the work.

54.6 The Contractor shall be responsible for any damage caused by drainage or water runoff from construction areas and from construction plant areas.

54.7 In an emergency affecting the safety of life, or of the work, or of adjoining property, the Contractor, without special instruction or authorization from the Engineer, is hereby permitted to act at its discretion to prevent such threatened loss or injury, and it shall so act without appeal if so instructed or authorized. Should the Engineer deem an emergency condition to exist, the Contractor shall immediately do those things and take those steps ordered by the Engineer. The decision of the Engineer in this respect shall be final and conclusive. Any claims for compensation made by the Contractor on account of emergency work shall be determined as specified under subsection 3.

54.8 Except as provided by California Government Code section 4215, the Contractor shall be responsible for the removal, relocation and protection of all public and private utilities, including irrigation facilities in the nature of utilities, located on the site of the construction project if and to the extent that the same are identified in the Contract

Documents; and the Contractor shall not be entitled to any extension of time or claim for damages for extra compensation in connection therewith. If and to the extent that such utilities or facilities are not identified in the Contract Documents, as between the Contractor and the District, the District will be responsible for the cost of their removal, relocation or protection, as the case may be, but the Contractor shall perform any such work in conformance with applicable provisions of subsection 3, if so directed by the Engineer and in such situation the Contractor shall not be responsible for delay in completion of the project caused by the failure of the District or the owner of the utility to provide for such removal or relocation. If the Contractor, while performing the work, discovers utility or irrigation facilities not identified by the District in the Contract Documents, it shall immediately notify the Engineer in writing.

54.9 When the work to be performed under the Agreement crosses or otherwise interferes with existing streams, watercourses, canals, farm ditches, pipelines, drainage channels, or water supplies, the Contractor shall provide for such watercourse or pipelines and shall perform such construction during the progress of the work so that no damage will result to either public or private interests; and the Contractor shall be liable for all damage that may result from failure to so provide during the progress of the work.

55. Accidents

55.1 The Contractor shall provide and maintain, in accordance with California Labor Code section 6708 and Cal/OSHA requirements, adequate emergency first-aid treatment for its employees and anyone else that may be injured in connection with the work.

55.2 The Contractor shall promptly report in writing to the Engineer all accidents of any nature arising out of, or in connection with, the performance of the work, on or adjacent to the site, which caused death, personal injury, or property damage, giving full details and statements of witnesses. In addition, if death or serious injury or serious damage are caused, the accident shall be reported immediately by telephone or messenger to the District and the Engineer.

55.3 If any 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 Engineer, giving full details of the claim.

56. No Personal Liability

The District, or their officers, directors, agents, or employees and Engineer shall not be personally responsible for any liability arising under the Agreement, except such obligations as are specifically set forth herein.

57. Basis and Measurement of Payment Quantities

57.1 It is the Contractor's responsibility to measure and/or compute the quantities of work completed, subject to verification by the District, under the terms of the Contract. In computing quantities, the length, area, solid contents, number, weight, or time as specified in the Contract or the Schedule of Values shall be used.

57.2 Unit Price Contracts

Payment for all work bid at a price per unit of measurement will be based upon the actual quantities of work as measured upon completion. The Estimated Quantities provided in the Bid Documents are for comparative bidding only. The District does not express or imply that the actual amount of work or materials will correspond to the Estimated Quantities. The Contractor shall make no claim nor receive any compensation for anticipated profits, loss of profit, damages, or any extra payment due to any difference between the amount of work actually completed, or materials or equipment furnished, and the Estimated Quantities. See also subsection 3.

57.3 Lump Sum or Job Contracts

Progress Payments will be based on the Schedule of Values prepared by the Contractor and approved by the District prior to acceptance of the first Progress Payment request (see subsection 59.9). If requested by the District, the Contractor shall furnish full copies of Subcontracts showing actual costs. The Schedule of Values shall be consistent with the baseline progress schedule prepared by the Contractor pursuant to Section 7-5.01, "Progress Schedule", of these Specifications.

57.4 Payment for Mobilization

Mobilization shall consist of preparatory work and operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the site; for the establishment of all offices, buildings, and other facilities necessary for the Work; and for all other work and operations which must be performed, or costs incurred, prior to beginning the Work.

57.5 Payment for mobilization will be as follows:

57.5.1 When the Contract does not include a separate pay item for mobilization, full compensation for mobilization will be included in the Contract lump sum price or in the prices paid for the various items of work in a unit price contract, and no additional compensation will be paid.

57.5.2 When the Contract or proposed Schedule of Values includes a separate item for mobilization, payment for mobilization will include full compensation for the furnishing of all labor, materials, tools, equipment, administrative costs, and incidentals for mobilization.

1. The District will pay no greater than five percent (5%) of the Total Contract Price as a separate pay item for mobilization. In the event the Contractor submits a mobilization pay item greater than five percent (5%) of the Total Contract Price, the District will pay any excess mobilization amount with the final Progress Payment.
2. Payment for mobilization will be prorated as follows: a. When the Progress Payment request is five percent (5%) or more of the original Total Contract Price (excluding mobilization), fifty percent (50%) of the contract item price for mobilization or two and one-half percent (2.5%) of the Total Contract Price, whichever is less, will be paid for mobilization.
    a. When the Progress Payment request is ten percent (10%) or more of the original Total Contract Price (excluding mobilization), seventy percent (70%) of the contract item price for mobilization or three and one-half percent (3.5%) of the Total Contract Price, whichever is less, will be paid for mobilization.
    b. When the Progress Payment request is twenty percent (20%) or more of the original Total Contract Price (excluding mobilization), ninety percent (90%) of the contract item price for mobilization or four and one-half percent (4.5%) of the Total Contract Price, whichever is less, will be paid for mobilization.
    c. When the Progress Payment request is fifty percent (50%) or more of the original Total Contract Price (excluding mobilization), one hundred percent (100%) of

the contract item price for mobilization or five percent (5%) of the Total Contract Price, whichever is less, will be paid for mobilization.

d. After final acceptance of the Contract, the amount, if any, of the Contract item price for mobilization in excess of five percent (5%) of the original Total Contract Price will be included for the final payment made in accordance with subsection 62.

3. The District will not pay additional mobilization compensation for work under a Change Order. Payment for mobilization shall be subject to retention per subsection 59.11.

58. Scope of Payment

58.1 The Contractor shall accept the compensation provided in the Agreement as full payment for furnishing all labor, materials, tools, equipment, and incidentals necessary to the completed work and for performing all work contemplated and embraced under the Agreement; also for loss or damage arising from the nature of the work, or from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the work until the acceptance by the District and for all risks of every description connected with the prosecution of the work; also for all expenses incurred in consequence of the suspension or discontinuance of the work as provided in the Agreement; and for completing the work according to the Specifications and Plans. Neither the payment of any estimate nor of any retained percentage shall relieve the Contractor of any obligation to make good any defective work or material.

58.2 No compensation will be made in any case for loss of anticipated profits. Increased or decreased work involving supplemental agreements will be paid for as provided in such agreements.

58.3 Unit Price Contract

Progress Payments will be made based on the unit price bid and measured quantities for work completed, plus work completed on approved Change Orders. For compensation for alterations in quantities of work, including deviations greater than twenty-five percent (25%), see subsection 3.

58.4 Lump Sum or Job Contract

Progress Payments will be based on the approved Schedule of Values for work completed, plus work completed on approved Change Orders.

58.5 Final Pay Items

An item designated as a Final Pay Item in the Contract shall be paid for as specified in subsection 9-1.015, “Final Pay Items”, of the State Specifications.

58.6 Allowances

Allowances may be included in the Bid Form for materials and/or work that may be added during the course of the Contract. The Allowance may be used in whole, in part, or not at all as determined by the District. Whenever costs of the Work included in the Allowance item are more or less than the specified Allowance amount, the Total Contract Price will be adjusted accordingly by Contract Change Order. The Contractor shall make no claim nor receive any compensation for anticipated profits, loss of profit, damages, or any extra payment due to any difference between the amount of work actually completed, or materials or equipment furnished, and the Estimated Quantities for the Allowance.

58.7 Payment for Material Not Incorporated in the Work

No Progress Payments will be made for materials and equipment not incorporated in the Work, unless specifically set forth in the Special Provisions or authorized by the District.

58.8 Work to be Done without Direct Payment

Compensation for any portion of the Work not specifically identified in the Bid Form or Schedule of Values is understood to be included in the price for other items, unless specified in the Special Provisions as extra work. No additional compensation is allowed for additional shifts or premium pay necessary to ensure that the Work is completed within the time limits specified in the Contract.

58.9 Payment for Use of Completed Portions of Work

If the District uses a completed or partially completed portion of the Work under subsection 29, the Contractor will be compensated in accordance with subsection 60. If the District accepts a completed or partially completed portion of the Work, the warranty period for that portion commences and the Contractor will be relieved of any further maintenance and protection of that portion. The Contractor will not be relieved of the Contract requirements for repairing or replacing defective work and materials.

59. Progress Payment Procedures, Retention Procedures and Withholdings

59.1 Progress Payment Procedures

No Progress Payment will be made when, in the judgment of the District, the Work is not proceeding in accordance with the provisions of the Contract or when the total work done since the last Progress Payment amounts to less than one thousand dollars ($1,000). On the 20th of each month, the Contractor shall submit in writing for District review an estimate of the total amount and value of work done, including that done under approved Change Orders, and the acceptable materials furnished and incorporated in the work through the 20th day of the month. The Bid Form or Schedule of Values shall be used to prepare a Progress Payment request for the items, or portions of items, of the Work completed during the monthly progress period. After deducting all previous payments, the retention as described in subsection 59.3, and other withholdings as specified in the Contract Documents from the estimated total value, the District will pay the Contractor the balance.

The payment of a Progress Payment or the acceptance thereof by the Contractor does not constitute acceptance of any portion of the Work, and does not reduce the Contractor’s liability to replace unsatisfactory work, material, or equipment. An inadvertence or error in an approved Progress Payment request will not release the Contractor or the Contractor's surety from damages arising from the work covered by the approved payment request or from enforcement of every provision of the Contract. The District has the right to correct any error made in any Progress Payment.

59.2 Inspection and Progress Payments Not a Waiver of Contract Provisions

No inspection, order, measurement, approval modification, payment, acceptance of work or material (including, but not limited to, acceptance of the entire Work), time extension, or possession of the Work or any part thereof shall be a waiver of any of the terms and conditions of the Contract, the powers reserved by the District, or any right of the District to damages or to reject the Work in whole or part. No breach of this Contract shall be construed a waiver of any other or subsequent breach. All remedies provided in the Contract shall be cumulative and shall be in addition to all other rights and remedies that may exist at law or in equity.

59.3 Retention Procedures

59.3.1 Retention to Ensure Performance

The District will retain ten percent (10%) of each Progress Payment to ensure performance under the Contract until thirty-five (35) days after filing of the Notice of Completion, see subsection 60.8.

59.3.2 Non-Compliance

The District may also retain portions of a Progress or Final Payment for Contract noncompliance in an amount deemed appropriate by the District.

59.3.3 Substitution of Securities

At the request and expense of the Contractor, in accordance with California Public Contract Code Section 22300, in lieu of the District withholding the ten percent (10%) retention defined in subsection 59.3.1, the Contractor may: 1) substitute a deposit of securities at least equivalent to the retention to be paid, or 2) request the District pay retention directly to an escrow agent.

The Contractor and District shall enter an escrow agreement in the exact form set forth in Public Contract Code Section 22300. All forms or correspondence pertaining to Security Deposit in Lieu of Withhold shall be addressed to:

Yuba County Accounting and Reporting
915 8th Street
Marysville, CA 95901

With a copy to District at:

Olivehurst Public Utility District
1970 9th Ave
Olivehurst, CA 95961

59.4 Withholdings/Denial of Progress Payment Request

59.4.1 The District may deny a Progress Payment request and/or withhold money from any Progress Payment to:

1. Cover any unpaid claims filed pursuant to Civil Code Sections 3179 et seq.;
2. Protect the District's interest; and/or
3. Pay any fines levied against the Work by the District or other entities.

59.4.2 The District may also deny a Progress Payment request and/or withhold money, or modify any previous Progress Payment, as necessary to protect the District from loss due to or affecting enforcement of:

1. Defective work not remedied.
2. Stop notices filed.
3. Failure of the Contractor to make payments properly to Subcontractors for labor, materials, or equipment.
4. Evidence that the Work cannot be completed for the unpaid balance of the Contract sum.
5. Evidence that the Work will not be completed within the Contract time.
6. Damage to the District or another contractor.
7. Failure to carry out the Work in accordance with the Contract.
8. Any violation or non-compliance with Contractor's legal responsibilities (see Section 6, "Legal Relations and Responsibilities", of these Specifications), including withholds for wages adjustments in accordance with California Labor Code Section1727 and any fines incurred by the District as a result of the Contractor's actions.

59.4.3 When, under the provisions of the Contract, the District charges any sum of money against the Contractor, the District will deduct and retain the amount of such charge from a Progress or Final Payment. If, on completion or termination of the Contract, sums due the Contractor are insufficient to pay the District charges against the Contractor, the District has the right to recover the balance from the Contractor or the Contractor's surety.

59.5 Deductions for Imperfect Work

For any portion of the Work retained in accordance with Section 5-19, "Right to Retain Imperfect Work", of these Specifications, the District will deduct from a Progress Payment a just and reasonable amount.

60. Completion and Final Acceptance

60.1 Definitions. The following definitions govern in interpreting this article and wherever such terms may appear in the Contract Documents:

60.1.1 "Final Completion" means the time when the Work has been fully completed in accordance with the Contract Documents and is ready for acceptance and final payment by the District.

60.1.2 "Final Inspection" means the inspection conducted by the District after to verify that the Work has reached Final Completion.

60.1.3 "The Final Punch List" is the listing of items that, in the Engineer's opinion, remain uncompleted after Substantial Completion but that must be completed by the Contractor prior to Final Completion.

60.1.4 "Semi-Final Inspection" means that inspection conducted by the Engineer to determine if the Work is Substantially Complete.

60.1.5 "Substantial Completion" means the Work has progressed to the point that:

1. Work is ready for beneficial use and occupancy by the District for the intended purpose
2. Fire and life safety work has been completed, inspected and accepted,
3. Mechanical and process systems and equipment are complete and have been put in automatic operation
4. The total value of uncompleted work is less than one-half of one percent of the Agreement Price and any approved cost extensions
5. Completing the Work will not significantly interfere with the District's convenience, or use or cost of operating the Work.

60.2 District's Right to Partial Use: When specifically provided for in the Contract Documents or when agreed to in writing by the District and the Contractor, the District may begin using a portion of the Work even though it is not Substantially Complete. In such a case, the Contractor, the District and the Engineer shall first agree on and document responsibilities for security, operation, safety, maintenance, utilities, insurance, warranties, and guarantees for that portion of the Work being used by the District. The District, the Contractor and the Engineer shall inspect such portion of the Work and shall prepare a list of work to be completed or corrected before final acceptance. The District's use of any portion of the Work shall not constitute final acceptance of that portion of the Work prior to Final Completion and

acceptance of the Work as a whole. The District shall allow the Contractor reasonable access to complete or correct work in areas being used by the District. Partial beneficial occupancy shall not relieve the Contractor of Liquidated Damages or waive any of the District's rights under the Agreement unless the Contract Documents expressly provide for and identify such portion of the Work to be considered Substantially Complete before the remaining portions of the Work or waiver of specific District rights.

60.3 Contractor's List of Deficiencies: When the Contractor considers the Work nearly complete, the Contractor shall review the Contract Documents, inspect the Work and prepare a list of deficiencies (Punch List). When the Punch List is prepared, the Contractor will deliver copies to the Engineer and the District. The Contractor shall complete or correct the items on the Punch List until, in the Contractor's opinion, the Work is Substantially Complete and ready for occupancy and use by the District. The Contractor shall then deliver the completed Punch List to the Engineer and notify the Engineer in writing that the Contractor believes the Work is Substantially Complete and ready for Semi-Final Inspection.

60.4 Semi-Final Inspection, Substantial Completion. After the Contractor notifies the Engineer in writing that it believes the Work is substantially complete, the Engineer will conduct the Semi-Final Inspection and may add additional items to the Contractor's Punch List. As a result of this inspection, the Engineer may determine one of the following:

60.4.1 The Work is not sufficiently complete to warrant a Semi-Final Inspection, additions to the Contractor's Punch List, or the preparation of a Final Punch List

60.4.2 The Work is sufficiently complete for the Engineer to prepare a Final Punch List but certain incomplete or Defective Work prohibits use of the Work for its intended purpose and therefore, the Work is not Substantially Complete;

60.4.3 The Work is Substantially Complete and usable for its intended purpose and the Engineer can prepare a Final Punch List.

In preceding cases (1) and (2), the Contractor shall continue the Work and call for a second Semi-Final Inspection when it believes the Work is ready. If the Contractor does not achieve Substantial Completion on the second attempt, it shall reimburse the District the cost of the Engineer's services for additional inspections. In case (3), the Engineer

will prepare a Final Punch List and a notice of Substantial Completion, which shall state the time agreed to by the District and the Contractor, not to exceed 30 days, in which the Contractor shall complete all remaining Punch List items and ready the Work for Final Inspection. The Engineer shall attach a copy of the Final Punch List to the notice of Substantial Completion. Time to complete punch list items provided in this subsection is for the convenience of the District and is intended as a deadline; and therefore, nothing in this section shall extend the time of completion for the Work fixed in the Contract Documents or excuse the failure of the Contractor to timely deliver the Work as complete in accordance with the Contract Documents.

60.5 Final Inspection, Final Completion: When the Contractor has completed or corrected all items on the Engineer's Final Punch List and has made all required final submittals, the Contractor shall give the Engineer written notice that the Work is ready for Final Inspection and acceptance and upon receipt of a final Application for Payment, the Engineer shall make a Final Inspection. If the Engineer finds the Work is not fully complete, it shall notify the Contractor of items still requiring completion or correction. The Contractor shall immediately correct these deficiencies and call for a re-inspection. When, on the basis of its knowledge of the Work, observations and inspections, the Engineer finds that the Work is acceptable and fully complete in accordance with the Contract Documents, and when all final submittals have been made, the Engineer will recommend that the District issue and file a Notice of Completion designating Final Completion of the Work, make Final Payment and accept the Work in accordance with the terms and conditions of the Contract Documents.

60.6 Contractor Responsibility: The Engineer's failure to include an item on the Final Punch List, to make the Semi-Final or the Final Inspection, or to recommend final acceptance shall not alter the Contractor's responsibility to complete all Work in accordance with the Contract Documents. If any lien or stop notice remains unsatisfied, the Contractor shall immediately take all steps necessary to remove any such lien or stop notice before Final Payment is made.

60.7 Waiver of Claims

The making of Final Payment shall constitute a waiver of claims by the Contractor except those arising from:

60.7.1 Liens, claims, security interests or encumbrances arising out of the Agreement and unsettled;

60.7.2 Failure of the Work to comply with the requirements of the Contract Documents; or

60.7.3 Terms of the one-year guarantee period and special warranties required by the Contract Documents.

60.7.4 Any of the Contractor's continuing obligations under the Contract Documents.

60.8 Notice of Completion

Upon completion of the Work, including acceptance of operation and maintenance manuals, Record Drawings, and test reports, the Agency will recommend to the Board that it accept the Contract as complete. Upon acceptance by the Board, a Notice of Completion will be filed with the County Recorder and a thirty-five (35) day lien period begins.

61. Final Payment

Within 10 days after the date of completion and Contractor's delivery to the District of a complete release of all liens arising out of this Agreement, or receipts in full covering all labor, materials and equipment for which a lien could be filed, or a bond satisfactory of the District to defend and indemnify the District against such liens, the District shall accept the Work and file in the office of the County Recorder, a Notice of Completion of the work herein agreed to be done by the Contractor. On the expiration of 60 days after the recordation of such Notice of Completion and there being no liens or stop notices filed, the difference between said final estimate and all payments theretofore made to the Contractor shall be due and payable to the Contractor, subject to any requirements concerning the furnishing of a maintenance bond, and excepting only such sum or sums as may be withheld or deducted in accordance with the provisions of this Agreement or as required by law. All prior certifications upon which partial payments may have been made, being merely estimates, shall be subject to correction in the final certificate. In accordance with California Public Agreement Code section 7107(c), in the event of a dispute between the District and the Contractor, the District may withhold from the final payment an amount not to exceed 150% of the disputed amount. If any liens are filed or exist after Final Payment is made, the Contractor shall refund to the District all money that the District may be compelled to pay in discharging such liens, including all costs and reasonable attorney's fees.

62. Final Release

Final payment to the Contractor in accordance with the final estimate is contingent upon the Contractor furnishing the District with a signed written

release of all claims against the District arising by virtue of the Agreement. Disputed Agreement claims in stated amounts may be specifically excluded by the Contractor from the operation of the release. The release shall be in substantially one of the following forms:

UNCONDITIONAL WAIVER AND RELEASE UPON FINAL PAYMENT

The undersigned has been paid in full for all labor, services, equipment or material furnished to the District for the **Plumas Lake WTP Manganese Treatment Expansion Project** located at the intersection of Plumas Lake Blvd and Algodon Road, in the community of Plumas Lake, CA, and does hereby waive and release any right to a mechanic's lien, stop notice, or any right against a labor and material bond on the job, except for disputed claims for extra work in the amount of $ _____.

Dated: _____

CONTRACTOR

_____ [Contractor name]

_____ [Authorized signature]

_____ [Printed Name]

_____ [Title]

Notice: This document waives rights unconditionally and states that you have been paid for giving up those rights. This document is enforceable against you if you sign it, even if you have not been paid.

If you have not been paid in full, use the following conditional release form:

CONDITIONAL WAIVER AND RELEASE UPON FINAL PAYMENT

Upon receipt by the undersigned of a check from the District in the sum of $ _____payable to Contractor and when the check has been properly endorsed and has been paid by the bank upon which it is drawn, this document shall become effective to release any mechanic's lien, stop notice, or bond right the undersigned has on the job of the District's **Plumas WTP Manganese Expansion Project** located at the intersection of Plumas Lake Blvd and Algodon Road, in the community of Plumas Lake, CA. This release covers the final payment to the undersigned of all labor, services, equipment, or material furnished on the job, except for disputed claims for extra work in the amount of $_____. Before any recipient of this document relies on it, the party should verify evidence of payment to the undersigned.

Dated: _____

CONTRACTOR

_____ [Contractor name]

_____ [Authorized signature]

_____ [Printed Name]

_____ [Title]

63. Right to Withhold Payments

In addition to all other rights and remedies of the District hereunder and by virtue of law, the District may withhold or nullify the whole or any part of any progress payment or withhold up to 150% of the disputed amount from the final payment (see Public Agreement Code section 7107(c)) to such extent as may reasonably be necessary to protect the District from loss on account of:

63.1 Defective work not remedied, irrespective of when any such work be found to be defective;

63.2 Claims or liens filed or reasonable evidence indicating probable filing of claims or liens including, but not limited to, claims under California Labor Code sections 1775, 1776, or 1777.7;

63.3 Failure of the Contractor to make payments properly for labor, materials, equipment, or other facilities, or to subcontractors and/or suppliers;

63.4 A reasonable doubt that the work can be completed for the balance then unearned;

63.5 A reasonable doubt that the Contractor will complete the work within the agreed time limits;

63.6 Costs to the District resulting from failure of the Contractor to complete the work within the proper time; or

63.7 Damage to work or property.

Whenever the District shall, in accordance herewith, withhold any monies otherwise due the Contractor, written notice of the amount withheld and the reasons therefor will be given the Contractor. After the Contractor has corrected the enumerated deficiencies, the District will promptly pay to the Contractor the amount so withheld. When monies are withheld to protect the District against claims or liens of mechanics, suppliers, materialmen, subcontractors, etc., the District may at its discretion permit the Contractor to deliver a surety bond in terms and amount satisfactory to the District, indemnifying the District against any loss or expense, and upon acceptance thereof by the District, the District shall release to the Contractor monies so withheld.

64. Waiver of Interest

The District shall have no obligation to pay and the Contractor hereby waives the right to recover interest with regard to monies that the District is required to withhold by reason of judgment, order, statute or judicial process, or may withhold pursuant to the provisions of this Agreement.

65. Satisfaction of Claims and Liens

Neither the final payment nor any part of the retained percentage shall become due until the Contractor, if required, shall deliver to the District, a complete release of all liens and claims arising out of this Agreement, or receipts in full in lieu thereof and, if required in either case, an affidavit that so far as it has knowledge or information the releases and receipts include all the labor and material for which a lien or claim could be filed; but the Contractor may, if any subcontractor refuses to furnish a release or receipt in full, furnish a bond satisfactory to the District, to indemnify the District against any lien or claim. If any lien or claim remains unsatisfied after all payments are made, the

Contractor shall refund to the District all monies that the latter may be compelled to pay in discharging such a lien, or claim, including all costs and reasonable attorney's fees.

66. Assignment

In accordance with California Public Agreement Code section 7103.5, the Contractor hereby offers and agrees to assign to the District 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 Contract Documents. This assignment shall be made and become effective at the time the District tenders final payment to the Contractor, without further acknowledgment by the parties.

67. Availability and Audit of Information

67.1 The District's duly authorized representatives shall have, during the term of the Agreement and for three years thereafter, the right to inspect, copy and audit all of the Contractor's and its subcontractors' books, accounts, records, and other material of all description, including but not limited to source documents and computer files, and to interview personnel, pertaining to the Agreement to verify or review the quantity, quality, work program and progress of the work, reimbursable costs, amounts claimed by the Contractor, pricing data, estimates of cost for fixed rates including those applicable to proposed changes, and for any other reasonable purposes. "Books," "accounts," and "records'; as used herein shall include, but not be limited to, original estimates, subcontracts, bids, proposals, purchase orders, books, documents, accounting records, papers, correspondence, project files and scheduling information, including the original Bid and all documents related thereto and to its preparation, the as-planned construction schedule and any related documents.

67.2 The Contractor's and its subcontractors' accounts shall be kept in accordance with generally accepted accounting principles in the particular industry and shall be kept in such a manner and in sufficient detail to clearly disclose the nature and amounts of the different items of service and cost pertaining to the Agreement and the basis for charges or allocations to the Agreement. The Contractor and its subcontractors shall preserve all such accounts and records for a period of three years after the term of the Agreement.

67.3 The Contractor shall include the necessary provisions in its subcontracts to ensure that its subcontractors comply with this provision.

67.4 The parties acknowledge that this Agreement, and performance and payments under this Agreement, are subject to examination and audit by the State Auditor General for three years following final payment under this Agreement pursuant to California Government Code section 8546.7.

68. Hazardous Materials

The California Health and Safety Code requires businesses to provide warnings prior to exposing individuals to materials listed by the Governor as chemicals "known to cause cancer or reproductive toxicity." The District may use chemicals on the Governor's list at many of its facilities. In addition, many of these chemicals are present at non-district-owned facilities and locations. Accordingly, in performing the work or services contemplated under this Agreement, Contractor, its employees, agents, and subcontractors may be exposed to chemicals on the Governor's list. Contractor is responsible for notifying its employees, agents, and Subcontractors that work performed hereunder may result in exposures to chemicals on the Governor's list.

69. Integration

The Contract Documents constitute the sole, final, complete, exclusive and integrated expression and statement of the terms of this contract among the parties concerning the subject matter addressed herein, and supersedes all prior negotiations, representations or agreements, either oral or written, that may be related to the subject matter of this Agreement, except those other documents that are expressly referenced in the Contract Documents.

70. Waiver

The waiver at any time by any party of its rights with respect to a default or other matter arising in connection with this Agreement shall not be deemed a waiver with respect to any subsequent default or matter.

71. Remedies Not Exclusive

The remedies provided in this Agreement are cumulative and not exclusive, and are in addition to any other remedies that may be provided by law or equity. The exercise by either party of any remedy under this Agreement shall be without prejudice to the enforcement of any other remedy.

72. Severability

The invalidity, illegality or unenforceability of any provision of the Contract Documents shall not render the other provisions unenforceable, invalid or illegal.

73. Governing Law and Venue

Except as otherwise required by law, this Agreement shall be interpreted, governed by, and construed under the laws of the State of California. Yuba County shall be venue for any litigation concerning the enforcement or construction of this Agreement.

74. Notices

Any notice, demand, invoice or other communication required or permitted to be given under this Agreement shall be in writing and either served personally or sent by prepaid, first class U.S. mail and addressed as follows: for the District, either to the Engineer or the District at the addresses set forth in the Invitation to Bid; for the Contractor, at the address set forth in its Bid. Any party may change its address by notifying the other party in writing of the change of address.

**** END OF SECTION ****

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Time Allowed for Completion and Liquidated Damages

PART 1 – GENERAL

1.01 Time Allowed for Completion

Substantial completion and final completion shall be completed by the dates specified herein.

Contractual Completion Event	Date of Completion
Substantial Completion – Plumas Lake WTP is operational and pumping water to the system. Site paving repairs completed.	July 15, 2024
Final Acceptance	August 15, 2024

For bidding purposes, the Notice to Proceed shall be July 30, 2023.

The time allowed for Substantial` Completion or Final Acceptance shall not be extended for delays that do not impact a critical path item of work.

Substantial Completion shall include all construction with the exception of final clean up and submittal of record drawings.

The time allowed for Substantial Completion and Final Acceptance shall include 36 weather delay days. Weather delay days in excess of 36 days may be added to the Contractor's date of completion for Substantial Completion and Final Acceptance.

1.02 Liquidated Damages

A. Contractor shall pay to the District liquated damages in the amount of five hundred ($500.00) per day for each calendar day after the date of Substantial Completion for which the contract is not substantially complete.

B. In addition to paragraph A above, Contractor shall pay to the District liquated damages in the amount of five hundred ($500.00) per day for each calendar day after the date of Final Acceptance for which the contractor has not received Final Acceptance.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

**** END OF SECTION ****

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PART 1 – GENERAL

1.01 Work Covered by Contract Documents

A. The work consists of supply, construction, and installation of the following list of items/activities. This partial list of items/activities is not intended to describe the complete extent of the Contract requirements outlined by these Drawings and Specifications. The Contractor shall make an independent determination of all project requirements and include all associated costs in their bid. The facility to be constructed under this contract will include, but not be limited to, the following components:

1. Removal of 14-inch above grade Backwash Supply (BWS)
2. Abandon in place a portion of the 14-inch below grade BWS
3. Removal of 6-inch surface wash waterline
4. Removal of the surface wash booster pump and its associated electrical. The surface wash booster pump base to remain.
5. Removal of 12-inch filter bypass waterline
6. Installation of new reinforced concrete pad and filter footings for three new filters and a fourth future filter (designed by Contractor)
7. Installation of three (3) filters (supplied by others). The Contractor to remove filters from loading truck and store at the WTP until the filter pad is ready for them to be installed.
8. Replacement of two (2) 10-inch Magnetic Meter Retrofits (existing filters 1 and 2 effluent)
9. Replacement of one (1) 12-inch Magnetic Meter Retrofit (existing filter to waste)
10. Installation of two (2) new 10-inch MOV butterfly valves (existing filters 1 and 2 effluent)
11. Installation of two (2) new 12-inch MOV butterfly valves (existing filters 1 and 2 rinse to waste)
12. Installation of four (4) new 12-inch MOV butterfly valves (existing filters 1 and 2 influent and backwash)
13. Installation of one (1) new 12-inch MOV valve (existing filter to waste)
14. Installation of three (3) new 12-inch magnetic meters (new filter effluents)
15. Installation of eight (8) new 12-inch MOV valves (new filter influent, effluent, rinse to waste, backwash)
16. Installation of one (1) new 16-inch MOV valve (combined filter effluent) in a new vault

17. PLC Replacement
18. PLC Programming and facility controls and alarms will be completed under a separate contract.
19. Retrofit one (1) new pressure transducer (existing filter influent)
20. Retrofit two (2) new pressure transducers (existing each filter effluents)
21. Install three (3) new pressure transducers (new filter effluent piping)
22. Plant piping to connect the new filters to the facility's existing piping.
23. Plant piping required to retrofit new meters and valves into existing piping.
24. Electrical: Conductors and conduits to operate the new and existing filter instruments, magnetic meters, MOV valves and pressure transducers.
25. Paving Repair: Paving repair where existing paving is damaged due to improvements.
26. All permits required by Yuba County (OPUD project is exempt from building and zone requirements)

B. Key components of the work are as follows:

1. Provide submittal data for the equipment referenced in the contract specifications and drawings.
2. Provide Operational and Maintenance Manuals for all specified equipment
3. Independent 3rd party testing by Contractor including concrete, compaction, and electrical testing or any other testing as specified in the Specifications.

C. Engineering Estimate: The Engineer's Opinion of Probable Cost for the Water Plant Project is 1,800,000.

1.02 Location

Work is to be performed on property owned by the District. The property is located on Plumas Lake Blvd, 2,600-ft west of River Oaks Blvd in Plumas Lake, CA 95961.

1.03 Contractor Use of Site (and Premises)

A. Construction Time: Time restrictions for performing all work is 7:00 a.m. to 6:00 p.m. Monday through Friday. Special approval will be required by the Engineer if a modification of the time schedule is required.

B. Site Security: The Contractor shall be responsible for securing their equipment within the project area. The District has existing onsite security and surveillance to assist the Contractor in the security of the Plant Site. The Contractor is still responsible for all equipment that they move onsite through final acceptance.

C. Site Access During Construction: The Contractor will be responsible for maintaining routine access to the site for District Staff and the project's inspector.

D. Emergency Exit: The contractor is responsible for maintaining safe emergency exiting for the District's, General Contractor's, and Contractor's personnel and agents in all areas affected by the Contractor's work.

1.04 Existing Operability of the Existing Facility

The existing operation of the Plumas Lake WTP cannot be out of service more than 10 hours per day and meet the operational requirement as stated in Section 01 45 23.

1.05 Type of Contract

The Work covered by these Contract Documents shall be provided as detailed in Section 00 41 43 – Bid Schedule.

1.06 Work Sequence

A. The sequence of work shall provide for the following requirements:

1. Provide submittals for Engineer's review and approval.
2. Develop a control point to establish grade
3. Order the materials and construct the facilities per the plans and specifications
4. Work with the District to phase construction work to avoid disruption to the operation of the WTP through September 2023.
5. After September, The WTP can be taken out of service with prescheduled shutdowns to testing the facility operation due to the PLC replacement programming.
6. Compile into binders and submit the operational and maintenance manuals for all equipment provided
7. Provide record drawings for the facilities constructed

1.07 Delivery (Staging Area)

The Contractor will be responsible for obtaining a delivery or staging area during construction if the existing project site does not meet their needs. If the Contractor uses an offsite delivery or staging area, the agreement to use this property will only be between that property owner and the Contractor. The Contractor understands that the District will assume no liability for the use of any offsite property by the Contractor.

1.08 Change Procedures

Change procedures are described in Section 00 72 43.

1.09 Regulatory Requirements

A. The codes and regulations together with local amendments when applicable adopted by the State and other governmental authorities having jurisdiction shall establish minimum requirements for this project. This project shall comply with the following:

1. International Building Code (IBC)
2. California Fire Code (CFC)
3. California Mechanical Code (CMC)
4. California Plumbing Code (CPC)
5. National Electric Code (NEC)
6. California Building Code
7. California Code of Regulations
    a. Title 8, Industrial Relations: Including CAL-OSHA and Elevator Safety Orders.
    b. Title 19, Public Safety: Portions of the work regulated by the State Fire Marshal.
8. Regional Water Quality Control Board, Division of Drinking Water

B. The latest edition of the requirements, standards, or codes in effect at the date of submission of bids shall apply.

C. In cases where the Contract Documents are more restrictive than applicable codes, the Contractor shall comply with the Contract Documents.

1.10 Reference Standards

A. When these specifications state that Work or tests shall conform to specific provisions in a referenced standard, specification, code, recommendation, or manual published by an association, organization, society, or agency the referenced provisions, as they apply to the Work of the Contractor, only shall be considered a part of these specifications as fully as if included in total. When these

specifications or applicable codes contain higher or more restrictive requirements than those contained in reference standards these specifications or applicable codes shall govern.

B. The latest edition of a referenced standard published at the time of submission of bids shall apply unless a specific date for the referenced standard is cited in these specifications.

C. General Provisions in referenced standards, specifications, manuals, or codes shall not change the specific duties and responsibilities between any of the parties involved in this work from those described in the General Conditions. Provisions in referenced standards with regard to measurement and payment shall not apply to this Work unless specifically cited.

1.11 Specification Language and Style

A. Many parts of the Specifications as well as notes on the Drawings are written in the active voice and are addressed to the Contractor.

1. When words or phrases requiring an action or performance of a task are used, it means that the Contractor shall provide the action or perform the task. For example: provide, perform, install, furnish, erect, connect, test, operate, adjust or similar words mean that the Contractor shall perform the action or task as referred whether the work Contractor is included.
2. When words or phrases requiring selection, acceptance, approval, review, direction, designation, or similar actions are referred to, it means that such actions are the Engineer's prerogative, and that the Contractor must obtain such action before proceeding.

B. Requirements in the Specifications and Drawings apply to all work of a similar type, kind, or class even though the word "all" or "typical" may not be stated.

1.12 Provisions for Future Work

The drawings show the following for provisions for future work:

A. Location of future piping, reservoir, and booster pumps

1.13 Document Existing Conditions

Prior to commencing the Work, examine the site with the Engineer. The contractor shall examine and document photographically and in writing the condition of existing structures, pavement, curbs, streel lights, improvements, and landscaping on or adjacent to the project site which are not to be disturbed as part of the project. This record shall serve as a basis for determination of subsequent damage due to the Contractor’s operations and

shall be signed by all parties making the examination. Record existing conditions on a flash drive by making color photographs. Any damage to existing facilities which cannot be shown from the initial examination records as pre-existing shall be the responsibility of the Contractor to repair or replace to the satisfaction of the Engineer.

1.14 Shutdown of Existing Utilities, Services or Operations

A. Obtain the Engineer's approval at least seven (7) days prior to the shutdown of any utility, service, or operation of any existing facility. Give required notice and make appropriate arrangements with utility owners and other affected parties prior to shutdown of any utility service. The Contractor's Bid shall include the cost of premium time to perform work requiring utility shutdowns on weekends or outside of normal working hours.

B. Schedule utility service or operations shutdowns for periods of minimum use and at the District's convenience. Have all required material, equipment, and workers on site prior to beginning any work involving a possible shutdown. Perform work as required to reduce shutdown time to the minimum. In some cases, this may require increased numbers of workers and/or premium time for night or weekend work.

C. The Agreement Price shall include the cost of additional workers and premium time work required to minimize the impact of utility service or operations shutdowns.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 Project Coordination

A. Any construction work requiring the shutdown of facilities must be scheduled and performed per subsection 1.14.

B. In addition to the above, the Contractor shall:

1. Coordinate scheduling, submittals, and work of the various sections of specifications to assure efficient and orderly sequence of installation of interdependent construction elements with provisions for accommodating items installed later.
2. Verify that the utility requirement characteristics of operating equipment are compatible with utilities planned to be provided. Coordinate work of various sections having interdependent

responsibilities for installing, connecting to, and placing such equipment in service.

3. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on drawings. Follow routing shown for pipes and conduit as closely as practicable; place runs parallel with line of building. Utilize space efficiently to maximize accessibility for other installations, maintenance, and repairs.
4. In finished areas except as otherwise indicated, conceal pipes and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
5. Coordinate completion and cleanup of work of separate sections in preparation for Substantial Completion and for portions of work designated for the District's partial occupancy.
6. Since this is an active District Facility, coordinate access to site for contract work, correction of defective work, and work not in accordance with Contract Documents, to minimize disruption of the District's activities.

3.02 Utility Relocations

Any pipe, fittings or valves that require relocation will be replaced with new.

**** END OF SECTION ****

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PART 1 – GENERAL

1.01 General

The Contractor shall be familiar with all items of the Project requiring coordination as well as plan the Work to ensure orderly progress and completion within the Contract Time. The Contractor shall coordinate the work of all subcontractors.

1.02 Existing Utilities

A. Only District Personnel shall operate existing water valves and the existing onsite facilities unless otherwise directed by the Engineer.

B. The Contractor shall coordinate their construction activities closely with the utility service companies. The Contractor shall give at least 72 hours (three business days) notice to the utility service companies prior to the time when field location of existing services will be required.

C. Obtain best available current information on location, identification and marking of existing utilities, piping, and conduits and other underground facilities before beginning any excavation. Call 811/800-227-2600 for information at least 48 hours in advance of beginning work. Give the Engineer 24-hour notice before beginning work.

D. The location of existing utilities and underground facilities known to the Engineer are shown in their approximate location based on information available at the time of preparing the Drawings. The actual location, size, type, and number of utilities and underground facilities may differ from that shown and utilities or underground facilities may be present that are not shown.

E. Use extreme care when excavating or working in areas that may contain existing utilities, process piping, conduits, or other underground facilities. Use careful potholing, hand digging, and probing to determine the exact location of underground installation(s). Some locations contain multiple pipes or conduits. Prior to performing any subsurface work, investigate, determine, and prepare a plan to turn off or disconnect each utility believed to be within 100 feet of the subsurface work in the event of an accidental breach of a utility conduit.

F. Where connections to existing utilities or other underground facilities are required or where new piping or conduits may cross or interfere with existing utilities or underground facilities, carefully excavate and uncover existing installations to a point 1 foot below the piping or

conduit to determine the actual elevation and alignment. Call the Engineer's attention to differing existing conditions that may require a clarification or change.

G. Shutdown of existing utilities, services, or operations shall be done in accordance with Section 01 11 00, Subsection 1.14.

H. The Contractor shall not install off site tie-ins or offsite connection points until the location and configuration has been reviewed and approved by the Engineer.

1.03 Preconstruction Meeting

A. Prior to beginning of Work, the Contractor and their key personnel and Subcontractors including the Contractor's Superintendent shall attend a meeting with the District and the Engineer to discuss the following related to the Forty Mile Water Plant Construction:

1. Name, Authority, and Responsibility of Parties Involved
2. Project Procedures:
    a. Progress meetings
    b. Correspondence
    c. Notification
    d. Submittal of Product Data, Shop Drawing Samples, and Proposed Equivalents
    e. Requests for Information
    f. Response to Requests for Information
    g. Requests for Quotation
    h. Work Directive Change
    i. Change Orders
    j. Engineer's "Items of Concern List"
3. Temporary Schedule and Contractor's Construction Schedule
4. Pay Requests
5. Temporary Facilities and Control
6. Testing During Construction
7. Contractors Coordination
8. Mechanical/Electrical Coordination
9. Maintenance of Record Drawings
10. Owner Provided Items or Work and Owner Furnished Contractor Installed Items
11. Early Beneficial or Partial Occupancy
12. Final Testing, Startup, and Balancing
13. Owner Training
14. Punch Lists and Project Closeout Procedures
15. Final Deliverables including Record Drawings, Operation and Maintenance Manuals, and Special Guarantees.

1.04 Progress Meetings

A. Progress meetings will generally be held bi-weekly and scheduled by the Contractor. During period of reduced construction activity, the Engineer may cancel some progress meetings.

B. Schedule - The meeting will generally be held at the Plumas Lake WTP's Operations Building Office on Tuesdays at 9:00 a.m. The Contractor will notify participants, set the agenda and administer the meeting. Contractor shall notify major subcontractors and suppliers, as appropriate. The Engineer will maintain dated record of: (1) actions required and taken and (2) decisions needed and made.

C. Attendance:

1. District's representative (optional)
2. Engineer and/or resident project representative.
3. Contractor's project manager or project superintendent
4. Subcontractor, as appropriate to the agenda
5. Suppliers, as appropriate to the agenda
6. Other parties as determined by Engineer and/or the District

D. Agenda:

1. Review minutes of previous meeting
2. Review of work progress since previous meeting
3. Review field observations, problems, and conflicts
4. Review problems which impede construction schedules
5. Review of off-site fabrication, delivery schedules
6. Review corrective measures and procedures to regain projected schedule.
7. Review revisions to construction schedules.
8. Review plan progress, schedule, during succeeding work period
9. Review coordination of schedules
10. Review submittal schedules; expedite as required
    - Review maintenance of quality standards
11. Review proposed changes for:
    - Effect on construction schedule and on completion date
    - Effect on other contracts of the project
12. Other business

E. Minutes – Contractor will prepare and distribute copies to participants and District for review at the next meeting.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

**** END OF SECTION ****

Field Engineering

PART 1 – GENERAL

1.01 Summary

The Contractor shall provide field surveying to make elevations and grades as well as locate the new facilities being constructed.

1.02 Field Surveying

A. Utilizing the District's reference points, the Contractor shall establish the initial control base line and all control bench marks to be utilized throughout the project. The base line shall be set in accordance with all lines, dimensions, reference points, and elevations given in the Contract Documents.

   Should the Contractor detect a discrepancy between the information as presented in the Contract Documents and any existing survey grid work, bench marks, structures, etc., the Contractor shall notify the Engineer immediately. New construction shall not commence until accurate control base lines and bench marks have been established.

B. The Contractor shall, throughout the course of the project, set all additional stakes which are needed for offset stakes, reference points, slope stakes, pavement and grade stakes, stakes for structures, storm drains, utilities, fence, culverts, or other structures, supplementary bench marks, and any other horizontal or vertical controls necessary to secure a correct layout and construction of the work. Stakes for line and grade for storm drains, etc., shall be set at twenty-five (25) foot maximum intervals. Base lines shall be staked in such manner as to clearly define them for the project.

C. It shall be the Contractor's responsibility that the finished work conform to the lines, grades, elevations and dimensions called for in the Contract Documents. The Work shall be subject to checking by the Engineer, but any inspection or checking of Contractor's layout by the Engineer and the acceptance of all or part of it shall not relieve the Contractor of his responsibility to secure the proper dimensions, grades, elevations and locations on the several parts of the Work. The Contractor shall exercise care in the preservation of stakes, monuments and bench marks and shall have them reset at his expense when they are lost or displaced.

D. Prior to the commencement of any Work activity, the Contractor shall survey and layout the Work to be performed and advise the Engineer of any conflicts, obstructions, concerns, etc. which will prevent completion of such work in accordance with the requirements of the Contract Documents. If the Contractor fails to conduct such survey

and layout or if the survey and layout fails to identify a conflict, obstruction, etc., which it reasonably should have, and a conflict, obstruction, concern, etc., is discovered, the Contractor shall bear the cost of any standby time for labor and/or equipment which occurs pending the Engineer's direction and the cost of rework of any Work installed which is affected by the conflict, obstruction, etc.

E. Where the dimensions and locations of existing structures are of importance in the installation or connection of any part of the Work, the Contractor shall verify such dimensions and locations in the field before the fabrication of any material or equipment which is dependent on the correctness of such information.

1.03 Preservation of Reference Points and Property Corners

The Contractor shall carefully preserve bench marks, reference points, lot corners, section corners and other stakes, and in case of destruction shall be charged for the resetting of such points and shall be responsible for any mistakes that may be caused by their unnecessary loss or disturbance. Price for resetting such points will be deducted from Contractor's monthly pay request. Resetting of property or section corners shall be by a surveyor licensed to practice in California.

1.04 Survey Notes

Contractor shall maintain survey notes in a neat and legible format. Contractor shall provide a duplicate set of survey notes for all staking operations to the Engineer for record purposes no later than twenty-four hours after the stakes are set. The Engineer reserves the right to monitor the work of survey crews as judged necessary to show conformance with this specification. However, such monitoring shall in no way relieve the Contractor of the responsibility for survey accuracy and adequacy to obtain a finished product fully conforming to the Contract Documents. Failure to provide adequate notes in the time specified shall be justification for immediate suspension of all work.

1.05 Utility Location Documentation

A. Contractor shall provide the document all northing and eastings of the following underground utilities that are being installed:

1. All water and wastewater pipe inverts that are required to avoid utility conflicts
2. Tie-ins to existing waterlines
3. Bends
4. Gate Valves

1.06 Location Potholing

Potholing to be conducted 2-4 weeks prior to construction (Unless determined otherwise by District Engineer). For any discrepancies, allow District Engineer up to 4 weeks for resolution.

**** END OF SECTION ****

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PART 1 – GENERAL

1.01 Scope of Work

The Contractor shall test all piping, valves, and appurtenances installed under these Contract Documents. Testing shall be performed concurrent with installation. Unless otherwise approved by the Engineer each pipe run shall be tested once installed.

1.02 Submittals

The Contractor shall prepare and submit to the Engineer schedules and procedures for testing of all parts of the water main installed in accordance with Section 01 33 13. The schedule shall be submitted seven days prior to any testing.

1.03 References:

A. AWWA C600 – Installation of Ductile-Iron Water Mains
B. AWWA C605 – Underground Installation of PVC Pipe and Fittings
C. AWWA C200 – Steel Water Piping 6-in and Larger

PART 2 – PRODUCTS

2.01 Equipment

The pump, pipe connections, and all necessary apparatus for the pressure and leakage tests, shall be furnished by the Contractor. The Contractor shall make all excavations and backfills accessible for pressure testing by the District or Engineer and shall furnish all necessary assistance for conducting the tests.

PART 3 – EXECUTION

3.01 General

The Contractor shall follow the hydrostatic testing method in accordance with ANSI AWWA C600, Section 5.2 Hydrostatic Testing, these specifications, and OPUD's Standards.

Air shall be vented from all high points in the line. If required, the Contractor shall provide a corporation stop in a saddle at these points to provide venting. All valves controlling the section to be tested shall be closed. A test pressure of 150 psi minimum, or 1-1/2 times the normal working pressure, whichever is greater, shall be applied and held for a period of 2 hours. The tank overflow and drain lines shall be tested to the pressure of 40 psi. The Contractor shall provide the necessary pump and a calibrated container for measurement of make-up water required to replace leakage during this 2-hour period.

Allowable leakage in the section during this test shall conform to the following method:

$$L = \frac{ND(P^{1/2})}{74000}$$

Where: L = allowable leakage, in gallons per hour N = number of joints D = nominal diameter of pipe, in inches P = average test pressure during test, in psig (gauge).

All defective items discovered during the pressure test shall be repaired or replaced by the Contractor at no additional cost to the District. The test shall be repeated after any repair until the system meets the above leakage requirement. The test will be witnessed by the Engineer.

3.02 Filling and Testing

Each segregated section of pipeline will be slowly filled with water insuring that all air is expelled. Extreme care must be taken to insure all air is expelled from the pipeline during the filling of pipe with water. The line shall stand full of water for twenty-four hours prior to testing to allow all air to escape. If necessary, tap the main at points of highest elevation so that air can be expelled as the pipe is filled with water. After successful completion of filling and air expulsion, but prior to testing, the corporation stops shall be removed and the taps tightly plugged.

****END OF SECTION****

PART 1 – GENERAL

1.01 Summary

Provide submittals as required in the specifications. All items shall be submitted to the Engineer. Any submittals not conforming to the requirements of this section shall be returned, without a review, for correction.

1.02 Submittal Procedures

Accompany each submittal with a letter of transmittal, containing the following information:

A. The name and phone number of the Contractor who prepared the submittal

B. The project name and identifying submittal number

C. Description of the submittal and reference to the Contract requirement or technical specification section being addressed

D. Certification that submittal complies with Contract Documents with all exceptions, or request for substitutions, clearly identified and noted

E. Submittals shall be sequentially numbered; re-submittals shall have the same number with a sequential letter suffix.

F. Reserve space at the bottom of the letter of transmittal for check boxes for the submittal status, 4-6 lines for the Engineer's comments and a line for the Engineer's signature and date. Provide a sample letter of transmittal to the Engineer prior to the first submittal.

1.03 Shop Drawings Submitted for Review

A. This paragraph covers submittal of Shop Drawings required for the Engineer's review as required in the Contract Documents. The Term "Shop Drawings" shall be understood to include shop drawings, detail design calculations, lists, catalog cut sheets, data sheets, operating instructions, installation instructions, fabrication details, and similar information as may be necessary to show that the materials and equipment meet the requirements of the Contract Documents.

B. Number and Type of Submittals:

1. Hard Copies:
   a. Shop Drawings: Submit Two (2) clear, sharp, high-contrast copies
   b. Product Data: Submit Two (2) clear copies

2. Electronic:
   a. All submittals shall be provided in an Adobe PDF Format

C. Submittal Schedule – The Contractor shall make all submittals early enough to allow adequate time for the Engineer's review, manufacture, and delivery at the construction site without causing delay to the Work. Submittals shall be made early enough to allow for unforeseen delays such as:

1. Re-submittals because of inadequate or incomplete submittal information or because the item submitted does not meet the requirements of the Contract Documents
2. Delays in manufacture
3. Delays in delivery – The Contractor shall allow 2 weeks for the Engineer's review of each submittal and one (1) week for each re-submittal. One (1) additional week may be required if the submittal contains requests for substitutions. If the Contractor requires more than one (1) re-submittal, the Contractor shall reimburse the Owner for the cost of the Engineer's additional review effort.

D. Content of Submittals:

1. Each submittal shall include all of the items and material required for a complete assembly, system, or Specification Section.
2. Submittals shall contain all of the physical, technical, and performance data required by the specifications or necessary to demonstrate conclusively that the items comply with the requirements of the Contract Documents.
3. Provide verification that the physical characteristics of items submitted, including size, configuration, clearances, mounting points, utility connection points, and service access points, are suitable for the space provided and are compatible with other interrelated items that are existing or have or will be submitted.
4. Label each Product Data Submittal and Shop Drawing with the information required in paragraph 1.03 B of this Section. Highlight or mark every page of every copy of all Product Data submittals to show the specific items being submitted and all options included or choices offered.

E. Submittal Verification:

1. Similar items, equipment, devices, or products furnished under a single specification section shall all be made by the same maker and have interchangeable parts.

2. All similar materials or products that are interrelated or used together in an assembly shall be compatible with each other.

F. Contractor Approval – The Contractor shall review, date, and sign submittals before sending them to the Engineer. By making such a submittal, the Contractor shall acknowledge the following:

1. Items submitted meet the requirements of the Project Manual, or else any deviations are identified and described in a separate letter accompanying the submittal.
2. Items submitted have been coordinated with and meet the requirements of other submittals and the Work as a whole and quantities and dimensions are correct.

G. Requests for substitution:

1. Cite the specific Contract requirement including the Specification Section and paragraph number for which approval of a substitution is sought.
2. Describe the proposed alternate material, item, or construction and explain its advantages and/or disadvantages to the Owner.
3. State the reduction, if any, in Contract Price that is offered to the Owner.

H. Engineer's Review Procedure and Meaning:

1. The Engineer will list comments and sign the letter of transmittal for each submittal prior to returning it to the Contractor.
2. A submittal review is not intended to apply to materials not included in the submittal even if omitted materials are related to the subject of the submittal.
3. The Engineer will assign a submittal status to each submittal. The statuses and their meanings are as follows:
   a. NO EXCEPTIONS TAKEN (NET): No re-submittal required
   b. MAKE CORRECTIONS NOTED (MCN):
      (1) No re-submittal required: the Contractor shall make corrections noted prior to manufacture
      (2) Partial re-submittals required: the Contractor shall submit related accessory or optional items as noted which are required but were not included with the submittal and/or shall resubmit unsatisfactory portions or attributes of items as noted. The Contractor may proceed to manufacture those portions of the submittal that will be unaffected by required re-submittals
   c. AMEND AND RESUBMIT (AAR): The Contractor shall amend and resubmit the submittal as noted or required to comply with the Contract Documents

d. REJECTED – RESUBMIT (RR): The item submitted does not comply with the Contract Documents in a major way. Resubmit items that comply with the requirements of the Contract Documents

4. The letter of transmittal accompanying the returned Product Review submittal may contain numbered notes and/or comments that are attached. Marking a corresponding number on a Shop Drawing submittal shall have the same effect as applying the entire note to the submittal.

I. Re-submittals that contain changes that were not requested by the Engineer on the previous submittal shall be accompanied by a letter explaining the change.

J. Required submittal status prior to proceeding:

1. Do not proceed with manufacture, fabrication, or delivery of items prior to obtaining a submittal status of NET or MCN.

K. Intent and Limitation of Engineer's Review:

1. The Contractor has primary responsibility for submitting and providing work that complies with the requirements of the Project Manual. Neither the Engineer’s submittal review nor failure to notice or comment on deficiencies in the Contractor's submittals shall relieve the Contractor from the duty to provide work, which complies with the requirements of the Contract Documents.

1.04 Construction Schedule

Construction schedule giving the starting and completion dates of the various stages of work shall be submitted within 10 days of the date of the Notice to Proceed. The schedule shall conform to the length of time and all specific schedule constraints established in the Contract Documents. The Contractor shall revise and resubmit the Construction Schedule whenever it changes by 7 days or more.

1.05 Substitutions of Named Equipment/Supplier

No substitutions are allowed where an Equipment/Supplier is named as “no equal”.

1.06 Manufacturer’s Certificates

A. Where required in the specifications, submit three (3) hard copies.

B. Submit manufacturers' certificate to Engineer for review. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as

appropriate. Certificates may be recent or previous test results on material or Product, but must be acceptable to the Engineer.

1.07 Operation and Maintenance Manuals

Submit Operation and Maintenance Manuals in accordance with Section 33 01 10.

1.08 Record Drawings

A. The Contractor shall keep and maintain, at the job site, one record set of Drawings. On these, the Contractor shall mark all project conditions, locations, configurations, and any changes or deviations which may vary from the details represented on the original Contract Drawings including buried or concealed construction and utility features which are revealed during the course of construction. Special attention shall be given to recording the horizontal and vertical location of all buried utilities that differ from the locations indicated or which were not indicated on the Contract Drawings. Said record drawings shall be supplemented by any detailed sketches as necessary or directed to indicate, fully, the Work as actually constructed. These master record drawings of the Contractor's representation of as-built conditions, including all revisions made necessary by addenda, change orders, and the like shall be maintained up-to-date at least weekly during the progress of the Work.

   1. Contractor shall note the dimensions of aboveground water features (valves, fire hydrants, etc.) and below ground water features (bends, reducers, etc.). Two dimensions will be required. One North/South and one East/West from a District approved landmark, (Centerline of street, lot line of a property, lip of gutter, back of walk).

B. The Contractor shall submit to the Engineer a final, complete and accurate set of Record Drawings prior to or simultaneously with the Contractor's request for final payment.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

**** END OF SECTION ****

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PART 1 – GENERAL

1.01 Description

This section contains requirements for the Contractor's to develop and perform startup and testing for the facility as required under this contract. This section supplements but does not supersede specific testing requirements found elsewhere in the contract documents.

1.02 Quality Assurance

A. Quality Assurance Program – The Contractor shall prepare a quality assurance program that includes the following:
   1. A testing plan setting forth the sequence in which all testing work required under this project will be implemented
   2. A documentation program to record the results all equipment and system tests
   3. A testing program for all treatment equipment, instrumental, mechanical, electrical instrumentation and operational systems
   4. A calibration program for all instruments, gages, meters, and thermometers used for determining the performance of equipment and systems
   5. A testing schedule conforming to the requirements specified in paragraph 2.02 C.

B. Calibration – all test equipment (gages, meters, thermometers, analysis instruments, and other equipment) used for calibrating or verifying the performance of equipment installed under this contract shall be calibrated to within plus or minus 2 percent of actual value at full scale. Test equipment used for individual test runs shall be selected so that expected values as indicated by the detailed performance specifications will fall between 60 and 85 percent of full scale. Pressure gages shall be calibrated in accordance with ANSI/ASME B40.1.

   Liquid flow meters installed in pipelines with diameters greater than 2 inches shall be calibrated in situ using a strap on ultrasonic meter. Flow meter calibration work shall be performed by individuals skilled in the techniques to be employed. Calibration tests for flow metering systems shall be performed over a range of not less than 10 percent to at least 75 percent of system full scale. At least five confirmed valid data points shall be obtained within this range. Confirmed data points shall be validated by no less than three test runs with results which agree within plus or minus 2 percent.

C. References – This section contains references to the following documents:

Reference	Title
ANSI/ASME B40.1	Gauges Pressure Indicating Dial Type-Elastic Element
ASTM E77	Method for Verification and Calibration of Liquid-in Glass Thermometers
ASJRAE 41.8	Standard Methods of Measurement of Flow of Gas
	Flow Measurement in Open Channels and Closed Conduits, Vol. 1, U.S. Department of Commerce, National Bureau of Standards, pg. 361.
	Techniques of Water-Resources Investigations of the United States Geological Survey, Chapter 16, Measurement of Discharge Using Tracers

1.03 Submittals

All submittals shall be provided in accordance with Section 01 33 13 and shall include:

A. Factory instrumentation calibration

B. Preoperational checkout procedures

C. Operational simulation testing procedure

D. Schedule for preoperational checkout and operational simulation testing

PART 2 – PRODUCTS

2.01 General

The Contractor shall prepare preoperational checkout and operational simulation testing procedures as specified in the following paragraphs. No preoperational checkout or operational simulation testing shall be performed until all test documentation has been submitted and accepted by the Engineer.

2.02 Development of Test Plans

The Contractor shall develop test plans describing the coordinated, sequential testing of each item to be tested. Test plans shall identify the equipment to be manipulated or observed during the testing and the specific results to be observed or obtained. The test plans shall also be specific as to support systems required to complete the test work, temporary systems required during the test work, and subcontractors' and manufacturers' representatives to be present and expected test duration. As a minimum, the test plans shall include the following features:

A. Step-by-step proving procedure for all control and electrical circuits by imposing low voltage currents and using appropriate indicators to affirm that the circuit is properly identified and connected to the proper device and yields the proper response for the imposed signal.

B. Calibration of all field instruments.

C. Preoperational checkout procedures for all mechanical, HVAC, and electrical equipment.

D. Performance testing of each individual item of mechanical, electrical, and instrumentation equipment. Performance tests shall be selected to duplicate the facilities operating conditions.

E. Overall system test that is designed to duplicate, as closely as possible, the intended operating conditions.

2.03 Testing Schedule

The Contractor shall produce a testing schedule for performing the test work. The schedule shall show the start date and duration of each test. The test schedule shall be submitted no later than 2 weeks in advance of the date testing is to begin. No preoperational checkout or operational simulation testing shall be performed until the test schedule has been submitted and accepted by the Engineer.

2.04 Witness Testing

The Engineer may require at their option to witness any testing under this Section. The Engineer shall provide the Contractor a 24 hour notice of any required witness testing based on the Contractor’s testing schedule.

PART 3 – EXECUTION

3.01 General

The Contractor shall organize teams made up of qualified representatives of equipment suppliers, subcontractors, the Contractor's independent testing

laboratory, and others, as appropriate, to efficiently and expeditiously calibrate and test the equipment and systems installed and constructed under this contract. The objective of the testing program shall be to demonstrate, to the Engineer's satisfaction, that the structures, systems, and equipment constructed and installed under this contract meet all performance requirements and the facility is ready for the commissioning process to commence. In addition, the testing program shall produce baseline operating conditions for the District to use in a preventive maintenance program.

3.02 Instrumentation 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 acceptance tests shall be performed until instruments, gages, and meters to be installed in that particular system have been calibrated.

3.03 Temporary Facilities for Testing

The Contractor shall install temporary connections, piping and valves, and make other provisions to simulate anticipated operating conditions during the facility testing as required.

3.04 Performance Tests

In general, performance tests for any individual system shall be performed in the order listed below. The order may be altered only on the specific written authorization of the Engineer after receipt of a written request, complete with justification of the need for the change in sequence.

The District must oversee and approve of any water produced into the water system. The Contractor must provide a written request to the Engineer and receive approval from District at least one week in advance for any planned discharge into the District's water system.

The performance testing shall include the following:

A. Pressure and leakage testing as specified in Section 01 21 19.

B. Factory and Field Testing as specified in Section 26 66 00.

C. Treatment equipment testing shall be in coordination with the treatment system that will be performed by the filter supplier as part of their prepurchase contract.

D. Operational Simulation:

1. Operational Simulation Testing Procedures – The Contractor shall provide operational testing procedures that will cover the

operation of the Well and Booster pumps, control valve, and manganese treatment, generator, and other automatic controls of the facility that are controlled by the new PLC.

2. Testing – Once all affected equipment has been subjected to the required preoperational checkout procedures and the Engineer has witnessed and has no found deficiencies in that portion of the work, individual items of equipment and systems shall be started and operated under simulated operating conditions to determine as nearly as possible whether the equipment and systems meet the requirements of these specifications.

   The equipment shall be operated a sufficient period of time to observe performance characteristics, and to permit initial adjustment of operating controls. When testing requires the availability of auxiliary systems such as piping, electrical power, or instrumentation which have not yet been placed in service, the Contractor shall provide acceptable substitute sources capable of meeting the requirements of the machine, device, or system at no additional cost to the District. Disposal methods for test water shall be subject to review by the Engineer.

   Test results shall be within the tolerances set forth in the detailed specification sections of the specifications. If no tolerances have been specified, test results shall conform to tolerances established by recognized industry practice. Where 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 performance of such test, then the Engineer may order the test to be repeated. If the repeat test, using such modified methods or equipment as the Engineer may require, confirms the previous test, then all costs in connection with the repeat test will be paid by the District. Otherwise, the costs shall be borne by the Contractor. Where the results of any functional test fail to comply with the contract requirements for such test, then such repeat tests as may be necessary to achieve the contract requirements shall be made by the Contractor at his expense.

   The Contractor shall provide, at no expense to the Owner, all power, fuel, compressed air supplies, chemicals, all labor, temporary piping, heating, ventilating, and air conditioning for any areas where permanent facilities are not complete and operable at the time of functional tests, and all other items and

work required to complete the functional tests. Temporary facilities shall be maintained until permanent systems are in service.

3. Retesting – If any equipment should fail to operational testing, the equipment shall be adjusted, altered, renewed, or replaced for the equipment to pass its operational test. The Contractor shall pay to the District all reasonable expenses incurred by the District, including the costs of the Engineer as a result of repeating such tests.

4. Post-Test Inspection – Once operational simulation testing has been completed all equipment 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. Any defects found during the course of the inspection shall be repaired or the equipment replaced to the satisfaction of the Engineer at no cost to the District.

3.05 Operational Test

After completion of all performance testing, the Contractor shall conduct an operational test of the entire facility in conjunction with the District to confirm the new PLC and its program is operating as intended.

Operational testing shall not be started until after September 30, 2023.

The District with support from the Contractor shall operate the facility as intended for a period of no less than one week. During this time, all parts of the facility shall be operated at various loading conditions, as directed by the Engineer.

Should the operational testing be halted for any reason related to the facilities constructed or the equipment furnished under this contract, or the Contractor's temporary testing systems, the operational testing program shall be repeated until the operational period has been accomplished without interruption. All process units shall be brought to full operating conditions, including pressure and flow.

After the operational period has been completed, the commission of the facility shall take place in accordance with Section 33 08 10 Commissioning.

****END OF SECTION****

PART 1 – GENERAL

1.01 Site Maintenance

The Contractor shall keep the work site clean and free from rubbish and debris. Materials and equipment shall be removed from the site when they are no longer necessary. Upon completion of the work and before final acceptance, the work site shall be cleared of equipment, unused materials, and rubbish to present a clean and neat appearance.

The Contractor shall keep the paved areas within and adjacent of the project of mud and/or dirt that originates from the project site. If the paved areas become dirty due to the Contactor work/vehicles, the Contactor will have the street cleaned by the end of the working day.

1.02 Storm Water Best Management Practices (BMPs)

The Contractor shall implement storm water control best management practices (BMPs) for erosion control.

The purpose of BMPs is to minimize the adverse environmental impacts of stormwater runoff from the project site and into the local storm drain system.

1.03 Noise Control

Noise from Contractor's operations shall not exceed limits established by applicable laws or regulations and in no event shall exceed 86 dBA at a distance of 50 feet from the noise source.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

****END OF SECTION****

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PART 1 – GENERAL

1.01 Administrative Procedures

Comply with requirements stated in the General Conditions of the Contract and Specifications for administrative procedures in closing out the Work.

1.02 Re-Inspection Fee

Should the Engineer perform re-inspections due to failure of the Work to comply with the claims of status of completion made by the Contractor, the District will deduct the amount of any re-inspection costs from the final payment to the Contractor.

1.03 Closeout Submittals

The Contractor shall provide the following documents as part of the final project closeout:

A. Project Record Documents

B. Operating and Maintenance Data and Instruction to District's Personnel

C. Control Strategy Plan that outlines the final programming of the WTP

D. Spare Parts: As specified in the individual sections and herein.

E. Evidence of Payment and Release of Liens: As specified in the General and Supplementary Conditions

F. Two (2) copies of each specified special bond, warranty, and service contract

G. Two (2) copies of Supplier Warranty for Project

1. Complete Supplier Warranty form for Project
2. Fully executed copies of Certificates of Substantial Completion for the Project

PART 2 – PRODUCTS

2.01 Spare Parts

A. Provide spare parts, maintenance materials, and special tools as specified in the individual specification sections.

B. Package all spare parts adequately protected and labeled for long-term storage.

PART 3 – EXECUTION

3.01 Final Cleaning (Within Designated Construction Area)

A. Execute final cleaning prior to final inspection.

B. Clean site and sweep paved areas

C. Remove waste and surplus materials, rubbish, and construction debris

3.02 Substantial Completion Ready for Punch List

A. When Contractor considers the Work complete, submit written certification that:

1. Contract Documents have been reviewed
2. Work has been inspected for compliance with Contract Documents
3. Work has been completed in accordance with Contract Documents
4. Equipment and systems have been tested in the presence of the Engineer and are operational
5. Work is completed and ready for final inspection
6. All O&M Manuals have been delivered in final accepted form
7. All Shop Drawings have been delivered in final accepted form with all revisions and notations corrected on as-built drawings

B. The Engineer will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.

C. Should the Engineer consider that the Work is incomplete or defective:

1. Engineer will promptly notify the Contractor in writing, listing the incomplete or defective Work
2. Contractor shall take immediate steps to remedy the stated deficiencies and send a second written certification to the Engineer that the Work is complete
3. The Engineer (or their assigned) will re-inspect the Work

D. When the Engineer finds that the Work is acceptable under the Contract Documents, the Contractor shall be requested to make closeout submittals.

3.03 Project Record Documents

A. Maintain, on site, one set of the following record documents; record actual revisions to the work:

1. Contact drawings
2. Specifications
3. Addenda
4. Change orders and modifications to the Contract
5. Reviewed shop drawings, product data, and samples
6. Applications for payment

B. Store record documents separate from documents used for construction.

C. Record information concurrent with construction progress.

D. Record documents and shop drawings. Legibly mark each item to record actual construction including:

1. Measured depths of foundations in relation to finish elevation
2. Measured horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements
3. Measured locations of internal utilities and appurtenances concealed in construction referenced to visible and assessable features of the work
4. Field changes in dimensions
5. Details not on original contract drawings

E. Submit full set of above documents to the Engineer with final Application of Payment.

3.04 Delivery to the District

A. At or prior to the time of the final inspection, suppliers shall deliver all required items to the site and place as designated by the Engineer.

1. Suppliers and representatives of the District shall inspect and inventory all items delivered

B. Submit to the Engineer a Detailed Bill of Lading of all Items Delivered:

1. Contractor and the supplier's representatives shall sign bill of lading certifying that all items listed were delivered and that, unless otherwise noted on the invoice, all items were in good condition at the time of delivery to District

C. Contractor shall deliver all additional items identified by the Engineer and replace all damaged and defective items noted on the original invoice before requesting final inspection.

3.05 Final Application for Payment

Upon completion of the closeout submittal, the Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the Conditions of the Contract.

3.06 Payment

Final payment will be made when all equipment operates satisfactorily, all specified spare parts, maintenance materials, and special tools have been delivered to the District are in acceptable condition, and all contract requirements have been met.

**** END OF SECTION ****

PART 1 – GENERAL

1.01 Description

This section contains requirements for training the District's personnel, by persons retained by the Contractor for the purpose of providing training in the proper operation and maintenance of the equipment and systems installed under this contract.

The training shall include:

- The operation of the manganese treatment system in coordination with the MTS
- The operation of the facility under the WTP's new control system in relation to the PLC programming and interface

The MTS is required to provide training under a separate contract as included in Specification 01 70 01. The Contractor shall be responsible in coordinating overall training program.

1.02 Quality Assurance

Where required by the detailed specifications, the Contractor with coordination with its subcontractors, consultants, and the MTS shall provide on-the-job training of the District's personnel. The training sessions shall be conducted by qualified, experienced, factory-trained representatives of the various equipment manufacturers.

Training shall include instruction in both operation and maintenance of the Manganese treatment system its associated equipment and the new operation of the WTP that is associated with the PLC and its interface.

1.03 Submittals

The following information shall be submitted to the Engineer in accordance with the provisions of Section 01 33 13. The material shall be reviewed and accepted by the District as a condition precedent to receiving progress payments in excess of 50 percent of the contract amount and not less than 3 weeks prior to the provision of training.

A. Lessons plans for each training session to be conducted by the manufacturer's representatives. In addition, training manuals, handouts visual aids, and other reference materials shall be included.

B. Subject of each training session, identity, and qualifications of individuals to be conducting the training and tentative date and time of each training session.

PART 2 – PROJECTS

2.01 General

Where specified, the Contractor shall conduct training sessions for the District's personnel to instruct the staff on the proper operation, 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. Approved operation and maintenance manuals shall be available at least 30 days prior to the date scheduled for the individual training session.

2.02 Location

Training sessions shall take place at the project site with times designated by the District.

2.03 Format and Content

As a minimum, training session shall cover the following subjects for each item of equipment or system:

A. Familiarization:

1. Review catalog, parts lists, drawings, and etc., which have been previously provided for the District’s files and operation and maintenance manuals
2. Check out the installation of the specific equipment items
3. Demonstrate the unit and indicate how all parts of the specifications are met
4. Answer questions

B. Safety:

1. Review safety references
2. Discuss proper precautions around equipment

C. Operation:

1. Review reference literature
2. Explain all modes of operation (including emergency)
3. Observe District's personnel on proper use of the equipment

D. Preventive Maintenance:

1. Review preventive maintenance (PM) lists including:
   a. Reference material
   b. Daily, weekly, monthly, quarterly, semiannual, and annual jobs
2. Show how to perform PM jobs

3. Show District Staff what to look for as indicators of equipment problems

E. Corrective Maintenance:

1. List possible problems
2. Discuss repairs – point out special problems
3. Open up equipment and demonstrate procedures, where practical

F. Parts:

1. Show how to use previously provided parts list and order parts
2. Check over spare parts on hand. Make recommendations regarding additional parts that should be available

G. Local Representatives:

1. Where to order parts: name, address, telephone
2. Service problems:
   a. Who to call
   b. How to get emergency help

H. Operation and Maintenance Manuals:

1. Review any other material submitted
2. Update material, as required

PART 3 – EXECUTION

Training shall be conducted in conjunction with the operational testing and commissioning periods. The Contractor shall arrange to have the training conducted on consecutive days, with no more than 6 hours of classes scheduled for any single day. Concurrent classes shall not be allowed.

Acceptable operation and maintenance manuals for the specific equipment shall be provided to the District prior to the start of any training.

The following services shall he 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.

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 District approved practice maintenance and repair job(s), including mechanical and electrical adjustments and calibration and troubleshooting equipment problems

**** END OF SECTION ****

PART 1 – GENERAL

1.01 Description

This section specifies preformed joint fillers as required to complete the required work as shown on the Drawings and specified herein.

1.02 Quality Assurance

Reference – This section contains references to the following documents:

Reference	Title
ASTM D994	Preformed Expansion Joint Filler for Concrete (Bituminous Type)
ASTM D1752	Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

PART 2 – PRODUCTS

2.01 Preformed Asphalt Fiberboard

Preformed asphalt fiberboard joint filler shall be in accordance with ASTM D994 and shall be 112 inch thick unless otherwise specified.

2.02 Preformed Resin-Bonded Cork

Preformed resin-bonded cork joint filler shall be in accordance with ASTM D 1752, Type II. Cork joint filler thickness shall match the specified joint width.

2.03 Product Data

The Manufacturer's recommendations for the handling and installation of the material shall be provided in accordance with Section 01 33 00.

PART 3 – EXECUTION

3.01 General

Preformed joint fillers shall be placed into position before the concrete is poured. Where it is necessary for the filler to be fixed to existing concrete or other building materials, a suitable adhesive recommended by the filler manufacturer shall be used. Filler surfaces shall be clean and dry prior to the placement of the concrete.

3.02 Preformed Asphalt Fiberboard

Preformed asphalt fiberboard joint fillers shall be used for expansion joints in concrete sidewalks, curbs, and roadways.

3.03 Preformed Resin-Bonded Cork

Preformed resin-bonded cork joint filler shall be used for expansion joints in concrete structures. The expansion joint shall be sealed with a backer rod and sealant as specified in Section 07 92 00.

**** END OF SECTION ****

PART 1 – GENERAL

1.01 Description

This section specifies sealants as required to complete the required work as shown on the Drawings and specified herein.

1.02 References

This section contains references to the following documents:

Reference	Title
FEDSPEC TT -S-00230C	Sealing Compound: Elastomeric Type, Single Component
FEDSPEC IT-S-00227E	Sealing Compound: Elastomeric Type, Multi-Component

PART 2 – PRODUCTS

2.01 Polyurethane Sealant

A. Acceptable Products – Acceptable products shall be Sikaflex by Sika Chemical Corporation, Vulkem by Mameco International, U-Seal Joint Sealant by Burke Company, or Rubber Calk by Products Research and Chemical Corporation.

B. General – Polyurethane sealants shall conform to FEDSPEC IT-S-0230C for one-component systems and FEDSPEC TT-S-00227E for two-component systems. Polyurethane sealant shall be one of the following two types:

   1. Self-Leveling – Self-leveling polyurethane sealant shall be Type I, Class A as specified by the FEDSPECs referenced above.
   2. Non-sag – Non-sag polyurethane sealant shall be Type II, Class A as specified by the FEDSPECs referenced above.

C. Primer – Primer shall be as recommended by the sealant manufacturer.

D. Backer Rod or Backer Tape – Backer rod shall be open cell polyethylene or polyurethane foam. Rod shall be cylindrical unless otherwise specified. Backer tape shall be polyethylene or polyurethane with adhesive on one side.

2.02 Mastic Sealant

A. General – Mastic joint sealant shall consist of a blend of refined asphalts, resins and plasticizing compounds, reinforced with fiber. Sealant shall be compatible with joint fillers and shall be pressure grade.

B. Primer – Primer shall be as recommended by the mastic sealant manufacturer.

2.03 Product Data

The following information shall be provided in accordance with Section 01 33 00:

A. Manufacturer's product data showing conformance to the specified products.

B. Manufacturer's recommendations for storage, handling and application of sealants and primers.

PART 3 – EXECUTION

3.01 General

Sealants and primers shall be applied according to the sealant manufacturer's recommendations. Polyurethane sealants shall be used on all expansion joints and specified construction joints.

Joints and spaces to be sealed shall be clean, dry and free of dust, loose mortar, concrete and plaster. Additional preparation of joints and spaces shall be provided in accordance with manufacturer's recommendations. Primer shall be applied only to the surfaces that will be covered by the sealant.

3 .02 Polyurethane Sealants

A. General – Non-sag polyurethane sealants shall be used on vertical joints. Self-leveling polyurethane sealants shall be used on horizontal joints.

B. Joint Dimensions – Unless otherwise specified, joints and spaces to be filled shall be constructed to the following criteria. Joints and spaces shall have a minimum width of 114 inch and a maximum width of 1 inch. The depth of the sealant shall be one-half the width of the joint, but in no case less than 114 inch deep. Sealant depth shall be measured at the point of smallest cross section. When joints exceed the depth requirements, backing rod shall be inserted to provide the joint depth specified. If the joint sealant depth is within the specified tolerances, backer tape shall be placed in the bottom of the joint.

3.03 Mastic Sealant

A. Joint Dimensions – Joints to be sealed shall be 2 inches deep, 1 inch wide at the top, and 3/4 inch wide at the base.

**** END OF SECTION ****

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PART 1 – GENERAL

1.01 Summary

A. Section Includes:

1. All exposed metal and steel pipes and mechanical equipment except for the following:

   a. Stainless steel
   b. Rubber
   c. Plastic pipe, including polyvinyl chloride and similar items
   d. Nameplates and grease fittings
   e. Pre-finished or anodized aluminum

B. Related Sections:

1. Section 33 11 13, Piping Systems (Piping, Fittings, Valves and Meters)

C. The Contractor is to base this bid on using the products specified. If the products specified are not available or not available in formulations that meet applicable regulations on volatile organic compounds (VOC) levels at time of application, the Contractor is to submit for review products of equivalent quality and function that comply with regulations in effect at that time.

D. All steel pipes shall be lined and coated per AWWA C210 and C213 latest edition as specified.

1.02 References

A. American Water Works Specifications (Latest Addition):

1. AWWA C210 Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines

2. AWWA C213 Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines

B. National Sanitation Foundation (Latest Addition):

1. NSF 61 Drinking Water System Components Health Effects

C. SSPC Steel Structures Painting Council Specifications

D. ASTM D2200 Pictorial Surface Preparation Standards for Painting Steel Surfaces

1.03 Definitions

A. Dry Film Thickness (DFT) - The fully cured applied paint thickness for each coat.

B. Exterior Surface - Surface that is not inside a building or structure and is exposed to the weather.

C. Stripe Coat - Coating applied to the edge, corner, welds or bolts, which is applied prior to application of additional system coats.

D. Submerged - Surfaces that are under water or the vertical extension of those walls that are partly under water during normal operating conditions.

E. Definition of Painting Terms: ASTM D16

1.04 Submittals

A. Submit in accordance with Section 01 33 00, Submittals.

B. Prior to ordering material, submit a complete schedule of materials to be used. Include the manufacturer's brand name, product name, and designation number for each coat of each system to be used. Include statement as to VOC compliance with air quality standards within the County of Yuba, CA.

C. Prior to commencing work, submit a detailed list of all surfaces and equipment items upon which the Contractor intends to apply protective coatings.

D. If materials other than those listed are submitted, submit additional information to fully define the proposed substitution. The Engineer may further require the Contractor to furnish additional test results from an independent paint laboratory comparing the proposed substitution with one of the named products, at no additional cost.

E. Provide Material Safety Data Sheets (MSDSs) for all products.

F. Manufacturer’s Certification – That products furnished meet applicable Air Quality Management District regulations as to allowable volatile organic compound (VOC) content for the place of application and use intended.

G. Color chart for each coating for color selection by the District. Submit color chart two (2) weeks in advance of required pre-painting conference and walkthrough.

1.05 Pre-Paint Conference and Walkthrough

Schedule with the Engineer a pre-paint conference and walkthrough two (2) weeks prior to start of field painting or coating to ensure the paint and coating products and colors are properly selected and allow coordination with other trades.

1.06 Quality Assurance

A. Environmental Regulatory Requirements:

1. All work, material, procedures, and practices under this Section shall conform to requirements of the local Air Resources Board or Air Quality Management District having jurisdiction. Prime or finish coat painting done in locations other than the project site shall be in accordance with air quality regulations in effect at the place the coating is applied. Contractor is responsible to confirm that products proposed are in compliance with the applicable volatile organic compounds (VOC) levels allowable at the date these Specifications were issued for bid.

2. The Air Resources Board or Air Quality Management District having jurisdiction may prohibit the sale or application of paints and enamels containing more than the stipulated percentages of volatile organic solvents manufactured after a stated date. Provide material meeting applicable regulations effective at the date of manufacture or, if not available, provide top of the line materials developed as replacements for specified materials and meeting applicable regulations as to VOC solvents content.

3. If the Contractor applies coatings that have been modified or thinned other than as recommended by manufacturer, they will be responsible for any fines, costs, remedies or legal actions that may result.

1.07 Warnings

A. Be advised that as a part of this work abrasive blasting is required. This may require the use of special equipment. Become familiar with the existing site conditions and take all steps necessary to protect adjacent facilities and personnel, at no additional cost to the District.

B. The Contractor shall furnish all labor, equipment and means required and shall carry out protective measures wherever and as often as necessary to prevent their operations from producing overspray or dust in amounts damaging to property or causing nuisance. The Contractor shall be responsible for any damage resulting from overspray or dust originating from their operations. The abatement measures shall be continued until all surface preparation and painting is completed. All compensation to be received for overspray and dust abatement shall be included in the prices named for appropriate items of the bidding schedule.

1.08 Delivery, Storage, and Handling

A. Deliver all coating materials in unopened containers with the manufacturer's label which must include name, batch number, and date and VOC content.

B. Store in an assigned area onsite with concurrence from the coating manufacturers. Maintain storage area clean and fire safe. Dispose of used rags, thinner and buckets daily. Solvents shall be stored in closed approved storage containers.

1.09 Coating Contractor Requirements

The field coating activities under this Section shall require a C-33 painting and decorating license. The Contractor shall have a foreman with a minimum of 5 years of practical experience in the application of the specified coating products to surfaces at similar facilities on site at all times during any site preparation and coating activities under this Section.

PART 2 – PRODUCTS

2.01 Materials

A. Paints used in each system shall be the product of one manufacturer.

B. Only compatible materials shall be used in the work. Particular attention shall be directed to compatibility of primers and finish coats.

C. Coating systems shall not contain lead.

D. Abrasives shall not be classified a hazardous material under California Title 22.

E. Materials – Paints and protective coatings listed in the Paint Systems and the Schedule in Part 3 of this Section refers to the following manufacturers and is specified as levels of quality. It is understood that the words "or equal" are included herein.

F. No request for substitution of an “equal” will be considered which decreases the film thickness designated, the number of coats to be applied, solids content by volume, the general type of coating, paint, or primer, or the quantity, quality and type of ingredients in the coatings specified. The Contractor shall provide a list of reference where coating of the same generic type has been applied on similar projects. The reference list shall give the project name, city, state, phone number of city, coating system reference and number, and year coating was applied. Coatings not listed in the specifications shall be submitted with certified ingredients analysis so that a complete comparison between specified and proposed coating may be made.

Sherwin Williams	CRC Industries
Kop Coat	Roto Metals
Tnemec Co.)	Protecto Wrap
Chemical Products Co.	Tapecoat
Amercoat	Or an approved equal

2.02 Colors and Samples

A. Colors are to be factory mixed, using light-fast colorants proportioned by accurate measurement into proper type base. All coatings must be formulated to perform in the climate and environment to which they will be exposed.

B. Finish colors shall be as selected by the District from the manufacturer's standard color samples. These colors are to closely match the existing colors at the WTP.

PART 3 – EXECUTION

3.01 Surface Preparation and Application

A. Field Coating – Prepare surfaces in strict accordance with the manufacturer's instructions prior to application. Provide the manufacturer's instructions with submittal. Apply first coat immediately after surface preparation. Keep all paints at a consistency and applied in accordance with the printed directions of the manufacturer. The painting shall be done by hand, spray, or roller as approved by the manufacturer's recommendations. The Engineer and Contractor will review all surfaces to be painted on the job prior to application of any coatings. Once the Contractor begins undercoating or priming, this will be his guarantee that the surface is acceptable to paint. All painted surfaces are to be free from drips, ridges, holidays and brush marks. The following stipulations also apply:

1. Thinning permitted only when recommended by the manufacturer and only with thinner recommended for use with the particular product.
2. The use of additives to improve working characteristics or to lengthen or shorten set time is prohibited.
3. Items difficult or impossible to paint after installation are to be painted before installation and touched up after installation.
4. Apply each coat to a uniform, even coating; lay material on in one direction and finish at right angles. Allow material to thoroughly dry between coats. Scuff, sand, runs, sags, overspray, surface

roughness, and other defects shall be removed between each coat. Dust and wipe surface clean before applying next coat.

6. Apply no less than the number of coats or dry film thickness specified. Apply additional coats if required for uniform coverage, full hiding, and to achieve file continuity. Finished work is to be uniform in color, full coverage, smooth and free of sags and brush marks.

8. Apply each coat on all work only after all major construction is inactive and the work areas have been cleaned up and are dust free.

9. Apply all coatings within the manufacturer's recommended recoat window. If a topcoat passes the recoat window, submit a letter from the coating manufacturer stating what is required before the topcoat can be applied. Do not apply topcoat until the corrective action has been favorably reviewed by the Engineer.

10. Coat abrasive blast-cleaned surfaces with primer before visible rust forms. Apply painting system within 8 hours of blast-cleaning the surface.

3.02 Field Quality Control

A. Pinhole and Continuity Testing:

1. After the application of the prime and finish coats of Paint Systems A, B and F, perform continuity and pinhole checking by means of a low voltage electrical resistance meter and check thickness with a magnetic thickness gauge to determine that pinhole free condition and specified film thickness of the paint system has been achieved over all of the painted surfaces. Repair all deficiencies in film integrity and thickness in accordance with the manufacturer's instructions. The Contractor shall provide pinhole and continuity testing equipment, conduct the test, and provide the test results to the Engineer. Notify the Engineer when the test will be held by at least 14 calendar days. The Engineer may elect or witness the test.

2. The Engineer or its independent testing consultant may perform its own continuity and pinhole checking and thickness checks in addition to the Contractor's required tests. The appropriate equipment and necessary support, if requested, is to be provided by the Contractor. Repair any additional deficiencies in film integrity and thickness per the manufacturer's instructions and to the satisfaction of the Engineer.

3. Attention is directed to the fact that past use of the low voltage electrical resistance meter has demonstrated that the painter must apply at least two and usually three or more stripe coats along all edges, angles and crevices formed by joining member in addition to the coats specified in order to achieve a pinhole free surface.

B. Adhesion Testing – Where there is a question of paint or coating adhesion to surfaces, demonstrate to the Engineer's satisfaction that the coating adhesion to the area in question is equal to or greater than that which the paint manufacturer literature states may be achieved by his product. An "Elcometer Adhesion Tester" shall be provided by and used by the Contractor to accomplish this test.

C. Continuity, Pinhole, and Adhesion Testing Support – Provide scaffolding, ladders, lighting, and labor as required to facilitate the Engineer's check. Repair any areas damaged during and by the testing operation.

D. Environmental Conditions:

1. Measure and record the temperature, dew point, and humidity daily (at the start of the day, prior to painting, and if conditions deteriorate). Maintain the records in a place where the Engineer can check them. Submit the records to the Engineer at the end of the project.

2. Coatings shall be applied only to surfaces that are dry, and only under such atmospheric conditions as will cause evaporation rather than condensation. Coating shall not be applied during rainy, misty weather, or to surfaces upon which there is frost or moisture condensation. During damp weather, when the temperature of the surface to be coated is within 10°F of the dew point, the surfaces shall be heated to prevent moisture condensation thereon.

   Bare metal surfaces, except those which may be warped by heat, may be dehydrated by flame heating devices immediately prior to coating application. During coating, and for a period of at least 8 hours after the coating has been applied, the temperature of the surfaces to be coated, the coated surfaces, and the atmosphere in contact shall be maintained at or above 50°F and not less than 10°F above the dew point. Coating, when applied, shall be approximately the same temperature as that of the surface on which it is applied. Fans or heaters shall be used inside enclosed areas where conditions causing condensation are severe.

3. Coating shall not be applied on surfaces hotter than 120°F.

E. Existing Coating Systems:

1. Unless otherwise specified, existing coating systems damaged by new construction shall be repaired and coated in accordance with the appropriate system specified for new work.

2. Contractor shall demonstrate that the existing coating is compatible with field coating by applying small test patches of specific coatings over existing coatings. If the existing coating is not compatible with the field coat (it lifts or ripples), the existing coating shall be re-primed with a primer compatible with both the existing coating and the field applied coating, or replaced with the proper prime coat. The primer shall be as recommended by the manufacturer of the field applied coatings.

3.03 Quality of Lining and Coating Application

The cured lining or coating shall be smooth and glossy with no graininess or roughness. The lining or coating shall have no blisters, cracks, bubbles, underfilm voids, mechanical damage, discontinuities, or holidays.

3.04 Cleaning and Completion

A. At the completion of this portion of the work, remove all debris, remove all paint and stains from work for which paint finish is not intended, touchup all marred surfaces, and leave all buildings and structures in a clean condition, ready for use.

B. Refinish all damaged or imperfect painting to the satisfaction of the Engineer prior to final acceptance of the facility.

C. Finish work, except waterproofing mastics, is to present an even, pleasing and uniform color and appearance. Surfaces exhibiting coatings with shadows, streaks, overlap marks, sags, drips, roughness or non-uniform sheen will be considered as improperly applied and will not be considered acceptable.

D. Leave all machinery nameplate data tags clean and readable and all grease fittings clean and usable. Clean paint from windows and electrical equipment provided with factory coatings.

3.05 Spare Paint

Furnish one-gallon (minimum) container of each type and color of finish product used. Label containers. Each product shall have a minimum of 11 months of shelf life at project completion.

3.06 Coating Systems

The coating systems used for different types of surfaces are listed below and followed by specification for each:

Surface Type	System
Ferrous Metal – Continually or Intermittently Submerged	A
Ferrous Metal – Exposed to Atmosphere	B
Ferrous Metal – Fusion Epoxy Bonded	C
Underground Piping and Appurtenances	D
Underground Ductile Iron Pipe and Appurtenances	E
Manganese Filters	F

System A- Ferrous Metal – Continually or Intermittently Submerged:

1. General:

   All submerged metalwork, equipment, and exposed pipe work except as noted hereinafter shall be painted with this coating system. No coating is required on stainless steel or aluminum metal surfaces. Coatings for vertical pump cans may be shop applied.

2. Surface Preparation:

   a. All metal surfaces (non-galvanized) shall be field sandblasted according to SSPC-SP-10, “Near-White Metal Blast Cleaning”, to provide a surface profile of 1.5 to 2 mils.
   b. For non-ferrous and galvanized metal, pretreat with Paint System B-2b.

3. Coatings:

   a. Tnemec: Prime coat shall consist of Tnemec 69-1211 H.B. Epoxyline II to a minimum dry film thickness of 3 mils. Finish coats shall consist of two or more coats of Series 69 - Color Epoxy, to a minimum dry film thickness of 10 mils. Total dry film thickness for this system shall be a minimum of 13 mils.
   b. Koppers: Prime coat shall consist of Koppers 654 Epoxy Primer to a minimum dry film thickness of 3 mils. Finish coats shall consist of one or more coats of Koppers Hi-Gard. Epoxy to a dry film thickness of 10 mils. Total dry film thickness for this system shall be a minimum of 13 mils.

System B - Ferrous Metal, Miscellaneous Items – Exposed to Atmosphere

1. General:

   All new exposed ferrous metal surfaces shall be pretreated and coated with this system with the exception of the generator, the motor control center, electrical panels, fusion epoxied pipe, and other equipment which may be factory coated per System C or a similar approved system.

The pumps and motors shall be shipped with a compatible shop applied prime coat and the final coat shall be field applied as specified herein. Exposed ferrous metal surfaces to be coated include all piping, fittings, and valves.

Well 12's above grade discharge piping and fittings to be sandblasted and recoated per System B.

Exposed conduits, junction boxes, communication and small power panels, and supports to be coated per System B unless otherwise specified.

2. Surface Preparation:
   a. All metal ferrous surfaces, except those with a factory pretreatment and primer, shall be sandblasted according to SSPC-SP-10, "Near-White Blast Cleaning"
   b. For nonferrous and galvanized metal shall be prepared in accordance with SSPC-SP-7 (Brush-off Blast Cleaning). Nonferrous and galvanized metal not in contact with water shall be cleaned prior to the application of the prime coat in accordance with SSPC-SP-1 (Solvent Cleaning)
3. Coatings:
   a. Tnemec: Prime coat shall consist of Tnemec 135 (epoxy) to a minimum dry film thickness of 5 mils. Finish coats shall consist of one or more coats of Tnemec Series 75 (aliphatic acrylic polyurethane) to a minimum dry film thickness of 5 mils. Total dry film thickness for this system shall be a minimum of 10 mils
   b. Carboline: Prime coat shall consist of Carboline Series 893 Primer (polyamide epoxy) to a minimum dry film thickness of 3 to 5 mils. Finish coats shall consist of two or more coats of Carboline Series 133 HB (aliphatic acrylic polyurethane). Total dry film thickness for this system shall be a minimum of 10 mils

<u>System C – Ferrous Metal – Above Grade Filter Piping and Meter Control Cabinet</u>

1. General:

   All new above grade steel piping and meter control cabinet shall be lined and coated in the shop with a fusion-bonded epoxy. For the filter piping, this includes all above grade piping and fittings with the exception of the check valves, magnetic meters, and butterfly valves that will come factory coated with this or a similar approved system.

2. Shop Application of Fusion-Bonded Epoxy Lining and Coating:

   Grind surface irregularities, welds, and weld spatter smooth before applying the epoxy. The allowable grind area shall not exceed 0.25 square foot per location, and the maximum total grind area shall not exceed one square foot per item or piece of equipment. Do not use any item, pipe, or piece of equipment in which these requirements cannot be met.

   Remove surface imperfections, such as slivers, scales, burrs, weld spatter, and gouges. Grind outside sharp comers, such as the outside edges of flanges, to a minimum radius of 114 inch.

   Uniformly preheat the pipe, item, or piece of equipment prior to blast cleaning to remove moisture from the surface. The preheat shall be sufficient to ensure that the surface temperature is at least 5°F above the dew point temperature during blast cleaning and inspection.

   Sandblast surfaces per SSPC SP-5. Protect beveled pipe ends from the abrasive blast cleaning.

   Apply a phosphoric acid wash to the pipe, item, or piece of equipment after sandblasting. The average temperature, measured in three different locations, shall be 80°F to 130°F during the acid wash procedure. The acid wash shall be a five percent by weight phosphoric acid solution. The duration in which the acid is in contact with the surface shall be determined by using the average temperature as tabulated below:

Pipe Temperature (°F)	Contact Time (Seconds)
80	52
85	45
90	36
95	33
100	28
105	24
110	21
130	10

   After the acid wash has been completed, remove the acid with demineralized water having a maximum conductivity of 5 micromhos/cm at a minimum nozzle pressure of 2,500 psi.

Apply lining and coating by the electrostatic spray or fluidized bed process. Minimum thickness of lining or coating shall be 15 mils. Heat and cure per the epoxy manufacturer's recommendations. The heat source shall not leave a residue or contaminant on the metal surface. Do not allow oxidation of surfaces to occur prior to coating. Do not permit surfaces to flash rust before coating.

Apply lining and coating per AWWA C213 except as modified herein.

Grind 0.020 inch (minimum) off the weld caps on the pipe weld seams before beginning the surface preparation and heating of the pipe.

3. Coatings:

   Lining and coating shall be a 100 percent solids, thermosetting, fusion-bonded, dry power epoxy resin NSF 61 certified for potable water systems: Scotchkote 134 or 206N, Lily Powder Coatings "Pipeclad 1500 Red," H.B. Fuller IF-3003, or equal. Epoxy lining and coating shall meet or exceed the following requirements:

Hardness	Barcol 17 (ASTMD 2583, Rockwell 50 (“M” scale)
Abrasion Resistance (maximum value)	1,000 cycles: gram removal 5,000 0.115 gram removal ASTM D 1044, Tabor CS 17 wheel, 1,000 gram weight
Adhesion (Minimum)	3,000 (Elcometer)
Ensile strength	7,300 psi (ASTM D 2370)
Penetration	0 mil (ASTM G17)
Adhesion overlap shear, 1/8-inch steel panel, 0.010 glue line	4,300 psi, ASTM 1002
Impact (minimum value)	100 inch-pounds (Gardner 5/8-inch diameter tup)

4. Field-Applied Epoxy Coating for Patching – Use a two-component, 80 percent solids liquid resin, such as Scotchkote 306 or an approved equivalent.
5. Coating of Flexible Pipe Couplings – Line and coat couplings the same as the pipe. Color shall match the color of the pipe fusion epoxy coating.

System D- Underground Steel Pipe and Appurtenances

1. General:

   Unless otherwise specified or factory painted with an approved system, buried pipeline items, such as valves, couplings and bolts shall be coated with this system.

2. Surface Preparation:

   Apply only to clean, dry surfaces. Remove rust, paint and other foreign matter by sand blasting (SSPC-SP-6), wire brushing, or scraping.

3. Coating:

   a. Lined and coated per AWWA C213
   b. Koppers: Two coats of Bitumastic Super Service Black, 13 mils each coat.
   c. Polyurethane Wrap

System E - Underground Ductile Iron Pipe and Appurtenances

1. General:

   Unless otherwise specified, all underground ductile iron pipe, fittings and appurtenances shall have a tubular polyethylene encasement and installed per manufacturer's recommendation per ANSI/AWWA C105/A21.5 and in accordance with Section 33 11 13 Subsection 2.05.

2. The polyethylene encasement shall be from Polywrap or an approved equivalent.

System F – Manganese Filters

1. General – The new manganese filters are painted and coated by the MTS. The Contractor shall provide field painting of the exterior to repair tank coating as needed.

2. The coating repair shall be with a high solids epoxy, Tnemec Series 69 or equal. One coat is to be applied to provide a finish DFT of 2 - 4 mils.

3. Exterior topcoat shall be polyurethane, Tnemec Series 1075 or equal, color to be selected by District.

3.07 Surfaces Not to be Painted

A. Unless otherwise specified, the following surfaces shall be left unpainted:

1. Stainless Steel
2. Aluminum
3. Hot Dip Galvanized Items
4. Rotork Actuators
5. Concrete
6. Glass
7. Equipment Nameplates
8. Electrical enclosures
9. Conduits
10. Transformers
11. Instruments,
12. Equipment (unless specifically stated)

**** END OF SECTION ****

PART 1 – GENERAL

1.01 Summary

A. This Section is applicable to the following secondary structural system elements, non-structural components, and/or equipment:

1. Mechanical, electrical, and plumbing equipment and appurtenances
2. Horizontal Pressure Filters
3. Conduit, piping, and similar systems

1.02 References

A. American Society of Civil Engineers Standard ASCE 7-05, Minimum Design Loads for Buildings and Other Structures, Chapters 11, 13, 15.

B. California Building Code, Latest Edition.

1.03 Definitions

A. Engineer – The Engineer responsible for the preparation of Contract Documents.

B. Specialty Engineer – Structural or Civil Engineer provided by the contractor licensed in the State of California responsible for specific elements of the primary structural system, the secondary structural system, non-structural elements and/or equipment supported by structures.

1.04 General Design Requirements

A. The Contractor is responsible for producing designs that resist the total seismic forces in accordance with the seismic design criteria. The Contractor is responsible for coordinating between the Engineer and the Specialty Engineer.

B. The seismic design for non-structural components and equipment shall be in accordance with the IBC Chapter 16, and the required coefficients and factors for determining the total design seismic forces are provided for in the geotechnical report that is in Appendices.

C. Coordinate the layout so that adequate space is provided between items for relative motion. Provide additional supports and restraints between items of different systems when necessary to prevent seismic impacts or interaction.

D. Design anchorages of all elements of structures, non-structural components, equipment supported by structures, and non-building structures to resist static and dynamic operational loads, plus total seismic loads specified in the IBC, ASCE 7-05 Section 13.3.1. For anchorage uplift, multiply dead load by 0.9 and subtract $0.2S_{DS}$ if used to reduce vertical seismic effects.

E. Design anchorages utilizing a Component Coefficient, R_p =1.5, unless supporting documentation for embedment length, showing compliance with section 13.4.2 of ASCE 7, is provided for expansion anchor bolts, chemical anchors, or cast-in-place anchors.

1.05 Design Requirements for Piping and Conduits

A. The Contractor is responsible for producing designs for support of piping, conduit, duct, or other systems to resist total seismic forces based on the seismic design criteria coefficients specified above unless shown on the Contract Documents. Except where the technical specifications give specific exemption from resistance of seismic forces, all supports shall be designed to meet seismic criteria.

B. Where possible, pipes, conduit, and their connections shall be constructed of ductile materials (e.g., copper, ductile iron, steel or aluminum and brazed, welded or screwed connections). Pipes, conduits, and their connections, constructed of non-ductile materials (e.g., cast iron, no-hub pipe and plastic), shall have the brace spacing reduced to one-half of the spacing allowed for ductile material.

C. Seismic restraints may be omitted for the following conditions where flexible connections are provided between components and the associated piping and conduit:

   1. All other exposed piping less than 2.5 inches inside diameter or electrical conduit less than 2.5 inches trade size.

D. As an alternative to designing the supports and anchorage where an approved national standard provides a basis for the earthquake-resistant design, submit standard, data, and details for piping, conduit, duct, or other systems:

   1. For mechanical piping, process piping, and electrical conduits, follow Guidelines for Seismic Restraints of Mechanical Systems by SMACNA modified as follows:
      a. Seismically brace piping regardless of size or location. Provide transverse braces at all changes in direction and at the end of all pipe runs. Space transverse braces not more than 20 feet apart. Provide longitudinal braces at 40-foot centers.

1.06 Submittals

A. Submit in accordance with Section 01 33 10.

B. Submit certification for equipment not listed in this specification but included in the contract documents that the equipment itself is designed to resist all internal seismic forces based on the seismic design criteria for the project.

C. Where required in the equipment specifications in or listed below, submit signed and sealed structural calculations and detailed drawings from a Specialty Engineer where the project is being built for the attachments and anchorage to the primary structure.

   1. Required anchorage items include:
      a. Hypochlorite Tank
      b. Packaged Sodium Hypochlorite Feed System
      c. Electrical Switchgear, Panels, and Equipment in Electrical Room

D. Structural calculations and detailed drawings shall be prepared by a Specialty Engineer.

E. Structural calculations and detailed drawings shall clearly show the total design seismic forces which will be transferred from the elements of the structural system, non-structural components, and/or equipment and their attachments to the prime structure.

1.07 Quality Assurance

A. The Contractor is responsible for submitting signed and sealed structural calculations and detailed drawings from a Specialty Engineer.

B. Comply with the California adopted and amended versions of the International Building Code (IBC) Section 1613, the referenced sections of ASCE 7.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

****END OF SECTION****

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PART 1 GENERAL

1.01 SCOPE OF WORK

A. The following list of components and areas of work is a summary of the work required in the Drawings and Specifications. The list is not comprehensive of the total work required nor is it in any specific order. It is merely being provided as an aid to the bidder. Work not listed herein, but described in the plans or Specifications, is also part of the overall scope of work.

1. Power Revisions:
   a. Revise existing MCC-1 Panel LP-A for new circuits.
   b. New panelboards FLT-1-2, and FLT-3-6.
   c. Spare out cubicle for surface wash pump
   d. Remove conductors for surface wash pump.
2. Communications system
   a. Valve Operators with network connection to PLC control system.
   b. Communications commissioning and testing
3. Control panel(s):
   a. Main Control Panel.
   b. Filter network control panels (2).
   c. Systems Integrator to design, furnish, assemble, wire, test, and complete all test forms pertaining to control panels as part of their scope of work.
   d. Furnish and install new backpan in existing plant main control panel. Remove and waste existing panel. Provide first right of salvage to Owner for components.
   e. Contractor shall remove and transmit PLC and Operator Interface to Application Programmer upon conclusion of factory testing. Purpose is for Application Programmer to complete PLC and OI programming and bench testing.
   f. Application programmer will return the PLC and OI to the System Integrator for insertion into the control panel at the beginning of Field Testing. Contractor shall re-install the PLC and OI into the Control Panel.
   g. System Integrator to perform factory and field testing as required for this project. Instrumentation calibrations and I/O checkout must be complete prior to Operational Testing.

h. System Integrator to coordinate, configure, and place communications system(s) into operation during pre-operational testing of system hardware.

4. PLC, OI, and SCADA Applications Programming:
   a. Configuration and Programming of the Programmable Logic Controller (PLC), and Operator Interface (OI), and SCADA System is by Application Programmer. Application programmer is defined in this specification section [Qualifications].
   b. Application Programmer work is limited to programming and testing (labor only) of the PLC, OI, and SCADA. All other material, assembly, and installation is by Contractor.
   c. Pre-energization and pre-operational testing must be complete prior to Application Programmer arrival for start-up services. Instrumentation calibrations and I/O checkout must be complete.
   d. Application Programmer will be available to startup systems as they become available. The Contractor shall notify the Application programmer of start-up and testing dates 2 weeks minimum in advance of requirement.
5. Instrumentation
   a. Systems Integrator to design, furnish, assemble, wire, test, and complete all test forms pertaining to instrumentation as part of their scope of work.
   b. Furnish NSF/ANSI 61 certified products that have undergone testing for any device, valve, instrument, or assembly that will come into contact with drinking water.
   c. Furnish mounting supports or other accessories as detailed and as recommended by the instrument manufacturer for the application.
6. Conduit, junction boxes, pull boxes, wire, and grounding system, for equipment interconnection, and operation.
   a. Contractor to perform termination of all field wiring and internal wiring for equipment that required dis-assembly for shipping.
   b. Contractor to label conduits, wire, and equipment per specifications.

7. All necessary process piping, shut off, sample and calibration valves, drains, pressure reducers and calibration equipment for connection of instrumentation.
8. Trenching, backfilling, compaction and resurfacing for all new underground conduit routes, concrete pads, and pull boxes.
9. Coordination and equipment for connection of power utility and telephone services per utility Drawings and standards.
10. Site electrical devices, lights and receptacles.
11. Seismic Anchorage Design Calculations and conforming installation.
12. System startup, calibration, testing and documentation.
    a. Complete factory and field testing per specification section [Factory and Field Testing] and as defined herein.
        1) Complete start-up and configuration of all components
        2) Complete testing documentation and submit for record.
    b. The Application Programmer (defined in Electrical Specifications [Electrical General].) and/or Construction Manager will be actively engaged in Operational Testing and Commissioning. These efforts shall be combined efforts of the Application Programmer, System Integrator, Construction-Manager, and Contractor.
    c. The Contractor shall facilitate test as outlined herein such that hardware, software and application programming are tested completely and all applicable test documentation is completed.
    d. The Contractor shall assume that a minimum of 80 hours will be required to assist in this task.
    e. Sufficient time shall be allocated in the construction schedule for troubleshooting, testing, startup, and verification of application programming in front of associated construction milestones. For instance, if a pump station is required to be operational prior to a certain date, then the schedule shall allocate time for these activities. The time necessary depends on the system to be started and shall be coordinated with the

Construction Manager during construction scheduling early in the project.

B. Electro-mechanical equipment to be installed in this project may be specified in other divisions but will interface to equipment provided under Electrical Specifications. Obtain submittals for those devices, review, coordinate and provide all interfacing equipment, software, communications, I/O, and testing to integrate the equipment to the extent possible and as intended.

C. Install electrical and control portion of electro-mechanical equipment specified in other sections. Reference those Specifications, pertinent details, and follow all manufacturer instructions to erect, install and commission equipment. Furnish all electrical equipment, interconnecting wire, and make connections to place equipment in operation.

D. All electrical equipment and materials, and methods - including installation, calibration, and testing - shall conform to the applicable codes and standards listed in this and other Sections. All electrical materials and work shall conform to published standards of the National Electric Code (NEC) current issue, Institute of Electrical and Electronic Engineers (IEEE), and Underwriters Laboratories Inc (UL).

1.02 RELATED SPECIFICATIONS

A. The following specification sections are part of the [Electrical Specifications].

Section	Description
26 01 10	Conduit and Boxes
26 01 20	Low Voltage Wire and Data Cable
26 44 50	Grounding
26 66 00	Factory and Field Testing
26 79 05	Control Panels
26 79 10	PLC & OI Hardware
26 79 15	PLC & OI Applications Programming
26 89 40	Instrumentation

B. Owner, Engineer, Construction Manager, and City are used within Electrical Specifications and are interchangeable. They are all representatives of the Owner, in this case, the Olivehurst PUD.

1.03 QUALIFICATIONS AND REQURIED WORK SCOPE

A. Electrical Contractor
   1. Management and installation of the entire electrical and control system required for this project shall be by an Electrical Contractor meeting qualifications as defined herein.
      a. Contractor shall be capable of looking at electrical equipment submittals, prior to installation, comparing hookup requirements to the Drawings, and noting any deficiencies.
   2. Electrical Contractor shall select, furnish, and install all commodity electrical materials (conduit, wire, supports, fittings, ductbanks, etc) that are generally not “custom” or uniquely manufactured for this project. Custom electrical panels, controls, and instrumentation shall be furnished by Systems Integrator.
   3. Electrical Contractor shall be competent in and familiar with management and subcontracting of specialty electrical and instrumentation supply and engineering work as requires of a Systems Integrator as described herein.
   4. Electrical Contractor must be competent in performance, supervision and coordination of work required and performed by equipment suppliers and Systems Integrator (Subcontractors).
   5. The Electrical Contractor (EC) shall meet the following minimum qualifications:
      a. Has a current C10 Electrical Contractor’s License issued by the State of California Department of Consumer Affairs.
      b. EC shall be regularly engaged in similar industrial power and controls electrical contracting for the Water and Wastewater Industry.
      c. EC shall have successfully performed work of similar or greater complexity (as measured in contract value on industrial power and controls projects) on at least three (3) previous projects.

d. EC shall carry all insurances as defined and required by the special provisions and as required by law.
e. EC shall be competent in methods and materials execution and selection associated in the type of electrical and instrumentation work specified in this Division.
   1) EC shall know and understand common terms and abbreviations used in this Industry. Not all terms and abbreviations will be defined in the Drawings and Specifications.
f. EC shall comply with State law which requires that all personnel installing electrical components are certified by the State of California as "Electrician" or "Electrician Trainee." Apprentices may install electrical components only under direct supervision of a certified Electrician.

B. System Integrator
1. Systems Integrator shall be a supplier to the Electrical Contractor and must be competent in performance, supervision and coordination of work required in this contract.
2. This includes, but is not limited to, all work necessary to select, furnish, construct, supervise installation, configure, calibrate, test, and place into operation all transmitters, instruments, programmable controllers, control panels, motor controls, alarm equipment, communications, monitoring equipment, and accessories.
3. The System Integrator shall have on staff a Project Engineer with three years prior experience on similar sized projects. This Project Engineer shall coordinate the technical aspects of this project and prepare the submittals and drawings. The Project Engineer shall attend all coordination meetings when specifically requested by the Engineer.
4. The System Integrator (SI) shall meet the following minimum qualifications:
   a. SI shall be regularly engaged providing electrical and control systems for the Municipal Water and Wastewater Industry.
   b. SI shall have an Electrical Engineer on staff registered in the State of California as a Professional Engineer.

c. SI shall be capable of labeling all electrical panels as manufactured or customized by the System Integrator with appropriate Underwriters Laboratories (UL) label prior to factory testing or shipment to project site.
d. SI shall have successfully completed work of similar or greater complexity and on similar facilities on at least ten previous projects under the present company name.
e. SI shall be actively engaged in the following disciplines for the last 5 consecutive years.
   1) Design and manufacturing of custom Control Panels, Motor Controls Centers, and associated devices and equipment as specified in this division.
   2) Programming and commissioning of SCADA, PLC and Operator Interface hardware.
   3) Instrumentation - selection, purchase, calibration, start-up and commissioning.
   4) Testing, calibration, start-up, and commissioning of control systems as applied to the Water and Wastewater industry.
f. SI shall employ personnel on this project who have successfully completed ISA or equal training courses on general purpose instrumentation.
g. SI shall have a permanent, fully staffed and equipped service facility within 200 miles of the project site for a minimum of 1 year prior to bid date with personnel and equipment required to maintain, repair and calibrate the instrumentation system.

5. If the System Integrator does not meet the requirements above and cannot demonstrate through submittal process that it is qualified, then the System Integrator will be rejected and a replacement System Integrator must be submitted.

C. Application Programmer
1. The Applications Programmer will be a part of the Construction Management team and their work is not in contract.
2. The Application Programmer work is limited to programming and configuration, and associated startup and testing

services of the PLC, Operator Interface, and SCADA. All other work is by Contractor.

1.04 CONTRACT DOCUMENTS

A. The resolution of conflicting information within the contract electrical documents shall put precedence on electrical Drawings over that of electrical Specifications.

B. The Drawings and Specifications are intended to be descriptive of the type of electrical system to be provided with sufficient detail to construct. Minor omission of detail shall not relieve a qualified contractor from the obligation to provide a complete operational system if it can be determined that the particular detail is usual and customary for similar systems.

C. The following Specifications may incorporate specific equipment or materials that do not have equal equipment listed. These items are standards because of their familiarity, serviceability, and/or spare parts inventory. However, equal alternate equipment or materials (noted in the submittal cover letter) will be considered for use on this project if submitted. The Engineer may reject said equipment for the purpose of adherence to standards.

D. Contract Drawings are diagrammatic and indicate general arrangement of systems and equipment.
   1. Exact locations and layouts of electrical products shall be defined during submittal, assembly, or field fit during construction. Field measurements take precedence over dimensioned drawings. Drawing intent is to show initial size, capacity, approximate location, orientation, and general relationship of equipment in area shown but may not show exact detail or arrangement.
   2. However, when materials, locations, sizes, or methods are specifically dimensioned, detailed or noted, the Drawings shall take precedence over electrical Specifications in the event of conflict. In no case, is NEC, UL, or other applicable governing standards to be overridden.

E. The Contractor shall examine the architectural, mechanical, structural, and electrical and instrumentation submittals and equipment furnished under other Specifications divisions in order

to determine conduit routing, stub-up locations, and final terminations for all conduits and cables. Conduits shall be stubbed up as near as possible to equipment electrical terminals. The exact locations and routing of cables and conduits shall be governed by structural conditions, physical interferences, and the physical location of wire terminations on equipment.

F. All equipment shall be installed and located so that it can be readily accessed for operation and maintenance. If accessibility appears to be compromised, the location of equipment or stub ups shall be modified to the extent possible.

G. Where conduits are shown on the Drawings, or stated to be furnished but not explicitly shown, as part of the scope of work; the Contractor shall provide all fittings, boxes, wiring, etc. as required for completion of the raceway system in compliance with the NEC and the applicable Specifications in this Section.

H. No changes from the Drawings or Specifications shall be made without written approval of the Engineer. Should there be a need to deviate from the Contract documents, submit written details and reasons for all changes to the Engineer for review.

I. The Contractor shall maintain a neatly and accurately marked full size set of Contract Drawings recording the as built locations and layout of all electrical and instrumentation equipment, routing of raceways, junction and pull boxes, and other diagram or drawing changes. Drawings shall be kept current weekly, with all "change orders", submittal modifications, and construction changes shown. Drawings shall be subject to the inspection by the Engineer at all times, progress payments or portions thereof may be withheld if Drawings are not accurate or current.

J. When documents are changed, they shall be marked with erasable colored pencils using the following coloring scheme:
   1. Additions - red
   2. Deletions - green
   3. Comments - blue
   4. Dimensions - black

K. Prior to acceptance of the work, the Contractor shall deliver to the Engineer one set of record full size drawings neatly marked accurately showing the information required above.

1.05 PROJECT COORDINATION

A. Prior to submittal, the Electrical Contractor shall coordinate with equipment suppliers to verify sizes, mounting, connections, storage, and delivery of equipment. If there are any issues whereby the solution will be in conflict with plans and Specifications, or that are undefined and need direction, they shall be brought to the attention of the Engineer or Construction Manager via the RFI process.

B. Where connections must be made to existing or new operational facilities, the Contractor shall schedule all the required work with Engineer, including the power shutdown period. Carry out each shutdown so as to cause the least disruption to the operation of the installation.

1. The Contractor shall limit all unscheduled shutdown periods to less than 15 minutes and only with prior approval of the Station operator.
2. Carry out shut downs of durations greater than 15 minutes only after the time and date schedule and sequence of work proposed to be accomplished during shutdown has been favorably reviewed by the Engineer. Submit shutdown plans at least 2 days in advance of when the scheduled shutdown is to occur.
3. Provide temporary power to all existing facilities utilizing a portable generator. The generator shall be utilized for all shutdowns that exceed 15 minutes and run continuously for the duration of the primary power shutdown. All cost for operating the generator including equipment, fuel and labor shall be provided.
4. The Engineer reserves the right to delay, change, or modify any scheduled shutdown at any time, at no additional cost to the Owner, when the risk of such a shutdown would jeopardize the operation of the water distribution system and/or water plant operation.

1.06 SUPERVISION

A. The Contractor shall schedule all activities, manage all technical aspects of the project, coordinate submittals and drawings, and attend all project meetings associated with this Section. The Contractor shall coordinate and confirm that the project schedule is being adhered to and all work is being completed within the scheduled time frames.

B. The Contractor shall supervise all work in this Section, including the electrical system general construction work, from the beginning to completion and final acceptance.

C. The Contractor shall coordinate, obtain, prepare, and/or complete the documentation required within this division. All documentation shall be complete and delivered prior to final acceptance.

1.07 INSPECTIONS

A. General

1. Contract work or materials shall be subject to inspection at any time by the Engineer. If equipment, material, or installation method does not conform to the Contract documents, or does not have a favorably reviewed submittal status and has been determined to be unsatisfactory by the Engineer, then the Contractor shall remove said material from the premises; and if said material has been installed, the entire expense of removing and replacing same, including any cutting and patching that may be necessary, shall be borne by the Contractor.
2. The Engineer may inspect and test the fabricated equipment at the factory before shipment to job site. See Electrical Specifications [Factory and Field Testing] for requirements.
3. Work shall not be closed in or covered over before inspection and approval by the Engineer. All costs associated with uncovering and making repairs where non-inspected work has been performed shall be borne by the Contractor.
4. The Contractor shall cooperate with the Engineer and provide assistance at all times for the inspection of the electrical system under this Contract. The Contractor shall remove covers, provide access, operate equipment, and

perform other reasonable work which, in the opinion of the Engineer, will be necessary to determine the quality of the work.

B. Milestones requiring inspection and signoff.
   1. Underground conduit and grounding system complete. Do not cover any portion of conduit prior to inspection. Conduits must be labeled with temporary tags per Electrical Specifications [Conduit and Boxes] and [Grounding].
   2. Factory testing. Coordinate test date with Engineer 2 weeks prior to test scheduled date.
   3. Installation of electrical equipment. Equipment is anchored in place, conduit connections are complete, no wire is yet pulled into conduit. Permanent conduit tags must be in place per Electrical Specifications [Conduit and Boxes] and [Grounding].
   4. Wire termination complete. Do not energize equipment. All wire tags must be installed and wires terminated per Electrical Specifications [Low Voltage Wire and Data Cable]. Pre-energization testing to commence after inspection.
   5. Testing per Electrical Specifications [Factory and Field Testing]. All testing per Electrical Specifications [Factory and Field Testing] shall be witnessed unless specifically declined by the Engineer. Schedule tests with Engineer 2 weeks prior to test date.
   6. Start-up per Electrical Specifications [Factory and Field Testing]. Schedule tests with Engineer 2 weeks prior to test date.
   7. Punch list – final inspection. Schedule final walkthrough with Engineer one week prior to intended project completion date. All items on punchlist must be complete prior to scheduling walk-through.

1.08 JOB CONDITIONS

A. Construction Power and Telephone Service
   1. The Contractor shall coordinate, furnish and install, temporary utility services required during construction of the project, such as temporary electrical power and telephone service. Temporary services shall be installed in accordance with the applicable codes and regulations of the serving utilities.

2. Upon completion of the project, remove temporary services. All equipment and material shall be the property of the Contractor.

B. Equipment Storage
1. The Contractor shall provide adequate protection for all equipment and materials during shipment, storage and construction.
2. Equipment and materials shall be completely and sufficiently sealed and covered and set on a pallet above grade so that they are protected from weather, wind, dust, water, or construction operations.
3. Equipment shall not be stored outdoors. Where equipment is stored or installed in an area with susceptibility to moisture, such as unheated buildings, untested piping, etc., provide an acceptable means to prevent moisture damage, such as plastic cover and a uniformly distributed heat source to prevent condensation.

C. The project site is located where outside temperatures vary between 10 deg F. to 110 deg F. Humidity in this area will range from 10% to 100%.

1.09 AREA CLASSIFICATIONS

A. Area classifications are shown on the site electrical plans. The area enclosed by walls or the entire drawing area shall be classified as shown unless otherwise described in notes.

B. All electrical equipment, enclosures, conduit, and supports shall be formally rated for or, at minimum, meet the intent of the rating as interpreted by Engineer.

C. If no area classification rating is shown on the Drawings, classification shall default to a NEMA 12 rating for indoors, and NEMA 4 rating for outdoors (non corrosive) and NEMA 4X for corrosive areas both indoors and outdoors.

1.10 SUBMITTAL REQUIREMENTS

A. General
1. Requirements described herein are specific to electrical submittals and are secondary to those described in other

general Specifications sections. Any additional requirements described here that are beyond those described in those sections shall be provided as described. Conflicts shall be resolved by giving priority to general Specifications.

2. The Contractor shall ensure that the System Integrator and/or equipment suppliers provide the submittal documentation required in this section. Submittals shall be neat, orderly, complete (without un-needed parsing), and indexed.
   a. Like equipment shall be submitted complete in a single submittal. For instance, all general electrical materials shall be in a single submittal. All instrumentation, all control panels, or all MCCs and so on shall be submitted complete where possible.
   b. Submittals that are broken down without sufficient cause will be rejected for future inclusion into a combined submittal.
   c. Do not separate submittals by area.
   d. Do not separate submittals by specification division unless agreed to in advance.
3. The Contractor shall coordinate submittals with the work so that project will not be delayed. This coordination shall include scheduling the different categories of submittals, so that one will not be delayed for lack of coordination with another. Time extensions will not be allowed due to failure to properly schedule submittals.
4. No material or equipment shall be delivered to the job site until the submittal for such items has been reviewed by the Engineer and marked "no exceptions noted" or "make corrections noted".
5. The equipment Specifications have been prepared on the basis of the equipment first named in the Specifications. The Contractor shall note that the second named equipment, if given, is considered acceptable and equal equipment, but in some cases additional design, options, or modifications may be required to meet Specifications or functional installation.
6. Exceptions to the Specifications or Drawings or equipment or procedures submitted as “equal” to specified equipment shall be clearly identified in a letter at the front of the submittal. Submittal data for “equal” equipment or procedures shall contain sufficient details so a proper evaluation may be

made by the Engineer. The Contractor is responsible for verifying proper application/operation of substituted equipment.

7. The opinion of the Engineer will be the final determination whether a substitution request meets the design intent.
8. Deviations from the Contract documents shall not be incorporated into the work without prior written approval of the Engineer. A "Change Order" directive from the Engineer is required prior to incorporating any deviation from the Contract documents that has costs associated. The cost differential associated with this change order must be negotiated with the Owner to amend the Contract to reflect the costs or savings.

B. Submittal Procedures

1. Identify all submittals by submittal number on letter of transmittal. Submittals shall be numbered consecutively and resubmittals shall have a letter suffix. For example:
   a. 1st submittal: 1
   b. 1st resubmittal: 1A
   c. 2nd resubmittal: 1B, etc.
2. Within 30 calendar days after contract award maximum and as the construction schedule dictates, the Contractor shall furnish to the Engineer all submittals (electronic) required for this Division. Interconnection drawings, training documents test procedures, and O&M Manuals as applicable shall be submitted timely as to not delay the project.
   a. Submittals shall be delivered entirely electronically via email (no hard copy required). However, General Contractor supervision must not be circumvented by sending submittals direct to Engineer.
   b. Electronic Submittals shall be viewable using a PDF reader.
   c. Electronic (PDF) submittals must follow all applicable requirements for indexing, bookmarks, highlighting, selection indicators (box, highlight) etc. Use of native PDF files (not scans) are required if one exists on the World Wide Web (WWW).
3. Submittal Preparation
   a. Electronic submittals shall be assembled in accordance with the Specifications with table of contents, bookmarks, tabs, subtabs, etc. utilizing the

electronic bookmarks feature available in the PDF assembler. Only one PDF file is allowed for each submittal. Multiple (.PDF) files will not be acceptable.

b. Use of native PDF files (not scans) are required if one exists on the www. Ignoring this requirement is cause for submittal rejection.

c. Submittal shall be appropriately labeled with the project name, contract number, equipment supplier's name, specification section(s), and major material contained therein.

d. An index shall be provided. This index shall itemize the contents of each tab and subtab section.

e. Field equipment shop documents, panel equipment shop documents, drawings, and bill of materials shall be grouped under separate tabs. Shop documents shall be ordered in the same sequence as their corresponding Contract specification subsection.

f. All spare parts shall be listed separately at the end of the Bill of Materials list.

g. Data summary sheets shall be provided for each individual piece of instrumentation. The data summary sheets shall have the following information preceding their corresponding catalog data:
   1) Instrumentation type and tag name.
   2) Location/description.
   3) The manufacturer's model and part number with all options.
   4) Range, span, units, input and output signals.
   5) Description of component.
   6) Contract specification subsection number reference.

4. The reviewed submittals will be annotated "Make Corrections Noted", "No Exceptions Noted", "Revise and Resubmit Noted Items", or "Rejected without Review." The following actions shall then be taken by the Contractor:

   a. "No Exceptions Noted" - The Contractor may proceed with the work covered in this submittal. No resubmission is necessary.

   b. “Make Corrections Noted” - The Contractor may proceed with the work covered in this submittal incorporating the changes noted. However, the

Contractor shall revise the submittal in accord with the changes noted and resubmit six (6) copies of drawings, bill of materials, and catalog data denoting changes within 14 calendar days when requested by the Engineer for record keeping purposes.

c. "Revise and Resubmit Noted Items" - The Contractor shall not proceed with the work covered in this submittal. The Contractor shall revise and correct the submittal in accordance with the comments and resubmit six (6) copies within 14 calendar days for approval.

d. "Rejected without Review" submittal - The Contractor shall not proceed with the work covered in this submittal. The submittal did not address the work scope as defined by the submittal's title or the previous submittal comments have not been addressed in full. The Contractor shall revise and correct the submittal in accordance with the Specifications, and resubmit six (6) copies within calendar 14 days for approval.

5. Resubmittals shall address all comments by the Engineer. A submittal response letter shall be submitted that addresses each comment by the Engineer with a standardized response of "revised" or with a written explanation. Partial re-submittals (that do not address all comments) may be returned without review at the discretion of the Engineer.

6. The Contractor shall be responsible for the Engineer's review cost for each resubmittal in excess of the second resubmittal. These costs will be back-charged to the Contractor and will be deducted from his progress payments.

C. Electrical Equipment -- Submittal data shall be grouped by equipment type. Each submittal shall be as complete as possible covering the entire project and scope of supply. Drawings or equipment submitted individually that are not on the critical path will not be accepted for individual review. The electrical submittals shall include (as a minimum):

1. Table of Contents

2. Comment Letter: The Project Engineer of the System Integrator shall note all deviations from Contract Documents and the reason(s) for the deviation. They may use this forum to inform the Engineer or installing Contractor of important

information related to the project. RFIs must be submitted separately. Re-submittals shall include written responses to every comment provided by the Engineer during the previous review.

3. Bill of Materials: The Contractor and System Integrator each shall provide Bill of Material for electrical components formatted as shown below. Generic names or part numbers as defined by a distributor or Integrator are not acceptable. Only the originating manufacturer's name and part number shall be listed. Provide separate bill of materials for each panel, MCC, instrument list, etc.

Bill of Material

Item #	Qty	Tag#	Description	Manufacturer	Part #

4. Shop Drawings:
   a. Equipment elevations with enclosure details drawn to scale or dimensioned with relative scale.
   b. Electrical One-line, Elementary, and wiring diagrams
   c. PLC I/O wiring diagrams
5. Catalog Data shall include the following: (features and options shall be highlighted, circled, or "arrowed.")
   a. Instrumentation data summary sheets (by Contractor)
   b. Manufacturer's technical information brochure
   c. Physical size and mounting details and illustrations
   d. Calibration Range
   e. Input/output signals
   f. Electric power, air, and/or water supply requirements.
   g. Options selected and available (Cross out items not included)
   h. Materials of construction of components

D. Shop Drawings Shop drawings shall be furnished for each electrical panel even if one was not shown explicitly on the Drawings. Shop drawings shall be numbered in sequence. Blank drawings or drawings that contain no specific project data will not be accepted for review.

E. All drawings shall be generated with a computer utilizing AutoCAD or similar drafting program. Drawings shall be no smaller than

11" x 17". The lettering shall be legible and no smaller than 0.75 inch in height.

F. Drawings shall be custom prepared for this project and shall have borders and a title block identifying the project, manufacturer, system or location, drawing number, drawing title, AutoCAD file name, project engineer, date, revisions, and type of drawing. Diagrams shall carry a uniform and coordinated set of wire colors, wire numbers, and terminal block numbers. The shop drawings shall include the following as a minimum:

1. Electrical one-line diagrams detailing all devices associated with the power distribution system. The following applicable information or data shall be shown on the one- or three- line diagram: location, size and amperage rating of bus; size and amperage rating of wire or cable; breaker ratings, number of poles, and frame sizes; power fail and other protective devices; fuse size and type.
2. Detailed analog and digital I/O diagrams showing the wiring requirements for each instrument or device connection. Reference the Drawings for an example of each I/O card drawing requirements. If one is not included in the Drawings, then one may be obtained from the Engineer upon request.
3. Elementary (wiring) diagrams shall be provided for all relay logic, programmable logic controls, motor controls, power supplies, and other wiring. All elementary (wiring) diagrams shall be drawn in JIC EMP/EGP format and standards showing ladder rung numbers and coil and contact cross referencing numbers.
4. Equipment exterior and interior scaled drawings of front, side, elevation, deadfront, front panel devices, and backpan components. Show fabrication methods and details; including material of construction, paint color, door latch and lock, and ventilation system. Show shipping split locations and offloading information. Submit base plan showing allowed conduit entrance areas and bolt hole locations.
5. Drawings shall show UL required information as needed to UL label the equipment in accordance with UL procedures for label applied.

6. Submit full size drawing of all nameplates and tags, as specified herein, to be used on project. Submittal to include the following:
   a. Dimensions of nameplate.
   b. Exact lettering and font for each nameplate.
   c. Color of nameplate.
   d. Color of lettering.
   e. Materials of construction.
   f. Method and materials for attachment.
   g. Drawing showing location of nameplates on each, panel and enclosure.

G. Seismic Anchor Design Calculations
1. All switchgear, motor controls centers, transformers, cabinets, raceways, supports, and electrical materials shall be so installed as to remain in a secure and captive position when subjected to a horizontal force in accordance with the current, applicable, and more stringent of current California Building Code (CBC) or International Building Code (IBC) requirements. Method of securing shall constrain equipment against both vertical and horizontal forces and overturning forces.
2. Calculations as prepared by a civil engineer registered in the State of California shall be submitted in accordance with current code requirements for earthquakes forces on all specified equipment. Calculations shall include wind loading forces for equipment installed outdoors. Use seismic and wind factors based on the project location and exposure. The risk Category is IV.
3. Provide a submittal, minimum 3 weeks prior to equipment installation, of calculations, materials needed, and supporting drawings and details for installation by Contractor.

1.11 OPERATING AND MAINTENANCE INFORMATION

A. Operational Training
1. At time of completion, the Contractor shall provide a period of not less than 6 hours training for instruction of operation and maintenance personnel in the use of systems. Instruct all personnel at one time in one session. Make necessary arrangements with manufacturer's representative. Provide

product literature and application guides for user's reference during instruction.

B. Operations and Maintenance Manuals
   1. Provide Operation and Maintenance manuals per Specifications as described in “Submittal Requirements” in this section with the following additional requirements:
      a. A comprehensive index.
      b. A complete "Record" set of favorably reviewed electrical submittals as provided under subsection “Submittal Requirements” illustrating all components, piping, and electrical connections.
      c. A complete list of the equipment supplied, including serial numbers, ranges, catalog cuts, and pertinent data.
      d. Full Specifications on each item.
      e. Detailed service, maintenance and operation instructions for each item supplied. Schematic diagrams of all electronic devices shall be included. A complete parts list with stock numbers shall be provided for the components that make up the assembly. All of these shall be originals, no copies.
      f. Special maintenance requirements particular to this system shall be clearly defined, along with special calibration and test procedures.
      g. Shop drawings in native file format and updated to reflect as-built conditions.
      h. Application programs, configurations, calculations, documents or other computer electronic files prepared for this project. Provide all files in native file format such as .dwg, .rss, .xls, .doc, etc.
   2. Submit electronic readable PDF file format (email with attachments or download links) of the proposed O&M manuals for review by the Engineer. Submittals shall be delivered timely to the Engineer to allow for review period, corrections, and re-submissions as necessary.
      a. General Contractor supervision must not be circumvented by sending submittals direct to Engineer.

C. At the end of the project hard copy and soft copy electronic PDF files, shall be updated to "as-built" conditions.

PART 2 PRODUCTS

2.01 QUALITY

A. All equipment and materials shall be new, in current production, and the products of reputable suppliers having adequate experience in the manufacture of these particular items. For uniformity, only one manufacturer will be accepted for each type of product.

B. Products specified that have become obsolete (out of current manufacturing, or have been superseded by another product) shall be cross-referenced to a replacement product(s) and provided in lieu of the specified product(s) for no additional cost. Under no conditions, shall products be submitted or furnished that are known (on manufacturer's list of obsolescence) and expected to be removed from current production within 12 months after project submittal. Products found to have been furnished this way will be removed and replaced at Contractor's expense.

C. All equipment shall be designed for the service intended and shall be of rugged construction, of ample strength for all stresses which may occur during fabrication, transportation, erection, and continuous or intermittent operation. All equipment shall be adequately braced and anchored and shall be installed in a neat and workmanlike manner. Appearance and safety, as well as utility, shall be given consideration in the design of details. All components and devices installed shall be standard items of industrial grade, unless otherwise noted, and shall be of sturdy and durable construction suitable for long, trouble free service. Light duty, fragile and competitive grade devices of questionable durability shall not be used.

D. The Contractor should expect that there will be occasional freezing conditions at the project site in outdoor locations. Instrument valves, tubing, instrumentation, and other components, etc. which are outdoors and susceptible to damage if frozen, must be provided with internal or external protection. Freeze protection can consist of internal or external active heaters with thermostats and/or passive insulation systems. Active systems can be powered from a nearby receptacle or via the conduit intended for the device.

E. Products that are specified and include a manufacturer, trade name or catalog number are intended to establish a standard of quality, performance, warranty and service. Products that are specified "or equal," do not prohibit the use of equal products of other manufacturers provided they are submitted, identified and promoted as equal, and favorably reviewed by the Engineer prior to procurement and installation.

F. Products submitted as "equal" to the named products will be reviewed for conformance with the Specifications and in comparison with the first named product. If the equal product meets Specifications, but does not have a feature or performance characteristic that is available with the first named product, and that feature or performance is required for this project, then the submitted equal product may be rejected on those grounds.

G. In the event that some claims of the manufacturer of submitted "equal" product are called into question by the Engineer, the Contractor, may be required to prove those claims either prior to installation or during startup of product. If the product does not meet the claims made or Specifications, the product may be rejected by the Engineer and a replacement product must be submitted by the Contractor in its place. All cost for the rejected product, installation, testing, and removal will be the responsibility of the Contractor.

H. Underwriters Laboratories (UL) listing is required for all substituted equipment when such a listing is available for the first named equipment. Extra parts, labor, panel space, power supplies, circuit breakers, and/or GFIC devices shall be provided as necessary for incorporation of specified non-UL components.

I. When required herein or requested by the Engineer, the Contractor shall submit equipment or material samples for test or evaluation. The samples shall be furnished with information as to their source and prepared in such quantities and sizes as may be required for proper examination and tests, with all freight and charges prepaid. All samples shall be submitted before shipment of the equipment or material to the job site and in ample time to permit the making of proper tests, analyses, examinations, rejections, and resubmissions before incorporated into the work.

2.02 NAMEPLATES & TAGS

A. Equipment exterior nameplates Nameplate material shall be rigid laminated black plastic with beveled edges and white lettering; except for caution, warning, and danger nameplates the color shall be red with white lettering. The size of the nameplate shall be as shown on the Drawings. No letters are allowed smaller than 3/16". All nameplates located outdoors shall be UV resistant. Securely fasten nameplates in place using two stainless steel screws, type 316L, if the nameplate is not an integral part of the device. Epoxy cement or glued on nameplates will not be acceptable. Engrave the nameplates with the inscriptions as approved by the Engineer in the submittal.

1. For each major piece of electrical equipment provide a manufacturer's nameplate showing the Contract specified name and number designation, and pertinent ratings such as voltage, # of phases, ratings, etc.
2. For each device with a specific identity (pushbutton, indicator, instrument, etc.) mounted on the exterior or deadfront of a piece of equipment provide a nameplate with the inscription as shown on the Drawings and described herein.
3. Where required by code, provide nameplates denoting information required. For example:
   a. Transformers not in sight of disconnect, furnish nameplate denoting location of feeding circuit breaker or disconnect.
   b. Motor controls without door interlock or disconnecting circuit breaker; furnish nameplate denoting location or feeding circuit breaker or disconnect.
4. Where no inscription is indicated on the Drawings or described herein, furnish nameplates with an appropriate inscription providing the name and number of device.
5. Install Safety Signs in accordance with the latest OSHA requirements.
   a. Entrances to electrical rooms and stations: Danger Sign requirements, ELECTRICAL ROOM, HIGH VOLTAGE (define voltage, example 480 VAC) KEEP OUT, AUTHORIZED PERSONNEL ONLY.
   b. Equipment enclosures, cable tray and wireway where 120 VAC or higher and 50 V DC and higher exist: Danger Sign requirements, HIGH VOLTAGE (define

voltage, example 480 VAC) AUTHORIZED PERSONNEL ONLY.

c. Equipment such as motor control centers, control panels, etc., where more than one source may be present in an enclosure or cubicle: Danger Sign requirements, VOLTAGE (define voltage, example 120 VAC control voltage or 480 VAC power) FROM MULTIPLE SOURCES IN THIS ENCLOSURE.

d. Equipment such as switchboards, switchgear, panelboards and motor control centers: Warning Sign requirements, WARNING, SERVICE ENTRANCE DISCONNECT FOR 1 OF ___ (define quantity) SERVICES TO THIS BUILDING. OTHER SERVICE ENTRANCE DISCONNECTS ARE LOCATED AT (define locations).

6. Caution, warning and danger nameplates shall be red with white lettering

B. Equipment Interior Nameplates Nameplate material shall be clear plastic with black machine printed lettering as produced by a KROY or similar machine; except caution, warning, and danger nameplates shall have red lettering. The size of the nameplate tape shall be no smaller than 1/2” in height with 3/8" lettering unless otherwise approved by the Engineer. Securely fasten nameplates in place on a clean surface using the adhesion of the tape. For each device with a specific identity (relay, module, power supply, fuse, terminal block, etc.) mounted in the interior of a piece of equipment provide a nameplate with the inscription as shown on the Drawings and described herein. Where no inscription is indicated on the Drawings or described herein, furnish nameplates with an appropriate inscription providing the name and number of device used on the submittal drawings. Stamp the nameplates with the inscriptions as approved by the Engineer in the submittal.

C. Equipment Tags When there is no space or it is impractical to attach an engraved plastic nameplate with screws, as is the case with most field devices and instruments, the Contractor shall attach a tag to the equipment with the same inscriptions as specified above in paragraph A. The tag shall be made from stainless steel material and the size of the nameplate shall be no smaller than 3/8"h x 2"w with 3/16" machine printed or engraved lettering unless otherwise approved by the Engineer. The tag shall

be attached to the equipment with stainless steel wire of the type normally used for this purpose.

2.03 FASTENERS

A. Fasteners for securing equipment to walls, floors, or ceilings, shall be stainless steel. The minimum size fastener shall be 3/8 inch diameter.

2.04 COMPONENTS

A. Switches and Pushbuttons
   1. Switches (HS) and pushbuttons (HC) for general purpose applications shall be water and oil tight as defined by NEMA 4X, corrosion resistant as defined by NEMA ICS 6 110.58, U.L. listed, standard 30 mm diameter, with plastic holding nut.
   2. Switches and pushbuttons shall have contacts rated NEMA A600 or 10 amperes continuous and 600 VAC. Provide NO and NC contacts as required.
   3. Engraved black legend plates shall be provided to define each switch and pushbutton function.
   4. Selector switch handles and pushbutton caps shall be black unless otherwise noted on drawing. Lock-out stop caps shall be red.
   5. Selector switches for hand off auto (HOA) applications shall have the hand position to the left, off in center, and auto in the right position.
   6. Pushbuttons and selector switches in hazardous locations shall have hermetically sealed contacts or explosion proof enclosures.
   7. Lockout stop pushbuttons shall include padlocking attachment. Pushbutton type shall be coordinated with padlock attachment type.
   8. Switches and pushbuttons shall be Allen-Bradley 800H, or equal.

B. Indicating Lights
   1. Indicating Lights for general purpose applications shall be NEMA 4X, corrosion resistant as defined by NEMA ICS 6 110.58, U.L. listed, 30 mm diameter, with plastic lens, plastic holding nut, and miniature bayonet lamp base.

2. Lamp shall be full voltage 120 VAC with 28 chip (min) High Intensity LED.
3. Indicating lights shall have contacts rated NEMA A600 or 10 amperes continuous and 600 VAC. Provide NO and NC contacts as required.
4. Engraved black legend plates shall be provided to define each lights function.
5. Indicating light type and color of lens shall as follows or as otherwise shown on the Drawings:
   a. Open/On Green
   b. Closed/Off Red
   c. Alarm Amber or Blue
   d. Power On White
6. Indicating lights designated "PTT" on wiring diagram or shown with push-to-test wiring shall be provided with a push to test switch and wiring.
7. Indication lights shall be Allen-Bradley 800H, or equal.

C. Relays and Timers
1. General: Relays and timers shall be provided with N.O. or N.C. contacts as shown on the Drawings. All spare contacts shown shall be provided. Contacts shall be rated 10 amps minimum at 120 VAC, 60 Hz unless otherwise shown on the Drawings. Coil voltage shall be 120 VAC unless otherwise described or shown on the Drawings. Relays and timers shall be designed for continuous duty. All relays shall be U.L. listed. All relays and sockets shall be the product of a single manufacturer. The following is a summary of abbreviations associated with relays and timers:
   a. CR – Control relay
   b. TR – Timing relay
   c. TDOE – Time delay on energization
   d. TDOD – Time delay on de-energization
   e. PR – Power Relay
2. Sockets for plug in relays and timers shall be standard industrial type DIN rail mount with barrier type pressure plate screw terminals. Sockets shall be rated 300 VAC, 10 amps minimum.
   a. Blade 8 or 11 pin for coil voltage above 90 volts AC or DC.
   b. Octal 8 or 11 pin for coil voltage below 90 volts AC or DC.

3. Control relays (CR) shall be plug in type with neon indicating lights and clear see through sealed housing to exclude dust. Provide IDEC Type RR, or equal. Two form C contacts (minimum) shall be provided on each relay.
4. Time delay relays on energization (TR-TDOE) shall be solid state plug in relays with adjustable timer ranges from 1 second to 10 hours selectable unless other ranges are shown. Provide LED timer energized indicator lamp. Time delay relays shall be IDEC RTE, or equal.
5. Time Delay Relays (TR-TDOD)
   a. Time delay relays on de-energization (TR-TDOD) (continuous power control input) shall be solid state plug in relays with a timer adjustable range from 1 second to 10 hours selectable unless other ranges are shown. Provide LED timer energized indicator lamp. Time delay relays shall be IDEC RTE, or equal.
   b. Time delay relays on de-energization (TR-TDOD) (true off) shall be solid state plug in relays with a timer adjustable range from 1 second to 10 minutes unless other ranges are shown. True off time delay relays shall be IDEC GT3F-2, or equal.
6. Power relays (PR) shall be plug in ice cube type with clear sealed housing to exclude dust.
   a. Applications requiring 3PDT contacts rated 20A or 0.5 HP at 120 VAC (minimum), furnish Magnecraft Type 389FXCXC-120A, or equal.
   b. Applications requiring SPDT contacts rated 30A or 1.0 HP at 240 VAC, furnish Magnecraft Type 389FXHXC1-120A, or equal.
   c. Furnish compatible blade type relay socket model 70-788EL11-1 or equal.

2.05 DEVICES

A. Switches
1. General purpose commercial grade switches shall be manufactured in accordance with UL 20. Switches shall be one pole, brown, 20 amps at 277 VAC, 1HP at 120 VAC, 2 HP at 240 VAC. Switches shall have copper alloy contact arm with silver cadmium oxide contacts. Switches shall have slotted terminal screws and a separate green grounding screw. Provide Leviton, Hubbel, or equal.

B. Receptacles
   1. General purpose receptacles shall be commercial grade, duplex and rated 20 amps, 120 VAC, 2 pole, 3 wire grounding, NEMA 5-20R configuration, specification grade, and side wired to screw terminals. Face color shall be brown when paired with stainless steel covers. General purpose receptacles shall be specification grade Leviton, Hubbel, or equal.
   2. Ground fault circuit interrupter receptacles shall be used where noted as GFI on plan or where in outdoor NEMA 3R locations. GFI receptacles shall be commercial grade, duplex, brown, 20A, 120V, back and side wired, with "test" and "reset" buttons. “Daisy Chain” connecting multiple receptacles from one GFI unit is not acceptable. GFI receptacles shall be Leviton, Hubbel, or equal.
   3. Boxes shown in NEMA 3R environments and outdoor locations shall be weatherproof while in-use. Furnish in-use weatherproof covers and weatherproof boxes for these areas.

2.06 PANELBOARDS

A. Panelboards:
   1. General
      a. The Contractor shall furnish panelboards of a type indicated on the one-line Contract Drawings and specified herein.
      b. Furnish and install padlock lock-off attachment for each circuit breaker.
      c. Panelboards shall comply with the applicable sections of UL, NEC, and NEMA and shall be Cutler Hammer Pow-R-Line, Square D, ITT or equal.
      d. A machine-typed circuit directory with clear plastic cover shall be supplied mounted on the inside of door in a frame when equipment is shipped. Circuit directory shall be as approved in the Submittal.
   2. Interiors
      a. Interiors shall be completely factory assembled with bolt-on devices.
      b. Branch circuit breakers shall include padlock lockout provisions. Provide Cutler Hammer QLPB123PL or equal. Main breakers shall include padlock hasp suitable for frame size.

c. Full size insulated neutral bars shall be included. Neutral busing shall have a suitable lug for each outgoing feeder requiring a neutral connection.
d. Main bus bars shall be plated copper seized in accordance with UL standards to limit temperature rise on any current carrying part to a maximum of 50 degrees C above an ambient 40 degrees C maximum.
e. A copper ground and neutral bus shall be included in all panelboards with terminal screws.

3. Boxes
   a. Provide minimum gutter space in accordance with the National Electric Code. Where feeder cables supplying the mains of a panel are carried through its box to supply other electrical equipment, the box shall be sized to include the additional required wiring space. At least four interior mounting studs with adjustable nuts shall be provided.
4. Trims
   a. Provide a hinged door over all circuit breaker handles. Doors in panelboard trims shall not uncover any live parts. Doors shall have a catch, lock and trim.
   b. Surfaces of the trim assembly shall be properly cleaned, primed and a finish coat of gray ANSI 61 or 49 or to match MCC if contained within.
   c. Surface trims shall be same height and width as box for surface mount, and ¾" (min) beyond box on all sides for flush mount.
5. Panelboard Ratings
   a. Panelboards shall have voltage, phase and short circuit (AIC) ratings as shown on the Drawings.
   b. Breakers shall be a minimum of 100 ampere frame. Breakers 15 through 100 amperes trip size shall take up the same pole spacing.
   c. Panelboards shall be labeled with a UL short circuit rating. When series ratings are applied with integral or remote upstream devices, a label shall be provided. Series ratings shall cover all trip ratings of installed frames. It shall state the conditions of the UL series ratings including:
      1) Size and type of upstream device
      2) Branch devices that can be used

3) UL series short circuit rating

PART 3 EXECUTION

3.01 CONSTRUCTION METHODS

A. Equipment shall be assembled and wired by the manufacturer prior to shipment. Field modifications or changes are not allowed without a written "change order" to the Contract. Field changes, however large or small, shall be executed using the components, materials, wiring, labeling, and assembly methods identical to that of the original supplied equipment.

B. Electrical plugs, receptacles, cords, and connectors required to power or interface the equipment and panels shall be furnished and installed by the Contractor.

C. Factory as-built Drawings for each custom manufactured control panel or MCC shall be shipped with the equipment and placed inside in waterproof envelopes.

3.02 EQUIPMENT FABRICATION

A. All electrical equipment, including custom manufactured equipment, shall meet the requirements of Underwriters Laboratories (UL) and bear the appropriate label. Panels shall be affixed with UL label prior to shipment and be built in accordance with the UL guidelines and procedure that corresponds to the UL label. Custom control panels shall bear a UL-508A label for general use, minimum, with additional UL labels as required per intended service.
   1. Design and furnish a Low Voltage Limited Energy Circuit for any device(s) not bearing a UL listing or registration that are required to be installed into a UL labeled panel.
   2. Revise voltages for any electrical parts and equipment that are specified that do not bear the UL listing or registration.

B. Panel cutouts for devices (i.e. indicating lights, switches) shall be cut, punched, or drilled and smoothly finished with rounded edges. Exposed metal from cutouts that are made after the final paint finish has been applied shall be touched up with a matching paint prior to installing device.

C. Equipment doors shall swing freely and close and latch with proper alignment.

D. Component within the electrical equipment shall be securely mounted on an interior subpanel or backpan and arranged for easy servicing. Mounting bolts and screws shall be front mounted for device removal without special tools or removal of entire mounting panel.

E. A ground bus shall be provided in each enclosure or cabinet. It shall have provisions for connecting a minimum of ten grounding conductors. Screw type lugs shall be provided for connection of grounding conductors. All grounding conductors shall be sized as shown on plans or in accordance with NEC Table 250 95, whichever is larger.

F. Bolts and screws for mounting devices on doors shall have a flush head which blends into the device or door surface. No fastening devices shall project through the outer surfaces of equipment.

3.03 WORKMANSHIP

A. All work in this division shall conform to the codes and standards outlined herein.

B. Installation shall be performed by qualified personnel providing first class workmanship per Electrical Specifications [Electrical General, Qualifications].

C. Maintain equipment installed (or to be installed) in new condition. Protect equipment from damage while in Contractor care from dust, water, or mishaps that are typical to construction sites

D. Confirm that equipment and materials are correct for their intended duty and will be installed per manufacturer guidelines. Equipment and components found to be installed inconsistent with manufacturer guidelines and/or these Specifications will not be acceptable and subject to removal and replacement.

E. Upon completion of daily work, remove excess materials, scraps, and debris from the work area and from the inside of equipment.

F. Upon notification, stop work on any portion of the installation that is determined to be non-compliant with contract or being installed by unqualified personnel.

G. Perform all work to correct improper installations at no additional cost to the owner.

H. Equipment furnished under this contract or provided to Contractor for installation shall be installed in accordance with manufacturer's instructions, installation calculations, and contract documents.

3.04 EQUIPMENT SHIPMENT AND STORAGE

A. Shipment -- Any equipment whose destination (jobsite) is more than 25 miles from the factory shall be carefully protected for shipping. All openings shall be protected by plywood securely fastened to the framework of the equipment. Equipment shall be adequately covered during local delivery.

B. Storage -- From the time of receipt until the equipment is installed and energized, the equipment shall be considered in storage. While in storage, a 120V, 1 phase source of power shall be made available and connected to space heaters in all items of equipment so equipped. Equipment not provided with space heaters shall be provided with a light bulb or electric heater while in storage to prevent moisture condensation. Unless stored indoors, it shall be a least 1 foot above grade covered with at least 2 layers of heavy polyethylene plastic sheets and anchored to prevent damage by high winds. All equipment shall be protected from dust and moisture prior to and during construction.

3.05 DAMAGED PRODUCTS

A. Damaged products that cannot be repaired to new condition shall be replaced with new products. All equipment and materials shall be in like-new condition at start-up and commissioning.

B. Any equipment furnished outside of contract to the Contractor shall be repaired or replaced if damaged while in the Contractor’s care. The Contractor shall pay for the parts and/or services of the original equipment manufacturer (OEM) to troubleshoot, asses, and repair damaged equipment.

C. Minor cosmetic damage shall be repaired by spray painting, after properly preparing the surface, all scratches or defects in the finish of the equipment. Only identical paint furnished by the equipment manufacturer shall be used for such purposes.

3.06 INSTALLATION

A. General
   1. Install all products per manufacturer's recommendations and the Drawings.
   2. Provide all necessary hardware, conduit, wiring, fittings, and devices to connect the electrical equipment provided under other Sections.
   3. Protect wiring insulation from wear by installing rubber cushions, bushings, or strip insulation, or by fastening the wiring to a rigid surface with zip ties and anchors.
   4. Provide additional devices, wiring, conduits, relays, signal converters, isolators to complete interfaces of the electrical and instrumentation system.
   5. Changing normally open contacts to normally closed contacts or vice versa
   6. Adding additional relays to provide more contacts as necessary.
   7. All programmable devices (not specifically excluded herein) shall be programmed, set-up and tested by the Contractor prior to startup. Programming and set-up parameters shall be adjusted or changed as directed by the Engineer during start-up and throughout the warranty period.
   8. Coordinate with the Engineer and setup all alarm, process, and operation setpoints.
   9. Keep a copy of the manufacturer’s installation instructions on the jobsite available for review at all times prior to and during the installation of the associated equipment.

B. Panels and enclosures:
   1. Install panels and enclosures at the location shown on the Plans or approved by the Engineer.
   2. Install level and plumb.
   3. Seal all enclosure openings to prevent entrance of insects and rodents.
   4. Clearance about electrical equipment shall meet the minimum requirements of NEC 110.26

C. Conduits and Ducts:
   1. Install all conduits and ducts per Electrical Specifications [Conduit and Boxes] and [Grounding].
   2. Minimum wire bending space at terminals and minimum width of wiring gutters shall comply with NEC tables 312-6 (a) & (b).

D. Wiring, Grounding, and Shielding:
   1. Observe proper grounding and shielding practices as this application environment is generally noisy. The shield of shielded cables shall be terminated to ground at one end only, the origination end. The shield at the other end shall be encased in an insulated material to isolate it from ground.

E. Cutting and Patching:
   1. The Contractor shall do all cutting and patching required for installing his work. Any cutting which may impair the structure shall require prior approval by the Engineer. Cutting and patching shall be done only by skilled labor of the respective trades. All surfaces shall be restored to their original condition after cutting and patching.

F. Cleaning and Touch up:
   1. At the completion of the work, all parts of the installation, including all equipment, exposed conduit, and fittings, shall be thoroughly cleaned of grease and metal cuttings. Any discoloration or other damage to parts of the building, the finish, or the furnishings, due to the Contractor's failure to properly clean the system, shall be repaired by the Contractor.
   2. The Contractor shall thoroughly clean any of his exposed work requiring same.
   3. Vacuum and clean the inside of all electrical and instrumentation enclosures prior to applying power.
   4. The Contractor shall paint scratched or blemished surfaces with the necessary coats of quick drying paint to match existing color, texture and thickness. This shall include all prime painted electrical equipment including but not limited to enclosures, poles, boxes, devices etc.

3.07 APPLICATION OF POWER

A. The Engineer will direct the energization and de-energization of all existing and new equipment. The Contractor is not authorized to energize or de-energize any equipment unless they have been given written permission to do so or while in the presence of the Engineer.
   1. Any equipment that is under repair, demolition or installation shall be locked off and tagged out of service with Contractor supplied padlocks and tags.
   2. The Contractor is required to comply with NFPA 70E and specifically in regards to safety when working on live equipment. Obtain work permits when needed to do live work.

3.08 WARRANTY

A. The Contractor shall warrant all electrical and instrumentation equipment & software for a period of 1 year from date of final acceptance. Standard published warranties of equipment which exceed the preceding specified length of time shall be honored by the manufacturer or supplier.

B. The Contractor shall have a staff of experienced personnel available to provide on-site warranty service on 2 working days notice during the warranty period. Such personnel shall be capable of fully testing and diagnosing hardware & software and implementing corrective measures.

3.09 FINAL ACCEPTANCE

A. Final acceptance will be given by the Engineer after the equipment testing is complete, each deficiency has been corrected, final documentation has been provided, and all the requirements of Contract documents have been fulfilled.

B. At the end of the project, following the completion of the field tests, and prior to final acceptance, the Contractor shall provide the following:
   1. Each "operation and maintenance" manual shall be modified or supplemented to reflect all field changes and as built conditions.

2. Two (2) disk copies of all final documentation to reflect as-built conditions.

C. Keys: Submit two sets of all keys for locks supplied on this project. Wire all keys for each lock securely together. Tag and plainly mark with lock number or equipment identification, and indicate physical location, such as panel or switch number.

END OF SECTION

Conduit and Boxes

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Labor, materials, equipment, tools, safety gear, test equipment, incidentals, services, and transportation for a complete electro-mechanical installation as shown on the Drawings, included in these Specifications, or as can be reasonably implied from project descriptions.

B. The scope of work includes:
   1. Furnish and install conduits, wireways, raceways, cable trays, junction boxes, pull boxes, and associated hardware. Provide conduit, fittings, hardware, hangars, mounting channel, and other parts for a complete raceway installation.
   2. Replacement of liquid tight flex conduit that is sun exposed for any conduit that is getting new conductors.
   3. Demolishing conduit and conductors for demolished equipment.
   4. Furnish and install grounding system required by drawings, or if not shown or defined, as required by Article 250 of the NEC.
   5. Installations shall be designed and installed with components meeting the NEMA area designation.

C. Work includes that specified in Electrical Specifications [Electrical General].

1.02 REFERENCES

A. Electrical Specifications [Electrical General]

B. Electrical Specifications [Low Voltage Wire & Data Cable]

C. Electrical Specifications [Grounding]

D. Project Drawings

1.03 QUALIFICATIONS

A. Material furnished under this specification shall be installed by qualified installers meeting requirements specified in Electrical Specifications [Electrical General, Qualifications].

1.04 SUBMITTAL REQUIREMENTS

A. Provide submittals and drawings as specified in Electrical Specifications [Electrical General, Submittal Requirements].

PART 2 PRODUCTS

2.01 CONDUIT, RACEWAYS AND WIREWAYS

A. GENERAL - Conduit, raceways, and wireways, wiring methods, materials, installation shall meet all requirements of the NEC, be UL labeled for the application, and meet the minimum following specifications.
   1. All wiring shall be installed in conduits, raceways, or wireways when interconnecting equipment and devices.
      a. The minimum size conduit shall be 3/4-inch unless indicated otherwise on the Drawings or for special connections to equipment.
      b. Provide cords and cord seals for devices or instrumentation requiring waterproof seal to maintain NEMA 4 or 4X ratings. Example devices include lighting and pipe mounted instruments that are located below grade.
   2. Conduits may connect into junction boxes or wireways as shown in the drawings or as requested by Contractor and approved by Engineer. Junction boxes (circle with J in drawings) can be as simple as a condulet or JIC box, or larger box as determined by contractor and needed for the installation. Drawing may or may not depict junction box requirements that may be required by code. Wireways or junction boxes shall be rated for area (as noted in the Drawings), or furnish minimum NEMA 4 if not noted.
   3. The Contractor shall use conduit material types (SPEC per conduit schedule) as defined below or as otherwise shown in the contract drawings or as specifically called out in the conduit schedule.

a. Non-exposed underground portions of conduit run shall be PVC-40 for all signals and voltages unless otherwise shown in the conduit schedule.

b. Exposed conduit material (not underground and beyond transition) shall be per the following table unless specifically noted otherwise in the plan drawings. The conduit schedule denotes the conduit type for non-exposed (under-ground, in-concrete, etc.) and does not apply or coordinate with this table. Exposed condulets, elbows, fittings, device boxes, and hardware shall be of the same material and finish as the adjacent conduit.

Location	Material
NEMA 1 or 12	Galvanized rigid steel (GRS)
NEMA 3R	Galvanized rigid steel (GRS)
NEMA 4	PVC-Coated Steel (GRS-PVC)
NEMA4X	PVC-Coated Steel (GRS-PVC)
Class 1 Div 1 or 2 hazardous	PVC-Coated Steel (GRS-PVC)

4. Conduit stubs and transitions:
   a. Conduit transitions shall be GRS-PVC for 6” on either side of the transition point (minimum) or as shown in drawing details. Conduit transition is defined as conduit sections emerging from or through concrete or earth or from below to above grade or through walls or vaults, non-exposed to exposed.
   b. Beneath pad mounted electrical equipment, where not exposed, shall be installed or trimmed to 2” or less above slab and have bushing or end bell installed. Overall height of conduit entering into the base of equipment shall be enough for bushings/bells to be installed but be high enough for conduit tags to be installed.
   c. Uniform in height for each panel or section. Conduits end bushings/bells shall not vary in height above slab more than ½” from lowest to highest.

d. Conduits shall be spaced apart such that bushings and end bells may be installed without interfering with the adjacent conduits.
e. Transitions to PVC shall include PVC coated locknuts to shield exposed steel pipe threads.
f. Through walls – shall protrude approximately 2" and include end bell or bushing. Pack space around conduit with non-shrink grout if the thru-hole was core drilled.
g. From hazardous locations – shall include seal off and/or conduit cable seals as required per NEC.
h. Conduits for future use shall be capped with coupling and plug. Identify each end with conduit labels.
i. Existing conduits that are no longer able to be used due to removal of equipment or shown demolished, shall have flexible conduit removed, wires removed or pulled back to the nearest pullbox, coiled and labeled at each end. Disconnect wires at each end.

5. Conduit Tags
   a. All conduits listed in the "Conduit and Wire Routing Schedule" shall have conduit tags at both ends of each conduit run with tag number from schedule identified. This shall include ends within underground pull boxes.
   b. All conduits shall have temporary tags during construction. Temporary tags may be made from duct tape with hand written ink marking or suitable equivalent. Temporary tags shall be removed by Contractor at time of installation of permanent tags.
   c. Tag material shall be rigid laminated red plastic with white lettering. The size of the tag shall be ¼" thick by 1" round or ¾" x 1" rectangle minimum.
   d. Letter height shall be 3/8" minimum. Engrave the tags with the conduit number or acronym. Labeling shall be neatly installed for visibility and shall be clearly legible. Securely fasten tags in place using 20ga stainless steel tie wire through a pilot hole on the tag.
   e. Conduit tags shall be Custom manufactured per specification.
6. Supports

a. Cross section of a single channel shall be 1-5/8" x 1-5/8" and cross-section of a double channel shall be 1-5/8" x 3-1/4". The channel wall thickness shall be 12 gauge as applicable.
b. One-Hole clamps shall be intended for pipe mounting on support channels and equipped with clamp-backs. The clamps shall be Efcor, Thomas and Betts, Appleton or equal
c. Spacers, provided to support underground conduits in concrete encasements, shall be plastic. The spacers shall be Carlon, Johns-Manville, Underground Products or equal
d. Anchors shall be expansion type for securing equipment to concrete foundations, floors and walls. Anchors shall have length identification mark on the exposed end of the bolt. Provide Hilti Kwik Bolt 3, or equal.
e. Stanchions shall be provided as needed to mount equipment and electrical components. Stanchions shall be shop fabricated from welded 4” c-channel, 12” x 12” x ¼” steel base plate, coated with a rust inhibiting primer and top coat of gray polyurethane gloss paint. Attach equipment to the stanchion direct or on a ¼” aluminum sheet sized for the equipment supported.
f. Conduit Hangers shall be trapeze construction, with double channel, 3/8-inch rods and nuts. Suspend from suitable structural support.
g. Support material and finish shall be per the following table unless otherwise noted in the drawings. Brackets, fittings and hardware shall be of the same material and finish.

Location	Material
Indoors NEMA 12	Galvanized steel
Outdoors NEMA 3R	Galvanized steel
Outdoors NEMA 4	Stainless Steel type 316
Corrosive areas NEMA4X	PVC bonded, 40 mil, factory applied

h. Equipment mounting racks shall be designed by installer for rigid equipment and conduit mounting. Racks shall be bolted or welded construction and sized for equipment or as shown on the drawings.

i. Strut channels shall be used for mounting equipment to walls and for supporting conduit runs. Double strut channel type shall be used for fabricating equipment mounting racks as required and/or as detailed on the drawings. Add additional supports to rigid mounting locations as needed to prevent wobbling and to meet seismic requirements. All field cut surfaces of the strut channels shall be deburred and coated to prevent rust.

B. Galvanized Rigid Steel Conduit - (GRS)

1. Manufactured from high-strength steel and hot dipped zinc galvanized inside and out. Conduit and fittings shall meet UL 514B, UL 6, and conform to NEMA RN 2. Conduit shall be capable of being used as an equipment grounding conductor per NEC 250.
2. Provide galvanized rigid steel factory sweeps and elbows for 90 degree transitions.
3. Cast fittings and device boxes shall be malleable iron or aluminum. Appleton type FS/FD or equal.
4. In hazardous locations, fittings shall meet and be listed UL 886.
5. All fittings, hubs, couplings, pulling elbows and connectors shall be threaded-type. Set-screw type and compression-type are not acceptable. All thread conduit is not allowed over 1/2" exposed length. Cover plates shall be cast iron with sealing gasket in NEMA 3R locations.
6. Conduits entering enclosures shall be fitted with insulated grounding bushing; O-Z "HBLG", Appleton "GIB", or approved equal. All grounding bushings shall be tied to the grounding system with properly sized bonding conductors per the NEC code.
7. Combination expansion-deflection fittings installed exposed shall be Type XD as manufactured by Crouse-Hinds Co.; Type DX as manufactured by O.Z. Gedney Co.; Type DF as manufactured by Appleton Electric Co., or equal

C. Galvanized Rigid and Coated Steel Conduit (GRS-PVC)

Conduit and Boxes

1. Galvanized Rigid Steel conduit with a 40-mil thick polyvinylchloride exterior coating and a 2-mil urethane interior coating meeting NEMA RN-1, UL-6 and ETL PVC-001. The bond of the PVC to the zinc coated pipe must be stronger than the tensile strength of the PVC.
2. Provide PVC coated galvanized rigid steel factory sweeps and elbows for 90 degree transitions.
3. Cast fittings and device boxes shall be malleable iron or aluminum with a 40-mil thick PVC coating meeting the same
4. In hazardous locations, fittings shall meet and be listed UL 886.
5. Provide PVC coated threaded-type fittings, hubs, pulling elbows, couplings, and connectors; set-screw type and compression-type are not acceptable. Form 8 conduit fittings, ½" through 4", must have a tongue-in-groove gasket to effectively seal out the corrosive elements. Covers shall be supplied with plastic encapsulated stainless steel cover screws. Form 8 fittings shall be UL and type 4X and IP69 listed.
6. A "PVC Coated Sealing Locknut" shall be used on all exposed male threads transitioning into female NPT threads which do not have sealing sleeves, including transitions from PVC couplings/female adapters to PVC Coated GRC elbows in direct burial applications. "PVC Coated Sealing Locknuts" are not to be used in place of a myers hub
7. A PVC sleeve extending one pipe diameter or two inches, whichever is less, shall be formed at every female fitting opening except unions. The inside sleeve diameter shall be matched to the outside diameter of the conduit.
8. All junction and metal pull boxes shall be galvanized with exterior surfaces PVC coated to 40 mils thickness.
9. Unistrut, strut clamps, pipe straps, and clamp back spacers, shall have 40 mil thick PVC coating. All mounting anchors shall be stainless steel.
10. Conduits entering enclosures shall be fitted with insulated grounding bushing. All grounding bushings shall be tied to the grounding system with properly sized bonding conductors per the NEC code.
11. Installers of PVC Coated Conduit must be certified by the manufacturer and be able to present a valid, unexpired certified installer card.

12. GRS-PVC conduit to be Robroy Plasti-bond, Perma-Cote, KorKap, T&B OCAL or equal.

D. PVC Conduit, Schedule 40 or 80 (PVC-40, PVC-80)
1. Shall be high impact schedule 40 or 80 polyvinylchloride suitable for use underground, direct burial and for use with 90 C wires, and shall conform to UL 651. Shall be UL listed and labeled for "direct" burial.
2. A copper bonding conductor shall be pulled in each raceway and bonded to equipment at each end with approved lugs.
3. Each underground run shall be placed in a trench with a five (5) inch sand bed evenly compacted on all sides, top and bottom unless otherwise noted.
4. Elbows, and risers shall be per exposed conduit transition detail. PVC conduit is not allowed above ground except where specifically called out on the Drawings.
5. PVC fittings shall have solvent-weld-type conduit connections. Fittings and device boxes shall be PVC with factory fabricated conduit connections. Provide Carlon or equal.
6. Conduits entering enclosures shall be fitted with a glued male adapter, lock ring and bushing to prevent wire chafing. Conduits entering panels through concrete to an open bottom or entering a pull box shall have a glued end bell fitting.
7. PVC conduit shall be stored on a flat surface and shielded from the sun.

E. Liquid Tight Flexible Non-metallic Conduit (up to 2”) - (FLEX)
1. Liquid tight flexible Nonmetallic Conduit shall be constructed of flexible PVC and have a smooth inner surface with integral crush resistant reinforcement within the conduit and be designated as a Type LFNC-B (for FNMC-B).
2. Liquid tight Flexible Nonmetallic Conduit shall be sunlight, oil, and flame resistant and approved for the installation of electrical conductors in indoor and outdoor applications.
3. Liquid tight Flexible Nonmetallic Conduit shall be listed to UL standard UL1660.
4. Liquid tight flexible non-metallic conduit shall be installed in accordance with Article 351, Part B of the National Electrical Code (NEC) and other applicable sections of the NEC and/or local electrical codes.

5. Liquid tight Fittings shall be listed for the use with Liquid tight Flexible Nonmetallic Conduit and shall be marked LFNC-B (FNMC-B).
6. Flexible Non-Metallic Conduit shall be Carlon Carflex or equal.

2.02 DEVICE BOXES

A. BOXES
1. Device boxes shall be of zinc-galvanized malleable iron or cast aluminum with shape and size best suited for the particular application, rated for the location installed, and shall be supported directly to structure by means of screws, anchors, or bolts.
2. Box dimensions shall be in accordance with size, quantity of conductors, and conduit clearances per NEC articles 314 requirements.
3. Boxes exposed to the weather or in moist locations shall be weatherproof (WP) by means of gasketing under a weatherproof cover.
4. Boxes connected to GRS-PVC conduit runs shall be PVC coated with 40 mil coating.

B. DEVICE PLATES and COVERS
1. Indoor general purpose device plates and covers shall be stainless steel. Plates or covers shall be attached with stainless steel screws. An engraved plastic label denoting circuit breaker number and panelboard name shall be affixed to each cover with #4 stainless steel screws.
2. Weatherproof switch, outlet, and receptacle boxes shall be fitted with gasketed covers rated for wet locations. Each access cover shall have a padlockable cover to maintain security and weatherproof integrity even when a plug is connected to the receptacle. Screws and hinge springs shall be stainless steel. Weatherproof access covers shall be Leviton 5977-CL, Cooper 4966, or equal.

2.03 PULL BOXES

A. JUNCTION BOXES
1. Where required for best installation or where specifically called out in the Drawings, junction boxes shall have JIC

type construction with hinged door, NEMA 4X rating, manufactured of type 304 stainless steel or as otherwise shown. Door shall be fastened with clamps and stainless steel screws. No devices, screws, rivets, or bolts shall protrude through the exterior surface unless specifically shown on the Drawings. Boxes shall be Hoffman, Circle AW, or equal.

B. UNDERGROUND BOXES

1. Underground pull boxes shall be prefabricated "Christy Box" size and type as noted in the Drawings or equal. Size shall be as shown or dimensioned on the Drawings. Provide larger boxes as needed to meet code or as determined in field to allow for adequate pull area at Contractor discretion. Extension sections shall be provided as necessary to reach the depth of underground conduits with maximum depth of 48". All boxes shall have galvanized steel hold down bolts and hardware. Boxes shall be H/20 loading rated and have traffic rated covers. Steel covers or lids shall be galvanized and grounded with bonding jumper to the local grounding circuit per NEC. Pull box covers shall be labeled electrical, signal, utility, and telephone, whichever applies. Pull boxes shall be Christy Concrete Products, Brooks or equal.

C. Pull Box and Vault Identification

1. Engrave or bead weld box covers with minimum thickness of ¼" x 1" lettering with pullbox name (i.e. PBX-XXX) and purpose (electrical, signal, fiber, telephone, etc.). Provide an additional identifier "high voltage" for boxes with 600 volts or higher.
2. Utility pull boxes shall be labeled per Utility Company standards.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. All work in this Section shall conform to the codes and standards specified in Electrical Specifications [Electrical General, Workmanship].

3.02 INSTALLATION

A. System:
   1. Install all products per Electrical Specifications [Electrical General, Installation].

B. Rigid Conduits and Ducts:
   1. Exposed conduits shall be neatly arranged with runs perpendicular or level and parallel to walls. Bends shall be concentric.
   2. Except as expressly indicated or approved, all conduits shall be surface mount on block walls, concealed behind gypsum walls, and buried to required depth below floor slabs.
   3. Pipe threads shall be treated with conductive thread compound.
   4. Installation of the GRS-PVC conduits must be in accordance with the manufacturer's installation procedures using recommended tools.
      a. Apply touch up compound at each fitting sealing sleeve edge to improve watertight seal.
      b. To ensure compliance, the installer(s) must be "manufacturer certified" before installation can proceed.
      c. Certification available by contacting manufacturer's representative and attending a brief instructional course. Valid and unexpired certification card shall be available for review per installer.
   5. Repair GRS-PVC coating utilizing a touch-up compound as provided by the manufacturer of the conduit of the same material as the coating. Overlap beyond the damaged area to cover the PVC coating. Contact from touchup compound to PVC is required to maintain integrity. The entire conduit shall be replaced if the repair exceeds 1" combined length.
   6. A maximum of three equivalent 90 degree elbows are allowed in any continuous run. Install pull boxes where required to limit bends in conduit runs to not more than 270 degrees or where pulling tension would exceed the maximum allowable for the cable.
   7. Route all above grade conduits parallel or perpendicular to structure lines and/or piping. Conduits installed above grade shall be braced in place with stanchions. Expansion

joints shall be installed every 100 feet. Bends shall be concentric.

a. Combination expansion-deflection fittings installed exposed shall be Type XD as manufactured by Crouse-Hinds Co.; Type DX as manufactured by O.Z. Gedney Co.; Type DF as manufactured by Appleton Electric Co., or equal

8. Care shall be exercised to avoid interference with the work of other trades. This work shall be planned and coordinated with the other trades to prevent such interference. Process Pipe, mechanical and HVAC shall have precedence over conduits for routing and space requirements.
9. Seal each bottom entrance conduit into the MCC and other electrical enclosures with plugging compound sealant to prevent the entrance of gasses, insects and rodents. Plugging compound sealant shall be Gardner Bender Duct Seal or equal.
10. Seal conduits from wetwells within underground pullboxes with conduit cable seals. Furnish Roxtec RS UG, Crouse Hinds, or equal.
11. Exposed conduit stubs for future use shall be capped with coupling and plugged. Drill hole in plug for pull rope as necessary.
12. Explosion proof seal-off fittings shall be provided on all conduits that enter or leave hazardous areas per requirements of the National Electrical Code, Chapter 5 and UL 886. The seal-off fitting shall prevent hazardous gases and/or flames from passing from one type area to another through the conduit system. Ceramic or other non-asbestos fiber material and sealing compound shall be placed in the fitting to complete the seal.
13. Hazardous location conduit outlet boxes shall be used in hazardous locations for change in direction, access to conductors and as pull and splice boxes.
14. All spare conduits shall have 1/8" nylon pull ropes installed.

C. Flexible Conduit and Cords

1. Final connections to vibrating equipment such as motors, heaters and fans shall be made with liquid tight flexible conduit.
2. Flexible conduit lengths shall not be greater than 36 inches for sizes up to 2 ½” and 48 inches for 3” and larger conduit.

3. Flexible conduit shall include a ground conductor for equipment bonding in circuits over 30 VDC or as shown in the conduit schedule.
4. Flexible conduit shall only be installed in exposed or accessible locations.
5. Where equipment is cord connected, submersible rated, and conduit connections are not possible without modification, devices and equipment may be free-air cord connected in lieu of flexible conduit. Connection to adjacent rigid conduit shall be through liquid-tight cord connector fitting specifically designed for the purpose and sized appropriately for the cord. Cord connectors shall be rated similar to the adjacent conduit they are connected to: Stainless steel, galvanized or plastic.

D. Excavation and Back Filling:
1. Trenches for conduit below floor slabs and other underground electrical conduit shall be excavated to the required depths per utility requirements or specific detail. Conduits under floor slabs shall have minimum trench depth to contain bends without any portion of the radius visible at finished grade.
2. Underground conduits outside of structures, excluding utility conduits, shall have a minimum cover of 24 inches except under roadways where minimum cover shall be 30 inches or as otherwise shown in the Contract Drawings. Back filling shall be done only after conduits have been inspected. Excavation and back fill of conduits shall conform to the requirements of other applicable Specifications sections unless modified on plans, and to other entities (Utilities, etc.) as required.
3. Install spacers to support underground conduits. Horizontal and vertical separation shall be maintained by plastic spacers set every four feet. Spacers shall be Carlon Snap-Loc or equal.
4. At all times during the installation of the electrical system, the Contractor shall provide barricades, fences, guard rails, etc., to safeguard all personnel, including small children, from excavated trenches.

E. Underground pullboxes:

1. Pullboxes shall be located in areas that will experience the least traffic loading and in the general vicinity as shown in the Drawings. Boxes in pavement shall be set at final grade and boxes in planter areas shall be set 1" above final grade. Boxes shall not be buried by landscape material.
2. Steel pull box lids shall be grounded per NEC 250.4(A)(5) and 314.4.
3. Boxes shall be set on compacted base and base rock to minimize settling of the box over time. If the box is located in a paved traffic area, a 6" x 6" concrete ring shall be poured around the box below the pavement.

F. Device Mounting Heights:
1. Mounting heights of fixtures and devices shall be as follows unless otherwise indicated or when height has to be adjusted to be over or under counter tops.
   a. Wall switches => 48 inches
   b. Convenience outlets => 18 inches
   c. Telephone outlets => 18 inches
   d. Bracket fixtures => 7 feet 6 inches

G. Cutting, Coring, Patching and Repairing:
1. The Contractor shall do all cutting and patching required to install his work. Any cutting which may impair the structure will require prior approval. Cutting and patching shall be done only by skilled labor of the respective trades. Where it is becomes necessary to cut into existing work for the purpose of making electrical installations, locate existing post tension cables, rebar and electrical services prior to core drilling using ground penetrating radar or similar technologies. All surfaces shall be restored to their original condition after cutting and patching.

3.03 FIELD ASSISTANCE

A. General: Provide all equipment and supplies necessary to perform all testing. The Owner Representative shall have the option to witness and participate in the on-site tests performed by the installer.

B. Per Electrical Specifications [Factory and Field Testing].

3.04 WARRANTY

A. Provide warranty as specified in Electrical Specifications [Electrical General, Warranty].

END OF SECTION

Low Voltage Wire and Data Cable

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Labor, materials, equipment, tools, safety gear, test equipment, incidentals, services, and transportation for a complete electro-mechanical installation as shown on the Drawings, included in these Specifications, or as can be reasonably implied from project descriptions.

B. The scope of work includes:
   1. Furnish and install wire, splices, lugs, or other miscellaneous devices as defined in this specification.
   2. End to end wiring and terminations for each system, device, instrument, and piece of equipment shown in the Drawings as new, or rehabilitated, or reconnected.
   3. Testing of conductors and completed wired systems.
   4. Installations shall be designed and installed with components meeting the NEMA area designation.

C. Work includes that specified in Electrical Specifications [Electrical General].

1.02 REFERENCES

A. Electrical Specifications [Electrical General]

B. Electrical Specifications [Conduit and Boxes]

C. Electrical Specifications [Grounding]

D. Project Drawings

1.03 QUALIFICATIONS

A. Material furnished under this specification shall be installed by qualified installers meeting requirements specified in Electrical Specifications [Electrical General, Qualifications].

1.04 SUBMITTALS AND DRAWINGS

A. Provide submittals and drawings as specified in Electrical Specifications [Electrical General, Submittal Requirements].

PART 2 PRODUCTS

2.01 WIRING AND ELECTRICAL DEVICES

A. GENERAL
   1. General
      a. Provide wiring and electrical devices specified herein and install field and internal panel wiring as shown on the Contract Drawings.
      b. This section applies to all wires or conductors used internal (non-field) to electrical equipment or external for field wiring.
      c. Field wire quantity and size shall be per “Conduit and Wire Routing Schedule.”
   2. Analog Signals
      a. Analog signal transmission between electric or electronic instruments shall be 4-20 milliamperes and shall operate at 24 volts DC unless otherwise specified. Milliampere signals shall be current regulated and shall not be affected by changes in load resistance within the unit's rating.
      b. Provide powered current isolators wherever the loops’ load resistance exceeds the originating current signal transmitter's rating. Associated shunt resistors shall be located on rail-mounted terminal blocks. Exposed resistor leads shall be insulated with heat-shrink tubing.

B. LOW VOLTAGE WIRE AND CABLE (through 600V except instrument signals)
   1. General: Low voltage conductors shall be used for power, control, lighting and miscellaneous circuits. This Section applies to all wires or conductors used internal for all electrical equipment or external for field wiring. Wire shall be new, plainly marked with UL label, gauge, voltage, type of insulation, and manufacturer's name.

a. Conductors shall be copper with a minimum of 98% conductivity.
b. Control and instrument wiring shall have tinned copper conductors.
c. Class C stranding. Solid conductors may be used for lighting and receptacle circuits.
d. Wire shall be rated 600 volt (min).
e. Size all conductors per NEC minimum or as shown on the drawings.
    1) Minimum #12 AWG for wires used in power transmission circuits or as defined on the drawings.
    2) Minimum #14 AWG for wires used in signal transmission circuits or as defined on the drawings.

2. Wire colors and sizes shall not change within the circuit.
3. Wire shall be properly fused or breaker protected at or below the maximum amperage rating allowed by the NEC.
4. Control and Power Wiring:
    a. Field wire in conduit:
        1) Type XHHW-2, XLPE insulation, rated 90 °C in wet or dry locations, oil resistant.
            a) Use for power circuits carrying voltages higher than 200 volts phase to ground.
        2) Type THHN / THWN, PVC with nylon jacket insulation, rated 90 °C in dry locations and 75 °C in wet locations, oil resistant, UL83.
            a) Use for power circuits with voltages below 200 volts phase to ground, or control circuits.
        3) Minimum #12 AWG for wires used in power transmission circuits or as defined on the drawings.
        4) Minimum #14 AWG for wires used in signal transmission circuits or as defined on the drawings.
    b. Field wire in tray (Tray Cable type TC):
        1) Individual cables - Insulation type THHN/THWN, rated 90 °C in dry locations and 75 °C in wet locations, oil resistant, UL83.

2) Multi-conductor cables - Insulation type THHN/THWN (PVC/Nylon) conductors with an overall polyvinyl chloride (PVC) jacket, conforming to Article 318 “Cable Trays” and Article 340 “Power and Control Cable Type TC” of the National Electrical Code, and Standard 1277 of Underwriters Laboratories, Inc. Rated 600 volts, 90°C dry and 75°C wet, oil resistant, UL83.
3) 3 or more conductor plus ground wire in a single cable.
4) UL Listed as sunlight resistant, direct burial, and open wiring.
5) Conductor sizing per ICEA Publication P-54-440 for cable tray and ICEA P-46-426 for conduit
6) Minimum #12 AWG for wires used in power transmission circuits or as defined on the drawings.
7) Minimum #14 AWG for wires used in signal or control transmission circuits or as defined on the drawings.

c. Power cord
1) Flexible wire cord shall be type SOW, SOOW, or G and be provided in 2, 3, or 4 conductor plus ground as required for connected load.
2) EPR insulation, 90 deg C rating, oil and abrasion resistant., overall jacket plus individual conductor jackets. 600V rated
3) Conductors shall be stranded copper.
4) Cord shall be installed with cord grips on each end where it enters termination enclosures.

d. Nonfield control panel or factory installed equipment internal wiring:
1) Insulation - Type MTW, NFPA standard 79, UL 1063 with tinned copper.
2) Minimum #14 AWG for wires used for individual conductor circuits 100 volts and above.
3) Minimum #18 AWG for wires used for individual conductor circuits below 100 volts.

5. Instrument wiring:

a. Field: Instrument cables shall have 600V tray cable rated insulation and 100% individual shielded twisted pair #18 (or #16 conductors) with drain wire. Single twisted shielded pair (TSPR) cables shall be Belden 9341 (or 9342), or approved equal. Three wire twisted shielded cables (#18 TS3W) shall be Belden 1119A or equal. See drawings for cable size required.
b. Non-Field: Instrument cables shall have 300V rated insulation and 100% individual shielded twisted pair #18 conductors with drain wire. Single twisted shielded pair (TSPR.) cables shall be Belden 8760, or approved equal. Three wire shielded cable shall be Belden 8770 or equal.
c. Field multi-pair instrument cable as required per conduit schedule shall have 300V rated insulation and 100% individual shielded twisted pair #18 conductors with drain wire. Multiple twisted shielded pair (T.S.PR.) cables shall be Belden 9773 thru 9777, or equal.
d. Multi-pair cable is not allowed (unless specifically called out in conduit schedule or on plans) for use in field or non-field applications. One T.S.PR cable is required for each signal.

6. Manufacturer Supplied Cables
   a. Cables and wiring for special systems provided by the manufacturer with the equipment shall be installed per the manufacturer's recommendations.
7. Data Cable
   a. Data network category 6 cable (indoor) shall consist of 4 pair unshielded twisted pair #23 awg solid copper conductors. The cable shall be rated by IEEE for service intended – plenum and dry.
      1) Cable: IEEE Category 6, various manufacturers.
      2) Connectors: Standard RJ-45 with boot.
   b. Data network cable (outdoor) shall consist of 4 pair foil and braid shielded twisted pair #24 awg solid copper conductors with anti-crosstalk divider, and drain wire. Rated Level 2 Category 6+ Outdoor Carrier by IEEE for use in plenum, conduit, wet or dry.
      1) Cable: IEEE Category 6, Belden 2149a, or equal

2) Connectors: Grounded RJ-45 with drain wire crimp.

8. Temporary motor or panel hook-up
   a. Temporary cable may be cord without conduit or PVC conduit with wiring. In either case, the cabling must be protected from damage during construction. Sections may be located out of harms way, buried, or sleeved in steel conduit as needed.
   b. Power Circuits: Provide 2, 3, or 4 conductor plus ground power supply cable(s) for temporary pump connections or electrical power circuits. Cables shall be sized for breaker rating amperage, (minimum).
   c. Provide multi-conductor (TC) cables for digital control circuits. Provide quantity of conductors as needed.
   d. Provide instrument wiring for 4-20 ma instrumentation.
   e. Voltage drop in power circuits shall not exceed 15% during motor start and 5% during operation.

C. COLOR CODE
1. All wires #8 and below shall have wire insulation the color specified. Wires #6 and larger may be black with color electrical tape at termination points.
2. No other colors shall be used without prior approval.
3. Color code color code of all wire shall conform with the following table:

WIRE COLOR CODE TABLE

Description	**Phase/Code Letter**	**Field wire or tape color**	**Non-Field Wire Color**
480V, 3 Ph	A	Brown	Brown
	B	Orange	Orange
	C	Yellow	Yellow
240V or 208V, 3 Ph	A	Black	-
	B	Red (Orange if high leg)	-

	C	Blue	-
	Neutral	White	White
240 / 120 V, 1 Ph	L1	Black	Black
	L2	Red	-
24V Positive	24+	Blue	Pink
24V Negative	24-	Gray	Gray
12V Positive	12+	Blue	Red
12V Negative	12-	Black	Black
AC Control		Red	Red (Yellow for foreign circuits)
DC Control		Blue	Blue
Ground	G	Green	Green
Shielded Pair	+	Red, Clear, or White	Clear or White
	-	Black	Black

2.02 WIRE MARKING

A. All panel, enclosure and field wiring shall have wire labels on both ends of each wire. Labeling shall be neatly installed for visibility and shall be clearly legible. Each conductor of instrument shielded signal wiring shall be labeled. Wire labels shall be machine printed with on white heat shrinkable tubing. Each label shall fit a minimum 23 characters, 3/16" in height before shrink. Tubing shall be oversized for the wire and shrunk into place using an electric heat gun. The "shrunk" label shall have just enough give to allow the label to be rotated. Hand lettered wire labels are not acceptable and shall be replaced at the Contractor's expense. Provide Brady "PermaSleeve" or equal.

1. Node Style Wire Identification All wires that are electrically the same (connected to common termination points) and do not pass through a contact or other switching device shall have the same wire identification. The wire labeling code for each end of the same wire shall be identical.

a. The wire identification code for internal panel wiring shall be the number/letter as designated on the Drawing elementary and/or approved shop drawings.
b. Wire labeling for field wiring shall contain the field equipment name/tag as a prefix and the pupose. (I.E. FIT071-+ and FIT071-- or P10-124) where + or 124 are the field device terminal block name or purpose. The hierarchy of prefix label names is 1) Instrument Tag, 2) Electrical panel or equipment name, and 3) Equipment name. Therefore, wires from MCC50 P10 cubicle to PLC10 will be labeled MCC50-P10-xx where xx is the terminal number or the purpose. Wires from field pressure switch PSH10 to MCC50 P10 will be labeled PSH-10-xx where xx is the PSH terminal block name. See example PLC I/O wiring diagram.
c. Wire labels shall be per control panel submittal and/or interconnection submittal drawings using rules described above – Wire labels must be documented prior to printing and before they are applied. Abbreviations may be used in the wire label as long as they are consistent and understandable.
d. Wire labels for lighting and receptacle circuits shall consist of the panel board and circuit number and a unique node number. (I.E. LP#3-A, LP#3-B, LP#3-N)
e. Wire labels may be omitted on “neutral jumpers” less than 8” in length.
f. Wire labelling shall be documented and revised on drawings to as-built conditions.

2.03 ELECTRICAL TAPE / SHRINKABLE INSULATORS

A. Vinyl tape shall be 7 mil, 600 volt rated, flame retardant, hot and cold weather resistant conforming to UL510. Provide 3M Scotch Super 33+ vinyl tape or equal
   1. Vinyl tape for color coding shall be 7 mil, ¾” width, vinyl tape conforming to UL 510. Provide 3M Scotch 35 vinyl tape or equal.

B. Rubber Tape: EPR rubber, 90 deg C continuous rated. Provide 3M 130C rubber tape or equal.

C. Varnished Cambric Tape: Adhesive backed, 7 mil, bias cut cotton tape, coated with yellow insulating varnish. Provide 3M Scotch 2510 or equal.

D. Shrinkable insulators shall be heat shrinkable, polyolefin thick wall sleeves, end caps and cable repair sleeves are designed for use in splicing, sealing and re-jacketing of direct bury secondary cables. The insulators shall comply with UL 486D and be rated up to 1000 Volts. They shall provide long-term reliable performance overhead, underground or submerged with mechanical and environmental protection. Shrinkable insulators shall be 3M ITCSN or 3M IMCSN per manufacturer instructions for the application or equal.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. All work in this Section shall conform to the codes and standards specified in Electrical Specifications [Electrical General, Workmanship].

B. Perform work to remedy non-compliant installations after inspection.

C. Upon notification, stop work on any portion of the installation that is determined to be substandard or being installed by unqualified personnel.

3.02 FABRICATION AND INSTALLATION

A. System:
   1. Install all products specified in Electrical Specifications [Electrical General, Installation].
   2. Panels shall be completely factory wired and tested before shipment.
   3. All spare PLC input / output points shall be wired to terminal blocks.
   4. A minimum of 20% spare unwired terminals shall be provided in each panel.

B. Wiring Methods:

1. Wiring Separation: Wires carrying 100 volts and above shall be physically separated from lower voltage wiring by using separate bundles or wire ways with sufficient distance to minimize the introduction of noise, crossing only at 90 degree angles.
2. Harness: All wiring shall be neatly bundled and laced with plastic tie wraps, anchored in place by screw attached retainer. Where space is available, wiring shall be run in slotted plastic wireways with dust covers. Wireways shall be sized such that the wire fill does not exceed 60%. Tie wraps shall be T&B TY RAP or equal.
3. Retainers: Wireways, retainers, and other devices shall be screw mounted with round head 316 stainless steel screws or mechanically mounted by push in or snap in attachments. Glue or sticky back attachment of any type or style shall not be used. Retainers shall be T&B TC series or equal.
4. Hinge Loops: Where wiring crosses hinged surfaces, provide a "U" shaped hinge loop protected by clear nylon spiral wrap. The hinge loop shall be of sufficient length to permit opening and closing the door without stressing any of the terminations or connections. Spiral wrap shall be Graybar T25N or equal.
5. Routing: Wires and cable shall be routed such as to maintain separation between 100 Volt or higher from 100 volt or lower wiring being run in the same duct or bundle. Wires and cables shall have sufficient length to allow slack and to avoid any strain or tension in the wire or cable.
    a. Wires shall be routed in slotted plastic wireways with snap covers. Wires carrying 120 VAC shall be separated as much as possible from other wires and signal cables, and shall be routed only in ducts for 120 VAC. If the power wiring has to cross the signal wiring, the crossing shall be as close to a right angle as possible. Wireways for 24 VDC wiring shall be used for all other wires and cables. Routing of 120 VAC in combined wireways shall be minimized. Wires and cables shall be placed in the wireways in a straight, neat and organized fashion and shall not be kinked, tangled or twisted together. Additional wire ducting shall be provided for use by the electrical

subcontractor for routing field wires to their landing points in the each electrical and instrumentation panel.

b. Provide 2" minimum separation between wireway and terminal blocks.

c. Wiring not routed in wireways shall be neatly bundled, treed, and laced with plastic ties.

C. Wire Terminations

1. Single wire and cable conductors shall be terminated according to the requirements of the terminal device as follows:
   a. Crimp-on terminals: shall be UL listed, self-insulating sleeve type, with ring or rectangular type tongue, suitable for the size and material of the wire to be terminated, and for use with either solid or stranded conductors.
   b. Terminal Blocks: Remove the last +/- 0.25 inches insulation from of the conductor and insert it under the pressure plate to full length of the bare portion of the conductor. Tighten the screw to close the pressure plate onto the conductor. No more than two conductors shall be installed in a single terminal. All strands of the conductor shall be captured under the pressure plate.
   c. Screw-less terminals: wire shall be stripped back and inserted per the terminal manufacturer's instructions.
2. When stripping insulation from conductors, do not score or damage conductor.
3. The drain wire and stripped end of outer jacket of shielded cables shall be covered with heat shrink insulating tubing. The drain wire shall be covered along its full bare length between the cable jacket cover and the terminal lug and placed on end outer jacket to cover foil.
4. Condulets with wire nut connections shall be supplied for wire termination to devices with leads instead of terminals (i.e. solenoid valves, level probe, etc.).

D. Wire Splicing

1. No wires shall be spliced without prior approval.
2. Where splices are allowed or approved they shall conform to the following:

a. Wire splicing devices shall be sized according to manufacturer's recommendations.
b. Splices of #10 and smaller, including fixture taps, shall be made with nylon self insulated twist on wire nuts; T & B "Piggys", Ideal "Wing Nut" or equal.
c. Splices of #8 and larger shall be hex key screw, two way connectors, insulated with molded high-dielectric strength plastic; NSI Polaris IPL or IPLD Series terminal blocks or equal.
d. Non-Motor Splices #6 and smaller in underground pullboxes shall have wire-nut connections which are sealed with non-hardening silicone based sealant that protects the connection from moisture and corrosion. The wire nuts shall be factory filled with sealant and UL listed for waterproof connections. Provide Ideal Model 60 or equal.
e. each half lapped. Seal the connection with epoxy resin coating.

E. Wire Installation
1. Exercise care in pulling wires and cables into conduit or wireways so as to avoid kinking, stressing the cables, or damaging the insulation. Use a UL listed pulling compound for lubrication within conduits as necessary. The raceway construction shall be complete and protected from weather before cable is pulled in. Swab conduits before installing cables and exercise care in pulling, to avoid damage to the insulation or conductors.
2. All wire and cables (with the exception of coaxial antenna cable) shall be installed within UL listed raceways or enclosures. Install all wires and cables in one continuous length unless splices are per Contract Drawings, required to connect equipment or submitted and favorably reviewed.
3. Bundle incoming wire and cables in panels. Zip-tie at intervals of 2” and neatly spread into trees and connect to their respective terminals. Allow sufficient slack in cables for alterations in terminal connections. Do not bundle, tape or tie wires within conduits.

3.03 WARRANTY

A. Provide warranty as specified in Electrical Specifications [Electrical General, Warranty].

END OF SECTION

Grounding

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Labor, materials, equipment, tools, safety gear, test equipment, incidentals, services, and transportation for a complete electro-mechanical installation as shown on the Drawings, included in these Specifications, or as can be reasonably implied from project descriptions.

B. The scope of work includes:
   1. Furnish and install grounding system required by Drawings, or if not shown or defined, as required by Article 250 of the NEC. Ground conductors shall be sized for the protective device, minimum.
   2. Furnish and install conduits, junction boxes, underground boxes, and associated hardware. Provide hardware, conduit, fittings, and other parts for a complete grounding installation.
   3. Installations shall be designed and installed with components meeting the NEMA area designation.

C. Work includes that specified in Electrical Specifications [Electrical General].

1.02 REFERENCES

A. Electrical Specifications [Electrical General]

B. Electrical Specifications [Low Voltage Wire & Data Cable]

C. Project Drawings

1.03 QUALIFICATIONS

A. Material furnished under this specification shall be installed by qualified installers meeting requirements specified in Electrical Specifications [Electrical General, Qualifications].

1.04 SUBMITTAL REQUIREMENTS

A. Provide submittals and Drawings as specified in Electrical Specifications [Electrical General, Submittal Requirements].

B. Submit manufacturer's product information for connections, clamps, rods, terminals, and grounding system components.

PART 2 PRODUCTS

2.01 GROUNDING SYSTEM

A. General
   1. Grounding conductors shall be sized as shown on the Drawings or in accordance with NEC article 250, whichever is larger.
   2. Components of the grounding electrode system shall be manufactured in accordance with UL 467 - Standard for Safety Grounding and Bonding Equipment.

B. Raceway Grounds
   1. Metallic conduits shall be assembled to provide a continuous ground path. Metallic conduits shall be bonded using insulated grounding bushings.
   2. Provide separate code size wire ground conductor for PVC conduits

C. Equipment and Enclosure Grounds
   1. Electrical and distribution equipment shall be connected to the grounding system. Cables shall be sized as specified.

D. Components
   1. Every piece of equipment shall be grounded per NEC.
   2. Each electrical enclosure shall have a copper ground bus. Screw type fasteners shall be provided on all ground busses for connection of grounding conductors. Ground bus shall be a Challenger GB series, ILSCO CAN series or equal.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. All work in this Section shall conform to the codes and standards specified in specified in Electrical Specifications [Electrical General, Workmanship].

3.02 INSTALLATION

A. Grounding System:
   1. Install all products per Electrical Specifications [Electrical General, Installation].
   2. Each nonmetallic conduit shall contain a code sized grounding conductor.
   3. The system neutral conductor and all equipment and devices required to be grounded by the National Electrical Code shall be grounded in a manner that satisfies the requirements of the National Code.
   4. The system neutral (grounded conductor) shall be connected to the system's grounding conductor at only a single point in the system. This connection shall be made by a removable bonding jumper sized in accordance with the applicable provisions of the National Electrical Code if the size is not shown on the Drawings. The grounding of the system neutral shall be in the enclosure that houses the service entrance main overcurrent protection.
   5. Utilize mechanical connections in accessible locations and exothermic connections in non-accessible or buried locations.
   6. The secondary on all transformers shall be grounded.
   7. All raceway systems, supports, enclosures, panels, motor frames, and equipment housings shall be permanently and effectively grounded.
   8. Install insulated grounding conductor with feeders and branch circuit conductors in conduits. Size grounding conductors in accordance with NEC. Install from grounding bus of serving panel to ground bus of served panel, grounding screw of receptacles, lighting fixture housing, light switch outlet boxes or metal enclosures of service equipment. Ground conduits by means of grounding

bushings on terminations at panelboards and distribution panels with 12ga. conductor to grounding bus

9. All receptacles shall have their grounding contact connected to a grounding conductor.
10. Branch circuit grounding conductors for receptacles or other electrical loads shall be arranged such that the removal of a lighting fixture, receptacle, or other load does not interrupt the ground continuity to any other part of the circuit.
11. Attachment of the grounding conductor to equipment or enclosures shall be by connectors specifically provided for grounding. Mounting, support, or bracing bolts shall not be used as an attachment point for ground conductors.
12. Install grounding electrode conductor and connect to reinforcing steel in foundation footing. Electrically bond building steel to ground system. Bond metal siding not attached to grounded structure.

3.03 FIELD QUALITY CONTROL

A. Inspections:
   1. Ground system shall be inspected prior to cover.
   2. point resistance to less than 1 ohm.

END OF SECTION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section defines factory and field testing requirements of electrical and instrumentation equipment and as specified in this section and in Electrical Specifications. All equipment provided under Electrical Specifications and electrical equipment provided under other sections shall be tested as specified herein.

B. The System Integrator and/or Electrical Contractor shall provide all labor, tools, material, power, and technical supervision to perform the specified tests and inspections.

C. The Electrical Contractor shall be present during field testing and assist the System Integrator in testing all equipment. The Electrical Contractor shall be ready to correct any wiring problems found during testing.

D. The Application Programmer (defined in Electrical Specifications [Electrical General].) and/or Construction Manager will be actively engaged in Operational Testing and Commissioning. These efforts shall be combined efforts of the Application-Programmer/Construction-Manager/Engineer and Contractor. The Contractor shall facilitate test as outlined herein such that hardware, software and application programming are tested completely and all applicable test documentation is completed.
   1. Expect that field operational testing (SCADA and PLC automated controls checkout) is going to require 2 weeks after pre-operational tests are done. Contractor and System Integrator shall assist in this start-up. Coordinate with Construction Manager to schedule this start-up period.

E. It is the intent of these tests to ensure that all equipment is operational within industry and manufacturer's tolerances and is assembled in accordance with design plans and Specifications.

F. The Owner and/or Construction Manager may witness testing in effort to insure quality and verify results. The Contractor is required to provide notification 2 weeks prior to any test that are

intended to be documented and submitted for approval or are final tests. The Owner and Construction Manager must specifically decline witness of each test to be performed, and the test must be successful, and it must be documented on the day of test, in order for it to not have to be repeated in the presence of an authorized witness. Only the Owner or Construction Manager may assign an authorized witness.

G. All tests shall be documented in writing by the person performing the test on the test forms submitted (and similar to those shown at the end of this section) and signed by the Engineer as satisfactorily completed. The Electrical Contractor or System Integrator performing tests shall keep a detailed log of all tests that failed or did not meet Specifications, including date of occurrence and correction.

H. The Contractor shall perform all applicable testing of Owner supplied or existing equipment as a unit and as part of a system. Testing shall include documentation and witness sign-off.

I. The communications equipment shall be completely configured by the Contractor for permanent operation. This includes communications cards in mechanical and electrical equipment.

1.02 REFERENCES

A. Electrical Specifications [Electrical General]

B. Project Drawings

C. Additional testing may be specified in other Electrical Specifications.

1.03 FACTORY AND FIELD GENERAL REQUIREMENTS

A. Testing General
   1. Prior to any field testing Operation & Maintenance Manuals shall have been submitted and approved.
   2. The test forms shall be completed by the contractor during testing and calibration of all equipment. All tests shall be witnessed by the Owner's Representative. Completed test forms shall be given to the Owner's Representative the day of

the test. Complete two sets of test forms if Contractor wants to keep a copy.

3. The Contractor shall give the Engineer 10 working days notice of the dates and time for inspections and testing.
4. Include test results in the Maintenance and Operational Manual.
5. As a minimum, all the tests indicated/specified on the test forms shall be performed and test forms filled out by the Contractor.
6. Prepare and submit formal test procedures and forms at least two weeks prior to the start of testing. Testing shall not commence until the test procedures have been reviewed and approved. Submit a combined test procedure submittal with separate sections for factory and field tests.
7. If the results of any of tests are unacceptable, the Contractor shall make corrections and perform the tests again until they are acceptable; these tests shall be done at no additional cost.

B. Failure to Meet Test

1. Any system, material or workmanship which is found defective on the basis of these tests shall be reported immediately following the test. The Contractor shall replace the defective material or equipment and have tests repeated.

C. Safety

1. Testing shall conform to the respective manufacturer's recommendations. All manufacturers' safety precautions shall be followed.
2. Safety, as shown herein and in other divisions, shall be a combination of all methods and practices described. Safety practices may not be determined based on the least restrictive requirement, but instead, on the most restrictive requirement. Obtain clarification if there is any question prior to performing tests.
3. The procedures stated herein are guidelines for the intended tests, the Contractor shall be responsible to modify these tests to fit the particular application and ensure personnel safety. Absolutely no tests shall be performed in such a fashion that personnel safety is jeopardized.

4. The Contractor shall have two or more personnel present at all tests.
5. Two non-licensed portable radios shall be provided by the Contractor for use during testing.
6. Contractor shall comply with California Electrical Safety Orders (ESO) and Occupational Safety and Health Act (OSHA): All test and procedures shall comply with ESO and OSHA as to safety, protective clothing, clearances, padlocks and barriers around electrical equipment energized during testing.
7. The first set of tests to be performed (pre-energization) shall determine the suitability for energization and shall be completed with all power turned off.

1.04 QUALIFICATIONS

A. System Integrator Representative
   1. The system integrator representative shall have 1 year experience in field testing of equipment working for the System Integrator or equivalent. If the representative does not demonstrate necessary experience or competence during testing or start-up, the System Integrator shall provide a representative meeting the required competence and experience.

B. Electrical Contractor Representative
   1. The Electrician shall have 5 years minimum experience working with industrial control systems and have a Journeyman level experience rating.

1.05 SUBMITTAL REQUIREMENTS

A. The Contractor shall ensure that the System Integrator, and all equipment suppliers provide the submittal documentation required in this section. Submittals shall be complete, neat, orderly, and indexed. The Contractor shall check all submittals required under this Division for the correct number of copies, adequate identification, correctness, and compliance with the Contract Specifications and Drawings, and initial all copies certifying compliance.

B. The System Integrator shall assemble and submit for approval complete testing procedures and forms at least two weeks prior to the start of testing. Contractor is responsible for compiling testing procedures and forms from multiple sub-contractors as required.

C. Test submittal shall include: (as applicable)
   1. Proposed procedure for operational testing whether it is performed in the factory or field. Procedure shall include method, simulated I/O requirements, bypass piping, telemetry, and necessary materials and equipment to conduct test.
   2. Test forms (for all tests, factory and field, and regardless of who performs tests). Test forms shall be electronically completed prior to submittal with entry spaces filled to the extent possible. The only remaining data that shall require completion during the test is the test data itself. Test forms shall be provided as illustrated at the end of this section or equal.
   3. Approved shop one-line, elementary diagrams and PLC I/O drawings.
   4. Control strategies photocopied at 75% reduction with room at the side of page for comments on each paragraph or control strategy.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

A. Test equipment required to perform testing and document results shall be provided by Contractor or System Integrator.

B. Test instruments shall be calibrated to references traceable to the National Institute of Standards and Technology. Instrument calibration shall be current to one year from date of start-up. Test equipment accuracy shall be at least twice the accuracy of instrument being calibrated. Test instrument certificates of calibration shall be on-hand and provided prior to testing.

All test equipment to be used as part of the testing shall be listed in the submitted testing sheets. Contractor supplying the component or system to be tested shall provide all necessary test equipment.

C. The overall accuracy of each input and output loop shall be checked to ensure that it is within manufacturer's Specification tolerances. In no case shall the error exceed 0.25% or 0.04 mA.

PART 3 EXECUTION

3.01 FACTORY TESTING

A. General Requirements

1. The System Integrator shall conduct a thorough and complete factory test witnessed by Engineer per the criteria specified herein. Factory test shall be held within 150 miles of project location.
2. Temporary wiring and equipment shall be provided and connected during these tests to simulate the complete assembled system.
3. The testing shall not be started until the manufacturer has completed fabrication, wiring, setup, programming; quality control testing; and can demonstrate the system is complete and operational.
4. The equipment required for factory testing shall consist of, but is not limited to, control panels, MCCs, and/or miscellaneous electrical panels as provided under this contract.
5. Two digital multimeters/signal generators (minimum +/ 0.1% accuracy) with clip on leads shall be supplied and utilized during testing for measurement of digital and analog outputs.
6. All factory tests shall be conducted at the System Integrator’s facility. All factory tests shall be completed prior to shipment to the jobsite. The equipment shall be fully assembled, and connected similar to as it will be installed.
7. The length of the factory testing shall be a minimum of one (1) working day(s) (8 hours per day).
8. Faulty and/or incorrect hardware or software operation of major portions of the system may, at the discretion of the

Engineer, be cause for suspension, cancellation, or restarting of the factory test, at no additional cost to the Owner or extension in Contract time.

9. The Systems Integrator shall develop, furnish, and install a test program to be loaded into PLCs to verify all Logic Controller I/O Point to Point Tests prior to start of applications program testing. Systems Integrator shall use a computer running PLC programming software to confirm I/O calibration and status, force outputs and communications configuration.
10. The factory test will be considered complete only when the integrated system has successfully passed all tests. No electrical equipment shall be shipped to jobsite without completed test documentation.
11. During the testing period, under the supervision of the System Integrator, the Owner's Representative shall have unlimited and unrestricted access to the usage and testing of system hardware, configuration, software, meters and tools.
12. The System Integrator shall pay all expenses incurred by his personnel including labor, material, transportation, lodging, daily subsistence, and other associated incidental costs during the factory testing.
13. Acceptance and witnessing of the factory tests does not relieve or exclude the Contractor from conforming to the requirements of the Contract Documents.
14. Upon conclusion of factory testing, and at the request of the Application Programmer, the System integrator shall remove the PLC, OI, and communication equipment for Application Programmer's use and programming. The System Integrator shall provide equipment to Application Programmer immediately or ship unit within 2 working days. The System Integrator shall not be responsible for equipment while in Application Programmer's care.
15. All modifications to documentation as a result of the factory tests shall be corrected and completed before the submittal and delivery of "Operation and Maintenance" Manuals.
16. Copies of the completed and witnessed factory testing forms shall be included in the Operation and Maintenance Manual.

B. Factory Tests

1. Structured Factory Tests: The associated factory tests are to be performed by the System Integrator and witnessed by the Owner's Representative. The associated test forms shall be completed during each stage of the test.
   a. Visual and Mechanical Inspection Tests
   b. Wiring Tests
      1) Contractor shall confirm correct panel wiring per System Integrator panel shop drawings. Panel shop drawings shall be compared with Contract P&IDs and other Drawings to verify all hardwire logic are accounted for. Panel drawings used in factory tests shall be redlined and inserted into Factory Testing Results submittal.
   c. MCC and Control Panel Pre-Operational Tests
   d. Logic Controller I/O Point to Point Tests
   e. Simulated Alarm Tests
      1) Simulate the digital and/or analog signals at the terminals to verify that each PLC I/O point is functional and properly programmed. Verify that all parameters (i.e., setpoints, enable/disable toggle bits, timers, etc.) for the alarms operate according to the Specifications. Multiple alarm states (i.e., LO, LO LO, HI, HI HI, etc.) shall be checked.
   f. Simulated Operational Control Tests
      1) Simulate the digital and/or analog signals at the field terminals to verify that each control system is functional and properly configured and programmed.
      2) Each line of control logic in the Control Strategies section shall be checked. When the complete control strategy has been checked, it shall be signed and dated by testing person and person witnessing test.
      3) Verify that all parameters (i.e., setpoints, runtimers, totalization, etc.) operate according to the Specifications.
2. Unstructured Factory Tests: The various unstructured tests shall include, but are not limited to, the following.

a. Simulate the equipment failure and power fail/restart of PLC. Check the effects of each failure on maintaining operations with the remaining equipment.
b. The factory tests, as a minimum, shall simulate all normal and abnormal operating conditions including steady state, change of state, variable changes, fluctuations, transients, upsets, start up, shutdown, power failure, and equipment failure conditions.
c. Communications test to devices located within control panel.
d. Simulation of PLC communication error. Demonstrate error detection, alarming, and recovery.
e. Measure and test all power supplies for correct voltage. Operate rechargeable devices under battery power to test run duration, alarms and automatic recovery.

3.02 FIELD TESTING

A. General Requirements
1. Field testing is broken down into 4 components
a. Pre-Energization testing
b. Pre-Operational Testing
c. Operational Testing
d. Trial Period/Commissioning
2. Project wide, all Pre-Energization testing must be completed prior to Pre-Operational testing, all Pre-Operational testing must be completed prior to Operational Testing, and all Operational Testing must be completed prior to Commissioning.
a. Any deviation of this order, whether on a component level or larger scale, must be approved.
b. Out of order testing, if allowed, will be evaluated on a case-by-case basis when brought to the attention of the Owner's Representative. The Owner's Representative may require that the entire system, or portions thereof, be retested once the missing component(s) are installed and functional.
3. All equipment supplied by the Contractor or others shall be tested by Contractor per these specifications.
4. Two digital multimeters/signal generators (minimum +/ 0.1% accuracy) , AC current meters, torque wrench, and

other specialized test equipment shall be provided by the Contractor for use during testing.

5. If the equipment is determined not to be ready for testing, the test will be cancelled and rescheduled for a later date.
6. Faulty and/or incorrect hardware or software operation of major portions of the system may be cause for suspension, cancellation, or restarting of the area of testing, at no additional cost or extension in Contract time.
7. During the Operational testing period, under the supervision of the System Integrator, the Owner's Representative shall have unlimited and unrestricted access to the usage and testing of all hardware and software in the system.
8. The System Integrator shall pay all expenses incurred by his personnel including labor, material, transportation, lodging, daily subsistence, and other associated incidental costs during field testing.
9. Acceptance and witnessing of the tests does not relieve or exclude the Contractor from conforming to the requirements of the Contract Documents.
10. All modifications to documentation as a result of the tests shall be corrected and completed before the delivery of "as-built" documentation.
11. Copies of the completed and witnessed field testing forms shall be included in the Operation and Maintenance Manual.
12. The various contractors on this project (General Contractor, Electrical Contractor, and System Integrator) shall assume the lead role in testing activities as listed below. The Contractor shall obtain assistance of suppliers and/or manufacturers representatives for any major equipment testing.
    a. Electrical Contractor:
        1) Pre Energization Tests
            a) Visual Mechanical Tests
            b) Wire Insulation and Continuity Tests.
            c) Panelboard Tests
            d) Breaker Tests
        2) Trial Period
        3) Commissioning.
    b. System Integrator:
        1) Pre-Operational Tests

a) Visual Mechanical Tests
b) Control panel pre-operational test
c) MCC pre-operational test
d) Motor Tests.
e) PLC I/O point to point tests.
f) Instrumentation switch tests
g) Instrumentation transmitter tests.

2) Operational Tests.
3) Trial Period
4) Commissioning

c. General Contractor
1) Test Scheduling
2) Operational Tests.
3) Trial Period
4) Commissioning.

d. Application Programmer (software systems)
1) Operational Tests.
2) Trial Period
3) Commissioning.

B. Electrical Field Tests – The following test shall be performed within each test category. Complete test forms for each electrical panel, instrument, and/or device. Provide separate form for each component to be tested.

1. Pre-Energization Inspections and Tests:
a. Visual and Mechanical Inspection Tests
b. Wire Insulation and Continuity Tests
c. Panelboard Tests

2. Pre-Operational Tests:
a. Control Panel Pre-operational Tests:
b. Instrumentation Switch Calibration Tests
c. Instrument Transmitter Calibration Tests
d. PLC I/O point tests.
e. Communication Tests
1) The Contractor shall verify that all communications via radio, telephone, wireline, fiber optic, or other are functional and ready for operational testing. Revise all configurable parameters without additional cost to the Owner as required for an optimally functional system.

2) Verify that all components of the communication system operate together under all operating and power restart conditions. If faults occur, investigate source of problem and correct. Revise all configurable parameters without additional cost to the Owner.
3) Change setpoints from SCADA and confirm that corresponding field setpoint changes correctly. Check every I/O point on every screen, trend, and database.

3. Operational Tests:
   a. After all the previous tests in this subsection are complete, the test forms are completed and signed-off, the Contractor shall conduct operational testing.
   b. Representatives from the General Contractor, Electrical Contractor, System Integrator, and Owner's Representative shall be present during testing. Operational testing shall be performed by Contractor in the presence of the Owner's Representative.
   c. During operational testing the Contractor shall follow the instructions of the Owner. The Owner may place restrictions on operation that must be followed by the Contractor during testing. Any accidents or fines caused by actions of the Contractor where warnings or restrictions were placed, shall be remedied or paid by the Contractor.
   d. Alarm Tests
      1) Generate the digital and/or analog signals at the primary device to verify that each PLC I/O point is functional and properly programmed. Verify that all parameters (i.e., setpoints, enable/disable toggle bits, timers, etc.) for the alarms operate according to the Specifications. Multiple alarm states (i.e., LO, LO LO, HI, HI HI, etc.) shall be checked.
   e. Operational Control Tests
      1) Generate the digital and/or analog signals at the primary device by raising or lowering the actual measured process. Inject signal into the terminals or utilize a "force" function within the

device only as necessary. Verify that each control system is functional and properly configured and programmed.

2) Each line of control logic in the Control Strategies section shall be checked. When the complete control strategy has been checked, it shall be signed and dated by testing person and person witnessing test.

3) Verify that all parameters (i.e., setpoints, runtimers, totalization, etc.) operate according to the Specifications.

f. Other Tests

1) Force a power failure and power fail/restart of PLC and all other systems. Check the effects of each failure on each piece of equipment and automatic recovery.

2) Force a PLC communication error. Demonstrate error detection, alarming, and recovery.

3) Perform additional operational testing that has not already been witnessed.

4) Perform any additional operational testing as necessary to confirm robust and error free operation under all operational conditions.

4. Trial Period

a. Station/Equipment shall be activated to automatically run for 5 days, 24 hours per day Monday through Friday.

b. During the trial period the Owner's Representative will test all modes of operation and will look for errors and malfunctions. A punchlist will be generated to be completed by Contractor and re-tested prior to Commissioning.

c. If equipment failure occurs during the trial period, the Contractor shall repair or replace the defective equipment and shall begin another trial period, Monday through Friday.

d. This test shall be repeated until all new equipment functions acceptably and without failure for consecutive days.

C. Commissioning:

1. Commissioning shall not commence until Operational testing and System Training are complete with documentation submitted and with prior approval.
2. Commissioning period
   a. The new equipment shall be activated by the Contractor to operate in full automatic for 10 consecutive days, 24 hours per day. Commissioning shall only start on Mondays or Tuesdays.
   b. During Commissioning, the Owner will monitor and run the station in normal automatic mode. If equipment failure occurs during Commissioning, the Contractor shall repair or replace the defective equipment and shall begin another commissioning period after repairs are complete.
   c. Parallel, existing and/or back-up systems shall remain in place and functional during commissioning period. Demolition of parallel, existing or back-up systems shall not begin until commissioning is completed.
   d. This test shall be repeated until the new equipment functions acceptably for a consecutive commissioning period.
   e. Warranty will begin at the start of a successful commissioning period. However, if major hardware failure occurs during commissioning, the warranty and commissioning will restart once the problem has been identified and repaired.

3.03 WARRANTY:

A. Provide warranty per Electrical Specifications [Electrical General, Warranty].
   1. The completion of the above tests does not relieve the Contractor from any warranties specified in the Electrical Specifications or other sections.
   2. Warranty shall begin on the start date of a successful Commissioning period.

3.04 FINAL ACCEPTANCE:

A. Final Acceptance per Electrical Specifications [Electrical General].

SECTION 26 66 00
TEST FORMS

Index of Forms:

PC	Power Conductor Test Form
CC	Control Conductor Test Form
IC	Instrumentation Conductor Test Form
VM	Electrical Equipment Visual and Mechanical Inspection Form
PB	Panelboard Test Form
CPO	Control Panel Operational Test Form
BD	Breaker Device Test Form
IOP	Programmable Logic Controller I/O Point-to-Point Test Form
ISC	Instrumentation Switch Calibration Test Form
ITC	Instrumentation Transmitter Calibration Test Form

END OF SECTION

POWER CONDUCTOR TEST FORM

PROJECT NAME: _____ DATE OF TEST: _____

TESTING COMPANY: _____ TEST LOCATION: _____

EQUIPMENT #: _____

INSULATION TESTS						
CONDUIT	PHASE TO GROUND			PHASE TO PHASE		
#	A	B	C	AB	BC	CA

NOTES:

1) Use single form for up to 25 power conduits. Use additional forms as necessary.

2) Disconnect both ends of wiring prior to megger tests.

3) Megger insulation resistances of all 600 volt insulated conductors using a 500 volt megger for 10 seconds minimum (30 seconds minimum for motor leads). Make tests with circuits installed in conduit and isolated from source and load. Each conductor shall be meggered conductor-to-conductor and conductor-to-ground. These tests shall be made on cable after installation with all splices made up and terminations installed but not connected to the equipment.

4) Each megger reading shall not be less than 22 Meg-ohms resistive. Corrective action shall be taken if values are recorded less than 10 Meg-ohms. Conductors with low ohm values, that do not match similar lengths of conductors the same size, shall be replaced at no additional cost to the Owner.

5) Values of different phases of conductors in the same conduit run showing substantially different Meg-ohm values, even if showing above 22 Meg-ohms shall be replaced.

CERTIFIED BY: _____ _____ _____

SIGNATURE COMPANY DATE

WITNESSED BY: _____ _____ _____

SIGNATURE COMPANY DATE

CONTROL CONDUCTOR TEST FORM

PROJECT NAME: _____ DATE OF TEST: _____

TESTING COMPANY: _____ TEST LOCATION: _____

INSULATION TESTS

COND. # OF #	COND. TO GROUND	CONDUCTOR TO CONDUCTOR									
1		1 TO #	2 TO #	3 TO #	4 TO #	5 TO #	6 TO #	7 TO #	8 TO #	9 TO #	10 TO #
		X									
2		1 TO #	2 TO #	3 TO #	4 TO #	5 TO #	6 TO #	7 TO #	8 TO #	9 TO #	10 TO #
		X	X								
3		1 TO #	2 TO #	3 TO #	4 TO #	5 TO #	6 TO #	7 TO #	8 TO #	9 TO #	10 TO #
		X	X	X							
4		1 TO #	2 TO #	3 TO #	4 TO #	5 TO #	6 TO #	7 TO #	8 TO #	9 TO #	10 TO #
		X	X	X	X						
5		1 TO #	2 TO #	3 TO #	4 TO #	5 TO #	6 TO #	7 TO #	8 TO #	9 TO #	10 TO #
		X	X	X	X	X					
6		1 TO #	2 TO #	3 TO #	4 TO #	5 TO #	6 TO #	7 TO #	8 TO #	9 TO #	10 TO #
		X	X	X	X	X	X				
7		1 TO #	2 TO #	3 TO #	4 TO #	5 TO #	6 TO #	7 TO #	8 TO #	9 TO #	10 TO #
		X	X	X	X	X	X	X			
8		1 TO #	2 TO #	3 TO #	4 TO #	5 TO #	6 TO #	7 TO #	8 TO #	9 TO #	10 TO #
		X	X	X	X	X	X	X	X		
9		1 TO #	2 TO #	3 TO #	4 TO #	5 TO #	6 TO #	7 TO #	8 TO #	9 TO #	10 TO #
		X	X	X	X	X	X	X	X	X	
10		1 TO #	2 TO #	3 TO #	4 TO #	5 TO #	6 TO #	7 TO #	8 TO #	9 TO #	10 TO #
		X	X	X	X	X	X	X	X	X	X

NOTES:

1) Use single form for each conduit.

2) Disconnect both ends of wiring prior to megger tests.

3) Megger insulation resistances of all 600 volt insulated conductors using a 500 volt megger for 10 seconds. Make tests with circuits installed in conduit and isolated from source and load. Each conductor shall be meggered conductor-to-conductor and conductor-to-ground. These tests shall be made on cable after installation with all splices made up and terminations installed but not connected to the equipment.

4) Each megger reading shall not be less than 22 Meg-ohms resistive. Corrective action shall be taken if values are recorded less than 10 Meg-ohms. Conductors with low ohm values, that do not match similar lengths of conductors the same size, shall be replaced at no additional cost to the Owner.

5) Values of different phases of conductors in the same conduit run showing substantially different Meg-ohm values, even if showing above 22 Meg-ohms shall be replaced.

CERTIFIED BY: _____ _____ _____

SIGNATURE COMPANY DATE

WITNESSED BY: _____ _____ _____

SIGNATURE COMPANY DATE

NSTRUMENT T ON CONDUCTOR TEST FORM

PROJECT NAME: _____ DATE OF TEST: _____

TESTING COMPANY: _____ TEST LOCATION: _____

CONDUIT NUMBER: _____ E UIPMENT #: _____

CONTINUITY TESTS			INSULATION TESTS	
CONDUCTOR PAIR # OF #	CONDUCTOR TO CONDUCTOR	CONDUCTOR TO S IELD	CONDUCTOR TO CONDUCTOR	S IELD TO GROUND

NOTES:

1) Disconnect both ends of wiring prior to megger tests.

2) Megger insulation resistances of all 600 volt insulated conductors using a 500 volt megger for ten seconds. Make tests with circuits installed in conduit and isolated from source and load. Each conductor shall be meggered conductor-to-conductor and conductor-to-ground. These tests shall be made on cable after installation with all splices made up and terminators installed but not connected to the equipment.

3) Each megger reading shall not be less than 10 Meg-ohms resistive. Corrective action shall be taken if values are recorded less than 10 Meg-ohms. Conductors with low ohm values, that do not match similar lengths of conductors the same size, shall be replaced at no additional cost to the Owner.

4) Continuity Tests: Each instrumentation conductor twisted shielded pair shall have the conductor and shield continuity measured with an ohmmeter. Conductors with high ohm values, that do not match similar lengths of conductors the same size, shall be replaced at no additional cost to the Owner.

CERTIFIED BY: _____ _____ _____

SIGNATURE COMPANY DATE

WITNESSED BY: _____ _____ _____

SIGNATURE COMPANY DATE

GROUNDING SYSTEM TEST FORM

PROJECT NAME: _____ DATE OF TEST: _____

TESTING COMPANY: _____ TEST LOCATION: _____

TECHNICIAN: _____ TEST LOCATION: _____

EQUIPMENT NAME: _____

SOIL CONDITION: circle one WET DRY MOIST DAYS SINCE LAST RAIN # _____ OVER 7 _____

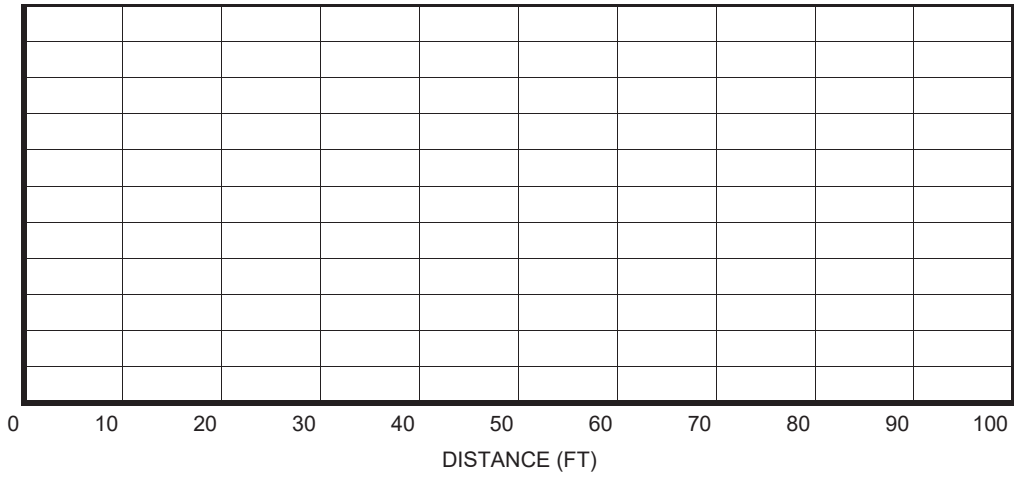
TEST ROD LOCATION RELATIVE TO SYSTEM GROUND UNDER TEST (DISTANCE AND DIRECTION) _____

COMMENTS:

FALL OF POTENTIAL TEST

MEASURED VOLTAGE PROBE	
DIST.	RESIST.
20	
30	
40	
50	
60	
70	
80	
90	

GRAPH OF MEASURED RESISTANCE VS. DISTANCE FROM TEST PROBE



NOTES:

1) Use ground resistance test meter and perform separate ground test for each building or independently derived grounding system.

2) Verify ground system is in compliance with drawings and specifications.

3) Perform the test not less than two days after the most recent rainfall and in the afternoon after any ground condensation (dew) has evaporated.

4) Investigate point-to-point resistance values which exceed 1.0 ohm. Correct (by adding additional grounding systems as necessary) and re-test. Consult design engineer if for direction on additional grounding materials and methods.

5) Connect all ground electrodes and/or UFER ground together and perform fall of potential test.

6) Perform fall-of-potential test in accordance with IEEE Standard 81 and NETA 7.13 on the main grounding electrode or system. Install reference electrode(s) a minimum of 100 feet from system under test. Connect power supply. Install/test/record/remove the potential test electrode every 10 feet during test.

7) Test measurements shall be made at 10 feet intervals in a straight line beginning at 90 feet and ending 10 feet from the system being tested. Plot resistance readings on graphical chart above.

8) Perform point-to-point resistance tests to verify low resistance between the main grounding system and all electrical equipment connected to the grounding system. Document results graphically from rod to rod and rod to equipment. Purpose is to check Cad-Weld connections and continuity point to point.

CERTIFIED BY: _____ _____ _____

SIGNATURE COMPANY DATE

WITNESSED BY: _____ _____ _____

SIGNATURE COMPANY DATE

ELECTR C L E U MENT
SU L ND MEC N C L NS ECT ON FORM

PROJECT NAME: _____ DATE OF TEST: _____

TESTING COMPANY: _____ TEST LOCATION: _____

E UIPMENT NAME: _____ E UIPMENT #: _____

NAMEPLATE DATA complete as applicable)

MANUFACTURER: _____ ENCLOSURE: _____

MODEL #: _____ U.L. #: _____

VOLTAGE: _____ P ASE: _____

BUS AMPERAGE: _____ SERVICE: _____

BUS TYPE: _____ BUS BRACING: _____

VERTICAL BUS: _____ ORI ONTAL BUS: _____

GROUND BUS: _____ NEUTRAL BUS: _____

SERIES #:

P YSICAL INSPECTION C EC LIST

ENTER A-ACCEPTABLE R-NEEDS REPAIR OR REPLACEMENT NA-NOT APPLICABLE

ITEM	C EC	NOTES
C EC NON-ELECTRICAL FASTENERS FOR TIG TNESS		
TOR UE TEST ALL WIRING AND BUS CONNECTIONS		
VERIFY ANC ORAGE IS PER SPECS AND OR CALCS		
C EC BUS BRACING AND CLEARANCE		
C EC MAIN GROUNDING CONNECTION AND SI E		
VERIFY GROUND BUS BONDING		
VERIFY E UIPMENT GROUNDS		
VERIFY CONDUIT GROUNDS AND BUS INGS		
C EC NEUTRAL BUS AND CONNECTIONS		
VERIFY ALL BREA ERS AND FUSES ARE RATED PROPERLY		
INSPECT FOR BRO EN OR DAMAGED E UIPMENT		
INSPECT ALIGNMENT OF PANEL AND DOOR		
VERIFY REMOVAL OF ALL DEBRIS AND DUST		
VERIFY WIRE LABELS ARE INSTALLED		
VERIFY ALL WIRE TERMINATIONS		
C EC FOR PROPER WIRE SI ES		
C EC FOR PROPER WIRE COLOR CODES		
VERIFY ALL NAMEPLATES		
C EC FOR PROPER CLEARANCES AND WOR ING SPACE		
INSPECT ALL PAINT SURFACES		
C EC EATERS AND T ERMOSTATS		
C EC VENTILATION AND FILTERS		
C EC IF DRAWINGS MATC E UIPMENT		
C EC ACCURACY OF OPERATION MAINTENANCE		

NOTES:

1) Complete checklist above. Note any items that were found out of compliance.

2) Torque all electrical connections to values defined by equipment manufacturer or per NEC 110-14.

CERTIFIED BY: _____ _____ _____

SIGNATURE COMPANY DATE

WITNESSED BY: _____ _____ _____

SIGNATURE COMPANY DATE

NEL O RD TEST FORM

PROJECT NAME: _____ DATE OF TEST: _____

TESTING COMPANY: _____ TEST LOCATION: _____

PANEL NAME: _____ PANEL TAG #: _____

PANELBOARD NAMEPLATE DATA

UL #: _____ MANUFACTURE: _____

MAIN BREAKER RATING: _____ MODEL #: _____

PHASE: _____ VOLTAGE: _____

VERTICAL BUS RATING: _____ BUS AMPERAGE: _____

NEUTRAL BUS RATING: _____ BUS TYPE: _____

GROUND BUS RATING: _____ ENCLOSURE: _____

ENTRY LOCATION: _____ SERIES: _____

PHYSICAL INSPECTION CHECKLIST

ITEM	CHECK	NOTES
TIGHTEN ALL BOLTS AND SCREWS		
TIGHTEN ALL WIRING AND BUS CONNECTIONS		
VERIFY ALL BREAKERS AND FUSES ARE RATED PROPERLY		
CHECK BUS BRACING AND CLEARANCE		
CHECK MAIN GROUNDING CONNECTION AND SIZE		
VERIFY GROUND BUS BONDING		
VERIFY EQUIPMENT GROUNDS		
VERIFY CONDUIT GROUNDS AND BUSHINGS		
CHECK NEUTRAL BUS AND CONNECTIONS		
INSPECT FOR BROKEN OR DAMAGED EQUIPMENT		
INSPECT ALIGNMENT OF PANEL AND DOOR		
VERIFY ANCHORAGE		
VERIFY REMOVAL OF ALL DEBRIS AND DUST		
VERIFY CIRCUIT BREAKER LEGEND PER CONTRACT		
INSPECT ALL PAINT SURFACES		
VERIFY WIRE LABELS ARE INSTALLED		
VERIFY ALL WIRE TERMINATIONS		
VERIFY PANEL SCHEDULE WITH TERMINATIONS		
VERIFY PROPER WIRE SIZE		

NOTES:

1) Complete checklist above by entering a checkmark for acceptable, R for needs repair or attention

CERTIFIED BY: _____ _____ _____

SIGNATURE COMPANY DATE

WITNESSED BY: _____ _____ _____

SIGNATURE COMPANY DATE

CONTROL NEL RE O ER T ON L TEST FORM

PROJECT NAME: _____ DATE OF TEST: _____

TESTING COMPANY: _____ TEST LOCATION: _____

CONTROL PANEL NAME: _____ CONTROL PANEL TAG #: _____

CONTROL PANEL MANUFACTURER: _____ CONTROL PANEL TYPE: _____

CATEGORY	EQUIPMENT TAG #	DEVICE CHECKS AND TEST								
		CONTROL SWITCHES	OPERATOR INTERFACE	PANEL METERS	PANEL LIGHTS	PANEL NAMEPLATES	PLC POWER SUPPLY	I O CARDS		
Height										
Voltage										
F nction										
CATEGORY	EQUIPMENT TAG #	POWER SUPPLY 1 V)	POWER SUPPLY V)	POWER SUPPLY V)	UPS	PANEL LIGHTS				
F nction										
Voltage										

NOTES:

1) Set config rable parameters and verify voltage inp t prior to applying po er.

) Verify e ipment po ers p and operates correctly.

) Perform trip f nctions and verify e ipment ret rns to normal operation ith only necessary operator intervention.

) Complete checklist above by entering a checkmark CM) for acceptable, or R for needs repair or attention, or NA for not applicable

Attention Re ied:

CERTIFIED BY: _____ _____ _____

SIGNATURE COMPANY DATE

WITNESSED BY: _____ _____ _____

SIGNATURE COMPANY DATE

RO R MM LE LO C CONTROLLER O O NT TO O NT TEST FORM

PROJECT NAME: _____ DATE OF TEST: _____

TESTING CO: _____ TEST LOCATION: _____

PANEL NAME: _____ PANEL TAG #: _____

PLC NAME: _____ RACK # _____ SLOT # _____ I O TYPE _____

I O POINT				Scale					Digital	Operator	SCADA	Pass Fail
I O #	TYPE	TAG #	Description	mA	mA	1 mA	1 mA	mA	On Off	Interface	Screen	CM or R
1												
1												
11												
1												
1												
1												
1												
1												

NOTES:

1) Connect signal generator to each I O point for factory testing.

) Utili e act al instr ment to generate signals for field pre operational tests here possible.

) Verify f nction and acc racy of loop by by s itching the digital signal or mod lating the analog signal from the connected device or instr ment

) Field verify all instr ments and indicators ithin loop of signal.

) Confirm polarity of signals and calibration ranges are e ivalent for all components in loop.

) Incl de significant digits past decimal in scale col mns

) Complete checklist above by entering a checkmark CM) for acceptable, or R for needs repair or attention

) Note items that need attention belo

Attention Re ied:

CERTIFIED BY: _____ _____ _____

SIGNATURE COMPANY DATE

WITNESSED BY: _____ _____ _____

SIGNATURE COMPANY DATE

NSTRUMENT T ON S TC C L R T ON TESTS FORM

PROJECT NAME: _____ DATE OF TEST: _____

TESTING COMPANY: _____ TEST LOCATION: _____

INSTRUMENT NAME: _____ INSTRUMENT TAG#: _____

INSTRUMENT UNITS: _____ NAME: _____

TYPE: _____ MODEL: _____

SERIAL #: _____

MANUFACTURER	INSTRUMENT
NAME: _____	UNITS: _____
TYPE: _____	
MODEL: _____	
SERIAL #: _____	

PROCESS SETPOINT	INCREASING TRIP POINT	DECREASING TRIP POINT	DEADBAND	SETPOINT TIME DELAY	ACTUAL TIME DELAY

NOTES:

1) Field test instr mentation and associated control systems in accordance ith the specifications and the man fact rer s instr ctions. Instr menatation shall f nction as intended nder act al process conditions or shall be repaired or replaced at Contractors e pnse.

) Complete a separate calibration form for each instr ment provided.

) Sim late process variable in field by applying kno n press re, temperat re, opening closing meas red device, raising lo ering act al level, etc. as re ired to confirm calibration. This step m st be itnessed by inspector.

CERTIFIED BY: _____ _____ _____

SIGNATURE COMPANY DATE

WITNESSED BY: _____ _____ _____

SIGNATURE COMPANY DATE

NSTRUMENT T ON TR NSM TTER C L R T ON TEST FORM

PROJECT NAME: _____ DATE OF TEST: _____

TESTING COMPANY: _____ TEST LOCATION: _____

INSTRUMENT NAME: _____ INSTRUMENT TAG#: _____

MANUFACTURER		INSTRUMENT	
NAME:		RANGE:	
TYPE:		SCALE:	
MODEL:		UNITS:	
SERIAL #:		TRANSMITTER OUTPUT:	
REMOTE SENSOR TYPE:		FACTORY SPECIFIED ACCURACY:	
If Applicable)		REMOTE SENSOR OUTPUT:	
		If Applicable)	

DESIGNED VALUE				ACTUAL VALUE			
INPUT SIGNAL	OUTPUT	ENG VALUE	CALCULATED TOLERANCES	INSTRUMENT DISPLAY	INSTRUMENT OUTPUT SIGNAL	PROCESS INDICATOR	LOGIC VALUE

NOTES:

1) With this form, attach and s bmit factory calibration forms for flo meters and transmitters that are available from factory.

) Field test and calibrate instr mentation and associated control systems in accordance ith the specifications and the man fact rer s instr ctions. Instr menatation shall meet specified acc racy or shall be repaired or replace at Contractor s e pense.

) Complete a separate calibration form for each instr ment provided.

) Sim late process variable in field by applying kno n press re, temperat re, pH, etc. as re ired to confirm calibration. This step m st be itnessed by inspector.

) Provide parameter val e for each parameter changed from factory defa lt.

CERTIFIED BY: _____ _____ _____

SIGNATURE COMPANY DATE

WITNESSED BY: _____ _____ _____

SIGNATURE COMPANY DATE

Control Panels

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide and install Control Panels, Terminal Panels, and custom specific purpose panels per Drawings and Specifications.

B. Provide complete wired and tested panel with all devices installed per the contract Drawings and as stated herein.

C. Provide all necessary hardware, conduit, wiring, fittings, and devices to connect the control panel to equipment provided under other Sections.

1.02 REFERENCES

A. Electrical Specifications [Electrical General].

B. Electrical Specifications [Low Voltage Wire & Data Cable]

C. Electrical Specifications [PLC & OI Hardware]

D. Electrical Specifications [PLC & OI Application Programming]

E. Electrical Specifications [Instrumentation]

1.03 SUBMITTAL REQUIREMENTS

A. Provide submittals and Drawings as specified in Electrical Specifications [Electrical General, Submittal Requirements].

B. Submit shop construction Drawings for the Control Panel. The following Drawings shall be provided as a minimum:
   1. Scaled drawings of the Control panel elevation, baseplan. The dimensions and locations of the cutouts shall be dimensioned from the bottom left corner of the door(s).
   2. Scaled drawings of the backpan including all mounted components and wireways.
   3. Wiring diagrams for AC and DC power distribution, I/O for each card in the PLC and communications block diagrams.

1.04 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Provide operating instructions as specified in Electrical Specifications [Electrical General].

PART 2 PRODUCTS

2.01 ENCLOSURE

A. The enclosure for the control panels shall be (at minimum) sized as shown in the Contract Drawings.
   1. Arrangement: Where so indicated, the instruments mounted in the panels shall have the nominal size and general arrangement shown. Panel layouts and nameplates shall conform to the approved submittal.
   2. Assembly: Mount all equipment on 12 ga. painted white backpan(s) that is bolted to rear (and sides) of the enclosure. Use drill and tap method for machine thread screws for all internal components on mounting panels. Provide extra mounting bolts through the rear of the structure if equipment weight exceeds backpanel mounting stud capacity.
   3. Hardware: Provide door latch and accessories as detailed in the Contract Drawings or as required to meet NEMA area ratings.
      a. Provide one or two single point latches for panels up to 36” height.
      b. Provide 3 point latching mechanisms for panels over 36” height consisting of rotating handle with latch, extension bars with plastic wheels at ends and guide slots at top and bottom of door, or as otherwise shown on drawings.
      c. Hinges, pins, bolts and screws shall be of 316 stainless steel only.
   4. When physical size requirements for individual components are different than that detailed on the Control Panel backpan drawing, the wiring diagrams and specifications herein shall supersede the elevation drawing and the Contractor shall furnish additional panel width as needed to fit the electrical equipment. Deviations with sufficient evidence for the change shall be submitted for approval. The Contractor is

required to provide for all equipment including spares and spaces as shown in the wiring diagrams.

2.02 CONTROL PANEL CIRCUIT BREAKERS

A. Furnish circuit breakers and accessories as required per Drawings and application.
   1. Copper busbar systems, up to 480VAC, 115A, 1, 2 or 3 phase as needed for application
   2. Trip rating per Drawings or as needed for protected device. Trip curves as selected by System Integrator.
      a. B curve magnetic trip point: 3 to 5 times the rated current, typically used for computers and electronic equipment with very low inrush loads (PLC wiring).
      b. C curve magnetic trip point: 5 to 10 times the rated current, typically used for small transformers, pilot devices, etc.
      c. D curve magnetic trip point: 10 to 20 times the rated current, typically used for transformers or loads with very high inductive loads.
   3. Quantity of pins and feed in lugs as required.
   4. Auxiliary contact, shunt trip as required in Drawings.
   5. DIN rail mounted, 18mm width per pole, finger safe pressure plate terminals.

B. Motor applications:
   1. UL489 for branch circuit protection up to 40A, 1 to 3 pole.
   2. 5 kAIC interrupting capacity @ 480 VAC
   3. Alltech, Eaton FAZ, or equal.

C. Control circuit transformers and other Non-motor applications:
   1. UL1077 supplementary protection up to 63 amps, 1 to 2 pole, AC or DC.
   2. Used where a UL489 protective device is upstream powering the circuit (from a panelboard or other source).
   3. Used within control circuits for power supplies, control power transformers, relays and PLC I/O points.
   4. Used in place of fuses that are applied as supplementary protection.
   5. Eaton FAZ, or equal.

2.03 FUSES AND FUSE HOLDER

A. Fuses shall not be used in branch or control circuits unless specifically shown in the Drawings. Circuit breakers shall be furnished and utilized where possible.

B. Fuses used in circuits 200 VAC and above shall be time delay, 13/32" x 1 1/2", and have an interrupting rating of 10,000 AIC at 500 VAC. Fuses shall be Bussman type FNQ or approved equal. Fuse holders shall feature open fuse indication lights and shall be rated 30A at 600 VAC. Fuse holders shall be Bussman Optima Series OPM or equal.

C. Fuses used in 120 VAC shall be time delay, 1/4" x 1 1/4", and have a rating of 250 VAC. Fuses shall be Bussman type MDA or approved equal. Fuse holders shall be of the same manufacturer, series and color as the adjacent terminal blocks and have blown fuse neon indicators. Fuse holders shall be Entrelec ML 10/13.SFL, Allen Bradley 1492-H4 or equal.

D. Fuses used in signal and 24 VDC circuits shall be fast acting, 5mm x 20mm and have a rating of 250 VAC. Fuses shall be Bussman type GMA or approved equal Fuse holders shall be of the same manufacturer, series and color as the adjacent terminal blocks and have blown fuse LED indicators. Fuse holders shall be Entrelec M 4/8.SFDT, Allen Bradley- 1492-H5 or equal

E. Fuses shall be sized in conformance with the NEC.

2.04 TERMINAL BLOCKS AND ACCESSORIES

A. General
   1. Terminal blocks to be clamp type, 5 spacing, 300 volt, minimum rating of 20 amps, and mounted on DIN rail. DIN rail shall be same type as used for the relays. Install extra DIN rail on each type of terminal strip with 10% spare terminals for future additions.
      a. Provide larger terminal as necessary based on gauge of connected wiring. Those terminals with 10-gauge larger gauge wiring or more than one 12-gauge wire should be evaluated and changed.
   2. Provide terminal blocks with "follower" plates that compress the wires and have wire guide tangs for ease of maintenance.

Terminal blocks that compress the wires with direct screw compression are unacceptable. All power, control and instrument wires entering and leaving a compartment shall terminate on terminal blocks with wire numbers on terminals and on both ends of the wires.

3. Provide end clamps, separators, din rails, and jumpers to complete terminal block system. See example PLC I/O drawing for additional information. Engineer can provide on request if not available in plans.
4. Terminal Tags and Markers: Each terminal strip shall have a unique identifying alphanumeric code at one end (i.e.: TB1, TB2, etc.) or as shown in Drawings.
5. Plastic marking tabs shall be provided to label each terminal block. These marking tabs shall have a unique number/letter for each terminal which is identical to the "elementary" and "loop" diagram wire designation. Numbers on these marking strip shall be machine printed and 1/8” high letters minimum.
6. Terminal blocks shall be physically separated into groups by the level of signal and voltage served a by PLC I/O card. Power and control wiring above 100 volts shall have a separate group of terminal blocks from terminal blocks for wiring below 100 volts, intermixing of these two types of wiring on the same group of terminal blocks is not allowed.

B. CP – Control Panel Terminal Blocks

1. All terminal blocks and relays shall be Gray in color unless otherwise shown on the Drawings. Do not color code terminal blocks or terminal labels without instruction.
2. Utilize two terminal blocks for each AI. Upper (highest) terminal shall be the positive or negative analog signal, the middle block shall be 24v +, and the lower terminal shall be 24v -. Buss each terminal 24+ to each other, and buss each 24 – to each other utilizing terminal jumpers (copper finger buss or center screw type). Analog grounds for wire shields shall be grouped and located adjacent to the analog terminals for each analog card.
3. Digital inputs shall utilize one general purpose terminal block and one disconnecting terminal block per input. Both blocks shall be in close proximity to each other.
4. Digital outputs shall utilize the relay terminals directly as the field connection terminal block.

5. Accessories are not listed such as end caps, anchors, jumpers, bridges, marking strips, or other items necessary to make up a complete terminal block layout. Furnish all parts necessary per manufacturer's intended solution. Minimize the use of wire jumpers for adjacent terminals.
6. Provide a ground terminal or connection point for each grounding conductor. Grounds will be associated with each incoming conduit and with shielded cables.
7. Provide a separate signal, common, and/or neutral terminal for every wire and PLC or remote device connection at minimum.

Description	Model number, Allen Bradley or equal
General Purpose Terminal Block, 20A	1492-W3
Disconnecting Terminal Block, 20A	1492-JKD3
Grounding Terminal Block	1492-JG4
PLC AI Sensor Block, 3 Level. Use upper terminal for AI +/- and lower blocks for 24+ and 24-.	1492-WTS3 (2 per AI)
PLC Digital Output Relays, 120VAC, 6A, SPDT	700-HLT1U1

C. MCC – Motor Starter Cubicle Terminal Blocks
1. MCC cubicle terminal blocks shall be pull apart as supplied standard by MCC manufacturer.

D. Power – Power terminal Blocks
1. Backpan mounted termination blocks shall be rated for 600V (min). The power termination blocks shall be rated to accept Copper or Aluminum cable and rated as shown on Contract one-line diagrams. Termination blocks shall be insulated with molded plastic covering and finger safe cover. Each termination block shall be provided with quantity and size of primary and secondary cable connections as required per installation. The power termination blocks shall be Erico UD, UDJ, BD, TD, or SB series or equal.
2. Unmounted termination blocks shall be constructed of aluminum and suitable for use with Aluminum and copper wire. Size and quantity of cable connections shall be as required for installation. Termination blocks shall be insulated with molded high-dielectric strength plastic

covering and eliminate the need for tape insulation of electric connection. The termination block shall have removable access plugs over the wire entry and hex screw ports. Provide NSI Polaris IPL or IPLD Series terminal blocks or equal.

E. Panel Receptacles
1. Ground fault circuit interrupter receptacles shall be used where shown for convenience use. Dedicated receptacles for equipment may be standard duplex outlets. GFI and standard receptacles shall be commercial grade, duplex, ivory, 20A, 120V, back and side wired. Furnish Leviton, Hubbel, or equal.

F. Panel Ground
1. Each electrical enclosure shall have a copper ground bus. Screw type fasteners shall be provided on all ground busses for connection of grounding conductors. Ground bus shall be a Challenger GB series, ILSCO CAN series or equal.
2. A 12ga. copper ground wire shall be attached between the ground bar and the panel enclosure, and between the ground bar and the mounting panels. The ground connection to the enclosure and panel shall be made by sanding the paint finish off a small area, drilling a hole for a 0.25 inch bolt and mounting a 0.25-20 bolt to the panel to serve as grounding stud. The grounding stud shall be attached with a nut and flat washers on both sides of the enclosure/panel, and with an inside tooth star lock washer next to the panel surface. The star lock washer shall be on the inside surface of the enclosure, and the front surface of the mounting panel. The grounding wire shall be secured to the stud with a nut and inside tooth star lock washer. These grounding points shall be located within 12 inches of the bottom to the grounding bar. Each terminal strip rail shall be individually grounded by means of a #12 AWG wire to the ground bus.
3. Components within the panel shall be grounded according to the manufacturer's recommendations.

2.05 POWER SUPPLIES

A. Uninterruptible Power Supply (UPS)

1. The UPS shall be installed within the control panel and power all process related 120 VAC devices and DC power supplies.
2. The UPS capacity/size shall be as shown in the contract Drawings. The battery capacity shall be such that it may provide nameplate power for 10 minutes (min) from a fully charged battery(s).
3. The UPS shall provide surge protection and filtering: 0.3% IEEE surge let-through, zero clamping response time to meet UL 1449. The inverter shall provide true sine wave output.
4. When the Utility power voltage is outside of a preset range (approx. <100 < V < 130 VAC) then the UPS shall power the load from storage batteries and a solid state inverter.
5. The power supply shall be wired into the control panel power circuit per the contract Drawings.
6. The UPS operating ambient temperature range shall be 32 deg F to 122 deg F minimum.
7. The inverter shall be self resetting and continuously on-line regardless of the Utility power existence. Configure the UPS to restart automatically upon restart of utility power without operator intervention. The rectifier/charger shall recharge and maintain float charge on the batteries automatically.
8. The UPS shall be of a readily available commercial manufacturer. Provide American Power Conversion Smart UPS, or equal.

B. DC Power Supply (PS)

1. The DC power supply shall utilize a switching power stage, rectifier and voltage regulator. The power supply case shall be DIN rail mountable.
2. The power supply shall operate on 120V AC and provide DC output voltage and current as shown in the Contract Drawings.
3. The power supply shall be wired and fused per manufacturer instructions and Contract Drawings. Power supply output shall include self resetting overcurrent protection.
4. Power supplies below 101 Watts output power shall be Class 2 rated.
5. The power supply shall provide 2% voltage regulation for a change of 10% load to 100% full load.
6. The DC power supply shall be Sola SDN-C, Phoenix Contact Quint Power, or equal.

7. Power supply shall include integral battery charger and DC UPS automatic switching circuitry such that system is powered by battery in the event of power failure.
8. The DC power supply shall be Weidmuller Connect Power CPSNT, and Weidmuller BBU-24, or equal.

C. DC Power Redundancy Module
1. The external redundancy module shall allow two power supplies to exist in a parallel redundant configurations. The external modules purpose is to increase the reliability by isolating the power supplies and providing a single output. If either of the power supplies was to fail, the output would not be impacted. The redundancy module shall include monitoring contacts for each input power supply and for the output. Provide the redundancy module with capacity rating equivalent or larger than the power supply rating.
2. The DC power redundancy module shall be Sola SDN xx RED, Phoenix Contact Trio Diode, Weidmuller Pro RM, or equal.

2.06 MISCELLANEOUS COMPONENTS

A. Wireway: Manufactured from light gray rigid PVC suitable for continuous use at temperatures up to 50 deg C. Wireway shall be 2" height, width as required with 0.5" slot spacing with removable covers. Provide Panduit type "F" or equal.

B. Intrusion Switch: The intrusion switch shall have a pin plunger that is depressed when the door is closed. The form C contacts shall be rated 2A at 120 VAC. Provide Hoffman A-LFSWD, Microswitch 1AC2 or equal.

C. LED Strip Light: The LED light shall be an "under cabinet" style with multiple LED lamps and acrylic diffuser. Lamp shall be switched on/off from integral switch or PIR motion sensor. Light housing shall be capable of magnet mount to top or side of enclosure or will include mounting tabs for mounting to brackets. Lamp shall be powered from 120VAC or from 24~48 VDC or shown in the contract Drawings. LED Strip Light shall be Stego 02540, or equal.

D. Circulation Fans: The control panel temperature shall be maintained 10 deg. F below lowest internal device's temperature rating. The fans shall be 4" or 6" unless otherwise noted on Contract Drawings. The Contractor shall calculate the heat generation of all internal components and determine if the fans submitted will meet the cooling requirements of the internal components. Circulation fans shall include louver with filter and bug screen for outdoor installations.

E. Forced Air Heater: The control panel temperature shall be kept above 50 deg. F through the use of a resistive forced air heater when the panel is located outdoors. The heater shall contain a fan, heating elements, and thermostat within a single self contained unit. The wattage of the heater shall be as calculated by the supplier using the manufacturers sizing method to meet the temperature requirements. The heater shall be Hoffman D-AH series, or equal.

F. Thermostats: The air circulation fans shall be controlled by adjustable thermostat. The thermostat shall be mounted near the top of the panel and easily accessible by a technician. The thermostat shall be capable of control of a heater or cooling fan(s) by selecting the proper contact logic. The thermostat range shall be adjustable from 30 to 140 deg F. Thermostat shall be Hoffman A-TEMxx, or equal.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. All work in this Section shall conform to the codes and standards specified in Electrical Specifications [Electrical General, Workmanship].

3.02 FABRICATION

A. Equipment Mounting:
   1. Mount all equipment using manufacturers mounting tabs/holes or brackets where possible. Where not possible, construct custom brackets to panel mount or backpan mount components as shown in the Contract Drawings.

2. Equipment or laptop shelves shall be provided where shown on the Contract Drawings. Equipment shown on shelves shall not be placed on the bottom of the panel after field installation.
3. All nuts, bolts, screws, washers and hinges used in the panel shall be stainless steel. All components shall be mounted using bolts or screw fasteners only which are drilled and tapped into the backpan. Pop rivets shall not be allowed within panel except for enclosure support arms.

B. Environmental:
1. Control panel environmental accessories including fans, louvers, filters, bugscreens, air conditioners, etc. shall be provided as noted in the Drawings and as necessary for a complete environmental solution.
2. Panels environmental controls shall be designed during shop drawing submittal and fabricated to maintain temperatures 10 degrees F below lowest internal equipment maximum temperature rating.
3. Contractor shall provide [additional] fans, louvers, screens, sunshades, air conditioners, etc. as necessary to prevent equipment malfunction or premature failure. Provide associated wiring and thermostats as needed.
4. Environments:
   a. NEMA 4X rated panels shall be cooled/heated with closed loop type conditioning systems to include air conditioners, internal panel circulation fans and resistive heaters.
   b. NEMA 3R rated outdoor panels shall be cooled/heated with open loop type conditioning systems to include air conditioners, exhaust fans and louvers, internal panel circulation fans and resistive heaters. All exhaust fans and louvers shall include filters and bugscreens.
   c. NEMA 12 or 1 rated indoor panels shall be cooled/heated with open loop type conditioning systems to include air conditioners, exhaust fans and louvers, internal panel circulation fans and resistive heaters. All exhaust fans and louvers shall include filters and bugscreens.

C. Wiring:

1. Panel Wiring: All wiring shall be installed in wireways between terminal blocks, PLC, and devices. Reference Contract Drawings for control panel power distribution diagram and control panel elementary diagrams.

3.03 INSTALLATION

A. Wiring:
   1. Install all equipment per Electrical Specifications [Electrical General].
   2. All internal and field wiring shall be per Electrical Specifications [Low Voltage Wire].
   3. Panel Wiring: All wiring shall be installed in wireways between terminal blocks and devices. Reference Contract Drawings for Control panel power distribution diagram and control panel elementary diagrams.
   4. Field Wiring: Wireways shall be provided for field wiring. Reference Contract Drawings for control panel power distribution diagram and control panel elementary diagrams.

B. Cleaning:
   1. The Contractor shall clean the inside of the control panel of any dust or debris remaining at the completion of installation and testing.
   2. The Contractor shall exercise care when using a vacuum cleaner or compressed air such as not to damage any component within the panel.
   3. Many electrical and computer components are open for ventilation. Falling debris can penetrate the openings and cause equipment failure. Equipment with debris inside shall be removed, cleaned and/or replaced.

3.04 FIELD ASSISTANCE

A. Provide testing as specified in Electrical Specifications [Factory and Field Testing].

3.05 WARRANTY

A. Provide warranty as specified in Electrical Specifications [Electrical General, Warranty].

3.06 FINAL ACCEPTANCE

A. Final Acceptance per Electrical Specifications [Electrical General].

END OF SECTION

PLC & OI Hardware

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Providing and installing Programmable Logic Controller (PLC) and Operator Interface Hardware and all supporting hardware, wiring and devices as specified in Electrical Specifications.

1.02 REFERENCES

A. Electrical Specifications [Electrical General]

B. Electrical Specifications [Low Voltage Wire and Data Cable]

C. Electrical Specifications [PLC and OI Application Programming]

1.03 SUBMITTAL REQUIREMENTS

A. Provide submittals per Electrical Specifications [Electrical General, Submittal Requirements].

B. Submit documentation showing the number and type of I/O modules required to meet the I/O requirements specified herein. Include complete manufacturer's part and model numbers.
   1. PLC I/O points are determined by the P&ID Drawings. The Contractor shall count and total the PLC I/O points per PLC controller and per type of I/O required based on the P&ID diagrams. Provide 25% spare I/O points per I/O type per PLC.

C. Submit calculations showing that the power supply meets the specified requirements and the requirements of the devices powered. Confirm PLC power supply is sufficient for all possible operable conditions.

D. Submit shop drawings showing physical backpan layout of equipment in Control Panel.

E. Submit communications block diagram including PLC, OI, motor controls, power supplies, switches, routers, radios, and any other connected components.

F. Submit hardware Operations and Maintenance Manual per Electrical Specifications [Electrical General].

PART 2 PRODUCTS

2.01 GENERAL

A. Provide PLC modules from a single family of products, using the same software and interchangeable I/O cards, that can be configured for a range of applications from small, uncomplicated sites to large, complex sites with a variety of equipment.

B. Provide a PLC that will meet the following requirements:
   1. Size and provide a CPU and power supply to accommodate the CPU, I/O cards, communication devices, etc. as specified herein.

C. Provide a PLC that can be expanded in the field by the addition of the following types of plug-in modules or cards and interface cables without rendering the originally furnished PLC components obsolete.
   1. Digital Inputs
   2. Digital Output
   3. Analog Input
   4. Analog Output with PID control

D. Size the PLC enclosure such that local I/O modules and supporting hardware required to meet the ultimate point count, as specified herein, will fit into the space of a single enclosure.

2.02 MECHANICAL

A. Provide modular PLC consisting CPU, power supply, communications, and I/O modules.

B. Provide I/O modules with removable terminal strips so that I/O modules can be removed without disconnecting field wiring.

2.03 PLC COMPONENTS

A. The following components (Allen Bradley, no equal) shall be provided to complete the PLC(s). Only major components are listed. Multiples of some components are required- see Drawings.

B. Compact Logix 5380

1.	Processor – (3MB, 31 I/O, 60 IP nodes)	5069-L330ER
2.	Power Supply	5069-FPD
3.	Digital Input Module (AC)	5069-IA16
4.	Digital Input Module (DC)	5069-IB16 (As needed for low voltage field or internal contacts)
5.	Digital Output Module (Relay)	5069-OW16
6.	Analog Input Module	5069-IF8
7.	Analog Output Module	5069-OF8
8.	Ethernet Adapter	5069-AENTR
9.	Address Reserve Module	5069-ARM
10.	Terminal Block 6 point	5069-RTB6
11.	Terminal Block 18 point	5069-RTB18
12.	Terminal Block 6-4 point	5069-RTB64

2.04 ISOLATION/INTERFACE RELAYS

A. Provide output isolation relays on all digital outputs that operate devices external to the control panel and on spare outputs or as otherwise shown in the Drawings. The relay coil connection shall be on one side of the relay base and form-C output contacts on the other.

B. Relays shall be 6A SPDT, coil voltage as required, indicating, plug in style as manufactured by Allen Bradley 700-HLT1U1 or equal. Provide jumper bars for common buss connections, Allen Bradley 700-TBJ20G, or equal.

2.05 ETHERNET SWITCH

A. The unmanaged Ethernet switch shall have minimum 16 ports. Ports shall be 10/100 Base-Tx with RJ-45, 8 pin female connectors. Switch shall be suitable for power from 10 - 30 VDC. Switch shall be N-Tron 116TX, Allen Bradley Stratix 2000, or equal.

2.06 IP SERVICE ROUTER

A. Acceptable products: Netgate SG-2100.

B. Provide shelf for panel mounting of router.

C. General Specifications
1. 2x 1 Gigabit WAN/LAN ports plus a 4 port switch provide high-speed wired connectivity
2. PF-Sense firewall to support stateful packet filtering, firewall, and pure router capability.
3. Supports IPsec, OpenVPN, PPTP, IPv6, NAT, BGP, RADIUS
4. ARM v7 Cortex-A9, 2 GB DDR4L memory, M.2 expansion for SSD, or LTE.

2.07 OPERATOR INTERFACE (OI)

1. Automation Direct C-More Model EA9-T15CL or equal.
2. Touch Screen
   a. 15 inch screen size with 1024 x 768 resolution, 65536 colors.
   b. TFT color touchscreen with LED backlight and 300nits brightness.
   c. Alarm history screen with present status and acknowledge functions.
3. Communications
   a. Modbus RS232, RS485 and Ethernet communication options. Provide cables for connection to PLC.
   b. Built in Web server for remote access and viewing screens on a network Windows computer.
   c. Remote control of process through web server interface.
   d. Type B USB port for programming.
   e. Type A USB port for data logging and alarm history.
4. Data storage
   a. 82MB backed up RAM for program, Two SD RAM slots for data.
   b. Furnish one 32GB SDHC card for data storage.
   c. Trending for up to 16 pens (colors) with historical data access from USB RAM drive.
5. Environmental conditions:
   a. Operating Temperature: 32 to 122 degrees F
   b. Storage Temperature: -4 to 140 degrees F

c. Humidity Rating: 10 to 90%, non-condensing at 32° F to 86° F
d. Rating: NEMA 12, 13, 4X (indoor only)

PART 3 EXECUTION

3.01 WORKMANSHIP

A. All work in this Section shall conform to the codes and standards specified in Electrical Specifications [Electrical General, Workmanship].

3.02 INSTALLATION

A. Fabrication
1. Mount, wire and Ground PLC and OI per manufacturer's recommendations.
2. Organize equipment on control panel backpan per Backpan Layout detail in Contract Drawings.
3. Locate and install PLC(s) and OI(s) per Contract Drawings.

B. Wiring
1. Terminate status, control and analog wiring on terminal blocks.
2. Label and wire PLC to terminal blocks per Electrical Specifications [Wire, Fuses & Terminal Block] and Example I/O Wiring Diagram in the Drawings.
3. All spare I/O points shall be wired to terminal blocks.
4. Install communication cables to connect the PLC to external devices.
5. Bundle and tie down wires in a neat and orderly manner.
6. Terminate drain wire of shielded cables at backpan terminal block only.

3.03 FIELD ASSISTANCE

A. Provide testing as specified in Electrical Specifications [Factory and Field Testing].

3.04 WARRANTY

A. Provide warranty per Electrical Specifications [Electrical General, Warranty].

B. Perform the following services during the warranty period:
   1. Repair or replace damaged modules returned for service within 24 hours.
   2. Determine and report the cause of failure of modules returned for service.
   3. Resolve design or implementation problems discovered.

3.05 FINAL ACCEPTANCE

A. Final Acceptance per Electrical Specifications [Electrical General].

END OF SECTION

PLC & OI Application Programming

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Programming of the PLCs, OIs and SCADA to control the station automatic functions and communications.

1.02 REFERENCES

A. Electrical Specifications [Electrical General]

B. Project Drawings

1.03 QUALIFICATIONS

A. Services furnished under this specification shall be performed by Application Programmer meeting requirements specified in Electrical Specifications [Electrical General, Qualifications].

1.04 SECTION INCLUDES

A. Program definition and control descriptions for Programmable Logic Controller(s) (PLCs) used to control new equipment (and existing equipment as noted) as it relates to this project.

B. Operator Interface(s) (OIs) configuration and programming to compliment PLC program code.
   1. Touch screen graphics, database, and configuration to support local control of the station/project. Graphic screens shall generally be based on P&ID drawings.
   2. Display of station status and values and allow for changes to settable parameters within the PLC program.
      a. Display of analog values and associated alarms.
      b. Display of digital values and alarms
      c. Alarm notification of un-acknowleged and acknowleged alarms.
      d. Manual control of equipment.
      e. Display values for setpoints and ability to modify setpoint values.
   3. Configuration of alarm notifications system for all alarms.

C. SCADA system configuration and programming: SCADA system is existing and has present license capacity for addition of this project.
   1. SCADA screen graphics, database, and configuration to support remote control of the station/project. Graphic screens shall generally be based on P&ID drawings.
   2. Configuration of historian database to log specific datapoints to record station activities and situations.
      a. Analog values and associated alarms.
      b. Digital alarms
      c. Equipment start/stop or open/close.
   3. Configuration of (voice and/or text) alarm notifications system for all alarms.

D. Related work as specified in Electrical Specifications [Electrical General].

1.05 SUBMITTAL REQUIREMENTS

A. Provide submittals per Electrical Specifications [Electrical General, Submittal Requirements].

B. Submit software operations manual including the following as a minimum.
   1. Program Code
      a. Program code demonstrating function in compliance with descriptions herein.
   2. Setpoint listing with description
   3. Program description
      a. Provide written description of program operation. Description shall cover all aspects of normal operation and alarm shutdowns. Describe all alarms and their effect on operation. Describe alarms that require manual reset.
   4. Register cross reference listing
      a. The listing shall be in table format and include all program constants and variable registers with their functions.
      b. The listing shall show (block and rung number) where the register is used within the program code.
   5. Configuration and Set-up

a. The configuration of the processor and hardware selections shall be summarized.
b. The configuration of the communication ports shall be shown.

6. Data Tables
   a. Print data tables with initial register values shown.
7. Special files
   a. Include any special files that are particular to the manufacturer. All files pertinent to programming or configuration shall be submitted.

C. Submit software documentation demonstrating understanding of control software requirements and compliance with Portability and Maintainability requirements specified in this Section.
1. Submit OI graphic layout and PLC program listing with cross-references for approval 4 weeks prior to factory test.
2. A PDF color copy of SCADA and OI graphic screens and PLC applications programs (with comments) shall be provided with the submittals and for as-programmed final documentation for O&M manuals. Layout shall be sized so that the complete program logic with comments fits on one page (portrait or landscape) and rotated upward.
3. Submit electronic version of SCADA and OI graphic screens and PLC applications programs native file format with each software submittal and at the end of the project for as-programmed final documentation for O & M manuals. Provide thumb drive with files or via internet with project name and purpose identified file and folder names.

1.06 PROGRAMMING METHODS

A. Design and code programs per the following:
1. Utilize ladder logic programming language as available in the PLC manufacturer's configuration software. Other software languages such as function block, flow charts, and structured text shall not be used unless approved through RFI/submittal process.
2. Clearly comment each line of program logic code. Include module headers detailing the purpose of the module, programmer name, date of last revision, revision history, and description of sequence of events.

3. Comment for each block of code explaining purpose of program block.
4. Code shall use the P&ID device names as the prefix to the names or tagnames throughout the program logic. Reference tag formation below. If PLC does not use tagnames as data reference, then provide tagname in symbol name or in comment areas at minimum.
5. Data arrays may be used in tagname aliases for communication data transfers.
    a. Provide program file for each type of program logic. The following are types that should be used, as applicable and at minimum.
    b. Analog input scaling
    c. Analog output scaling
    d. Analog alarms
    e. Digital alarms
    f. PLC clock, midnight and today/yesterday control
    g. Flow totalizations
    h. Equipment runtimes
    i. Equipment starts
    j. Communications
    k. Each individual piece of controlled equipment (digital control)
    l. Each individual piece of controlled equipment (analog control)
    m. Each individual process system (digital control)
    n. Each individual process system (analog control)

B. All custom software, including diagnostic, configuration and applications programming software shall become the sole property of the Owner for their use on this and future Owner projects.

C. No software or documentation shall be labeled proprietary.

D. Provide two (2) digital copies of all as-installed programs at the end of the project.

E. Furnish and maintain 256MB (min) USB RAM thumb drive on site and within control panel so that latest program files are always available and up-to-date. Upon conclusion of each downloaded program change, the USB RAM thumb drive shall be updated.

PART 2 PRODUCTS

2.01 APPLICATIONS PROGRAMMING SOFTWARE

A. The Contractor is responsible for obtaining PLC & OI configuration software to program and configure the PLC & OI for testing purposes.

2.02 APPLICATIONS PROGRAM CODE

A. The Application Programmer will provide, install and test (with Contractor assistance) application programming. The descriptions provided herein are not final and may have modifications made to them during construction that may change the nature of operation.

B. The descriptions are provided to give the Contractor an insight as to the level of testing effort that will be required in the later stages of the project. Minor modifications should be expected and will not constitute a change in project testing assistance scope unless those modifications cause significant additional testing time or materials by Contractor. Significant time shall be defined as 4 hours and only time or materials related to program modifications since bid may be accounted.

2.03 CONTROL STRATEGIES

A. General Requirements:
   1. The following requirements (General and Specific) are intended to be used as a guideline for application programming of the PLC. They are the major functions and are not intended to be completely comprehensive of all requirements of the station operation and do not attempt to cover all necessary program routines for an operational system. Additional features, functions and registers will be required for an operational system.
   2. The following general program functions shall be provided:
      a. Enable/disable toggle bits and variable time delays for all alarms.
      b. Analog input noise filtering -- software or firmware.

c. SCADA Auto-Off-Manual controls for all equipment controlled by the PLC. These control buttons shall also be accessible via the OI(s).

d. All equipment to have a Remote Reset feature available from SCADA and OI(s). Remote Reset signal to be held on until cleared by Reset Feedback signal.

e. Normal operations shall continue with loss of SCADA connection. The PLC code shall act on I/O connections, PLC to PLC communications, and non-SCADA communications only to control the system. Only in the event of SCADA override, shall the system not act on PLC I/O connections and non-SCADA communications. None of the program code to control the system shall reside in the SCADA system.

f. Time of day clock synchronization with SCADA system. PLC shall have registers defined for SCADA system clock write. The PLC shall have code written to recognize that the register(s) have been written to, stop the real time clock, set the clock, and restart it, with the value in the register(s). Date and time of day shall be set.

g. Resettable and non-resettable operation hour meters for all equipment and resettable starts counters for all equipment.

h. Scaling to engineering values of all variables. Minimum of 3 significant digits required.
   1) Level in 1/10th Feet or Inches
   2) Pressure in 1/10th PSI.
   3) Flow in GPM.
   4) Flow totalization
      a) Total non-resettable flow displayed in MGD with 9999999.999 presentation layout.
      b) Total resettable flow displayed in MGD with 9999999.999 presentation layout.
      c) Total yesterday flow displayed in KGAL with 99999.9 presentation layout.
      d) All registers shall roll over to zero automatically.
   5) Speed in percent %.

6) Motor current in 1/10 amps.
   a) Convert current input to power (in KW) where shown on drawings. Assume voltage to be 480 and power factor to be 0.85.

i. Data register types:
   1) Any register that requires precision past the decimal shall be floating point type.
   2) Integer registers may be used where decimal precision is not required.
   3) Boolean registers shall be used for all statuses and on/off controls.

j. All set point registers, enable/disable toggle bits and settable variable time delays shall be adjustable from the OI direct to program data table.

k. Provide communications messaging as required to share data information and interlocks between PLCs. Message structure shall be fail safe as to keep overflows or other improper operation from occurring.

l. A power fail shall reset all routines.

m. Pumps and equipment shall have backspin delays and power fail sequential re-start delay routines.

n. All powered equipment and devices shall have an assigned essential / non-essential status for purposes of generator load shedding.

o. Programming code shall have automatic error checking and proper initialization to prevent illegal operations such as negative values being placed in timer presets or mathematical out of range functions which could cause a processor fault.

p. PLC shall be programmed so that, in the event of a power interruption, the equipment controlled shall resume normal operation upon power restoration without requiring a manual reset unless otherwise shown.

q. Set points
   1) Minimum required set points for Lead / Lag pumping scenario.
      a) Lead Pump start level
      b) Lag Pump start level

c) Lead Pump stop level
d) Lag Pump stop level
e) Pump Start delay time
f) Pump Stop delay time
g) Backspin delay time
h) Sequential Start delay time
i) Pump rotation selection (0=auto rotate, 1=P1 Lead, 2=P2 Lead)

2) Additional minimum required set points for Lead / Lag pumping scenario when variable speed control is used.

a) Minimum Lead Pump speed to start Lag Pump
b) Minimum Lag Pump speed to stop Lag Pump
c) Maximum Pump Speed
d) Minimum Pump Speed

3. Analog Scaling:
   a. All analog values shall be adjusted (if necessary) prior to scaling for required offsets due to hardware / firmware conditions.
   b. All analog input values shall be scaled into real world engineering units and presented in REAL (floating point) format for use by SCADA and the OI(s).
   c. All analog output values shall be scaled from real world engineering units into INT (decimal) format to control current or voltage output from an analog output device.
4. Alarms General:
   a. Common alarms: Provide all applicable alarms per device based on available P&ID inputs and outputs.
      1) Motor power or amperage alarms shall be disabled when the motor is not running.
      2) If a device is called to start or move and the associated run status does not confirm start or move after a time delay then post a device “Run fail” alarm.
      3) All equipment (as marked on P&ID drawings) shall have a non-running alarm.

4) Not in Auto alarm: All devices (valves, gates, pumps) with auto switch monitoring shall have associated “Not in auto” alarms.
5) Moisture / Temperature alarms: All submersible pumps shall have “Moisture” and “Over temperature” alarms.
6) Seal Water Fail alarm: All sludge type pumps shall have “Seal water fail” alarms.
7) Pressure alarm: All sludge type pumps shall have “Inlet and Outlet pressure” alarms.
8) Temperature alarm: All sludge type pumps shall have a pump body “Over Temp” alarm.
9) Differential pressure alarm: All filters shall have “Differential pressure” alarms.
10) Low oil alarm: All lubricated mechanical devices (gearboxes etc.) shall have a “Low oil” alarm.
11) Vibration alarm: All moving mechanical devices (gearboxes, aerators, pumps etc.) shall have a “Vibration” alarm.
12) Over torque alarm: All geared mechanical devices (clarifiers etc.) shall have an “Over torque” alarm.
13) VFD Fault: All VFDs shall have a common fault alarm as a minimum. Further breakdown of alarms shall be provided based on data available from the VFD. All VFDs shall have a manual reset available from the OI(s) and SCADA.
14) Flow, level, pressure, analytical and other analog alarms shall follow alarm structure as defined herein.
15) All digital alarm values will have at a minimum an associated alarm structure as defined herein.

b. Analog Alarms:
1) If an analog value is above/below the associated set point, and the associated time delay has exceeded the time delay set point, then the alarm shall be generated / annunciated.
2) Transducer out of range alarms. If the scaled value of the analog input exceeds 21 mA or falls

below 3.5 mA, an out of range alarm shall be triggered for that input.

3) The alarm shall automatically reset unless a latch is required to keep the process from resuming and re-creating the alarm. A latching alarm requires either a reset set point for hysteresis or a manual reset.

4) The low flow alarms (and pressure alarms if applicable) shall only be enabled when the associated pump or system is running.
   a) Provide low flow alarm for pump operation where flow is expected above setpoint continuously when running. Alarm shall shutdown system and fail pump. If other pumps are available, they shall be called in its place.

5) Example analog alarm display structure (Units per alarm type). ENABLE / DISABLE shall be a toggle switch. DELAY to be editable timer base value for associated alarm delay timer. SET POINT column to contain current analog value in Transducer Fail Alarm row. Other alarm rows to contain editable alarm set point value with REAL (floating point) data type. LATCH to be either reset set point value for reset of alarm or manual reset toggle (blank if alarm is not latching).

Description	Status	En / Dis	Delay	Set Point	Latch
Transducer Fail Alarm	ALARM	Enable	10 sec.	28.4 GPM	Reset
High Alarm	OK	Enable	5 Sec.	xxx.x GPM	OK
High Warning	ALARM	Enable	5 Sec.	xxx.x GPM	
Low Warning	OK	Enable	5 Sec.	xxx.x GPM	xxx.x GPM

Low Alarm	OK	Disable	5 Sec.	xxx.x GPM	xxx.x GPM

c. Digital Alarms:
   1) If the digital alarm state is TRUE and the associated time delay timer has exceeded the time delay set point, then the alarm shall be generated / annunciated.
   2) The alarm shall automatically reset unless it is designated as “latch”. A latching alarm requires a manual reset.
   3) Example digital alarm Structure. ENABLE / DISABLE to be a toggle switch. DELAY to be editable timer base value for associated alarm delay timer. LATCH to be a manual reset toggle (blank if alarm is not latching).

Description	Status	En / Dis	Delay	Latch
Generic Digital Alarm 1	OK	Disable	10 sec.	
Generic Digital Alarm 2	ALARM	Enable	10 sec.	Reset

d. Communications Alarm:
   1) The SCADA and connected PLC(s) shall monitor for communications between controllers and they shall post an alarm if any PLC fails to respond to message queries.

5. Totalization:
   a. Flow totalization (Example):
      1) If an analog flow input value is positive, then increment the flow totalizers (resettable and not resettable) for each 1000 gallons of accumulated flow.
      2) If internal flow reset status is set, then set resettable flow totalizer to zero and reset the resettable totalizer.
      3) Similar for all flowmeters / totalizers.

b. Hour Meters (Example):
   1) If Generic Pump #1 running is set, then start hour timers.
   2) If internal run time hours reset status is set, then set resettable run time hours to zero.
   3) Similar for all device run time hours.

c. Starts Counters (Example):
   1) If Generic Pump #1 running input is set or Generic Pump #1 start command is set (if running input is not available), then increment starts counter.
   2) If internal starts reset status is set, then set resettable starts counter to zero and reset.
   3) Similar for all device starts.

d. Intrusion Alarms (Example):
   1) Provide intrusion alarms for panels and buildings with intrusion switches.
   2) Alarm shall be generated after an adjustable time delay to SCADA.
   3) If an OI or SCADA is present, then provide a way for an operator to reset and disable the intrusion alarm for a setpoint period of time.
   4) After that time elapses, then the alarm shall be re-activated automatically.
   5) If no SCADA or OI, then the alarm shall reset automatically once the condition is returned to normal state.

B. SPECIFIC REQUIREMENTS – Plant Call

1. To be further defined by Application Programmer and submitted for review. Include all operations to provide a fully functioning system.
2. Must comply with general requirements.
   a. Provide time delays and time delay setpoints for all functions.
3. Start Interlocks:
   a. 480 VAC power failure
   b. High treated water tank level
   c. Filter failure.
4. Consists of programming function for the following:
   a. Plant Start Call Operation

1) If the treated water tank level is below start setpoint, then start wells and selected filters to operate.
2) If the treated water tank level is above stop setpoint, then stop wells and selected filters.
3) If the plant stops based on tank level, filter backwashing is not required until one of the backwash conditions is met.

C. SPECIFIC REQUIREMENTS – Well pump

1. To be further defined by Application Programmer and submitted for review. Include all operations to provide a fully functioning system.
2. Must comply with general requirements.
   a. Provide time delays and time delay setpoints for all functions.
   b. Similar for two wells
3. Pump Interlocks:
   a. Low chlorine residual
   b. 480 VAC power failure
   c. High discharge pressure.
   d. Pump Fail
   e. Pump low flow alarm
   f. Filter failure.
4. Consists of programming function for the following:
   a. Well Pump Start Call Operation
      1) Interlock well operation with alarms – high pressure, low flow, and 480 VAC power fail.
      2) Well(s) will be a slave to plant call.
         a) The finished water tank level will create call for plant and such will call the well pump(s).
         b) The well pump, if selected by the operator, will be called to run with the plant.

D. SPECIFIC REQUIREMENTS – Filters

1. To be further defined by Application Programmer and submitted for review. Include all operations to provide a fully functioning system.
2. Must comply with general requirements.

a. Provide time delays and time delay setpoints for all functions.

3. Interlocks
   a. If backwash tank is above setpoint, then inhibit backwashes until level is below tank level reset setpoint.
4. Consists of programming function for the following:
   a. Filter Control
      1) Filter operation shall be as defined by filter manufacturer and modified as defined herein.
      2) On-line filters shall be as defined by Operator.
      3) If a filter is taken off-line by Operator, then the filter shall be backwashed prior to going off line.
      4) Filter flow (plant flow) shall be a single setpoint that is divided among operating (filtering) filters. If a filter goes into backwash, the number of operating filters is reduced and the setpoint flow is divided among 1 less filter.
      5) Filter steps:
         a) Off line: (no flow thru filter)

Influent valve	Closed
Effluent valve	Closed
Filter to Waste valve	Closed
Backwash Waste	Closed

(1) No flow through filter
(2) Filter goes off-line only after a backwash.

a) Filter to Waste:

Influent valve	Open
Effluent valve	Closed
Filter to Waste valve	Open
Backwash Waste	Closed

(1) Filter to waste for Setpoint minutes and setpoint amount of accumulated flow after initial operation. If turbidity is below

setpoint turbidity for filter, then proceed to next step.

(2) If turbidity is high, then force filter off-line and post high turbidity alarm.

a) Filtering:

Influent valve	Open
Effluent valve	Open (modulating)
Filter to Waste valve	Closed
Backwash Waste	Closed

(1) Use Effluent valve to modulate filter to obtain setpoint portion of plant flowrate per operating filter.

(2) Tabulate filter run hours and accumulated flow since last backwash.

a) Backwash:

Influent valve	Closed
Effluent valve	Open (modulating)
Filter to Waste valve	Closed
Backwash Waste	Open

(1) If filter differential pressure exceeds setpoint pressure for setpoint seconds, then set backwash DP BW call.

(2) If filter run hours exceed filter run maximum setpoint, then set backwash FRH BW call.

(3) If filter flow quantity exceeds maximum filter flow setpoint, then set backwash FFM BW call.

(4) Operator to select which filter backwash calls are to be used in algorithm to set backwashes.

(5) Filter backwash calls to be set in a que such that filters may be

backwashed by Operator initiation at next available time.

(6) Filter to go to backwash mode for setpoint minutes if initiated by Operator. Modulate filter effluent valve (to let water back into filter through outlet) and flow at setpoint flowrate.

(7) Return filter to off-line when complete or return to operation as set by Operator.

E. SPECIFIC REQUIREMENTS – Recycle Tank and Pumps

1. To be further defined by Application Programmer and submitted for review. Include all operations to provide a fully functioning system.
2. Must comply with general requirements.
3. Interlocks
   a. After each backwash, pumping shall be inhibited for setpoint minutes to allow for solids settling.
   b. If backwash tank is above maximum level setpoint, then inhibit new backwashes until level is reduced.
4. Consists of programming function for the following:
   a. Backwash recycle pump
      1) If any filter is in operation in filter mode, and recycle pumping is not inhibited, and backwash recycle tank is above minimum setpoint level, then start backwash recycle pump.
      2) If no filter is in operation in filter mode or recycle is inhibited, or backwash recycle tank is below minimum setpoint level, then stop backwash recycle pump.

F. SPECIFIC REQUIREMENTS – Sodium Hypochlorite Chemical System

1. To be further defined by Application Programmer and submitted for review. Include all operations to provide a fully functioning system.
2. Must comply with general requirements.
   a. Similar for two systems, one for each well.
3. Consists of programming function for the following:

a. Sodium Hypochlorite Pumps
   1) Start chemical pump system when the well is called to operate.
   2) Pump speed shall be controlled by a compound PID control loop based on well flow and residual chlorine content.
   3) Start – stop control shall include lead / lag and fixed rotation. Reference general requirements for setpoint details.

G. SPECIFIC REQUIREMENTS – Booster Pump Station
1. To be further defined by System Integrator and submitted for review. Include all operations to provide a fully functioning system.
   a. Must comply with general requirements.
   b. Provide time delays and time delay setpoints for all functions.
2. Pump Interlocks:
   a. Pump control valve failure.
   b. 480 VAC power failure
   c. High discharge pressure.
   d. VFD failure.
   e. Pump low flow alarm (calculated per pump, and only enabled in lead pump only operation)
   f. Low suction Pressure Alarm
3. Consists of programming function for the following:
   a. Booster Pump Station
      1) Booster pump station shall maintain discharge pressure setpoint utilizing an inverse PID algorithm to calculate pump speed. All operating booster pumps to run at same speed.
      2) Reduce pump speed and inhibit higher calculation of pump speed if suction pressure falls below minimum suction pressure setpoint.
      3) Pump Start Control
         a) Start lead pump on low pressure setpoint.
         b) Start lag pump on calculated pump speed output > setpoint maximum speed for setpoint time.

c) Start lag-lag pump on calculated pump speed output > setpoint maximum speed for setpoint time.
d) Stop lag-lag pump on calculated pump speed output < setpoint minimum speed for setpoint time.
e) Stop lag pump on calculated pump speed output < setpoint minimum speed for setpoint time.
f) Stop lead pump on high pressure setpoint or if tank low level alarm is active.
g) Set unique minimum and maximum speed setpoints for each of quantity of pumps operating.
h) Provide algorithm for 3 pumps.

b. Pump Speed Calculation
1) Pump station shall maintain level utilizing an inverse PID algorithm to calculate pump speed. All operating pumps to run at same speed.
a) Set unique minimum and maximum speed setpoints for each of quantity of pumps operating.
b) Pump speed calculation shall reset to minimum or maximum value at each change of pump quantity and restart calculation.
c) Pump speed with 3 pumps running shall not increase if the suction pressure is below minimum suction pressure setpoint.

H. SPECIFIC REQUIREMENTS – Hydropneumatic Tank

1. To be further defined by Application Programmer and submitted for review. Include all operations to provide a fully functioning system.
2. Must comply with general requirements.
3. Consists of programming function for the following:
a. Hydropneumatic tank
1) If the tank level is above high setpoint and if compressor pressure is within min to max range setpoints, then open add air valve for setpoint seconds.

2) If the tank level is below low setpoint, then open remove air valve for setpoint seconds.

I. SPECIFIC REQUIREMENTS – Hardware Autodialer

1. To be further defined by Application Programmer and submitted for review. Include all operations to provide a fully functioning system.
2. Must comply with general requirements.
3. Consists of programming function for the following:
   a. Autodialer inputs
      1) Provide PLC code to set digital outputs based on the conditions described in the PIDs.
      2) Outputs shall mirror the alarms in the PLC. Once acknowledged or reset, the output to the dialer is released.

2.04 SOFTWARE DEVELOPMENT

A. The programming, setup and configuration of the PLC & OI shall be done by the Application Programmer as defined in [Electrical, General].

B. The PLC & OI shall be ready to be placed in operation at the time of Operational Testing.

2.05 FIELD ASSISTANCE

A. Provide testing as specified in Electrical Specifications [Factory and Field Testing].

2.06 WARRANTY

A. Troubleshoot and correct all program abnormalities, glitches and bugs uncovered during the warranty period. Provide phone and/or on-site support as required to correct problem(s).

B. Software support which shall be provided by the Application Programmer:
   1. Free technical PLC / OI software and hardware configuration phone support for a period of one year. PLC / OI phone support shall be provided directly from the person(s) that configured the PLC / OI. Phone support shall be available

between 8 a.m. and 4 p.m. Pacific Standard Time Monday through Friday.

2. The Application Programmer shall correct any PLC / OI software configuration error that is discovered within the warranty period, at no additional cost to Owner. Updated documentation for each "operation and maintenance" manual and new USB flash drives of updated software shall be provided for each correction.

END OF SECTION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The major components in the instrumentation scope of work are:
   1. Furnish, configure, test, commission, and warrant instrumentation as shown in the P&IDs, plans, and/or listed in specification section.
   2. Include necessary piping, valves, pressure reducers, mounting brackets or flanges, supports, and anchors to complete installation.
   3. Provide sunshades for instrumentation for all instruments that are exposed to direct sunlight.

B. System Integrator selection of instrumentation shall be per manufacturer's recommendation for the application and per specifications. If a manufacturer's recommendation or installation instructions are inconsistent with the Contract installation details or specifications, then the Contractor shall submit an RFI describing the inconsistency. If the inconsistency is due to substitution from the first named equipment, then the responsibility of coordination and any additional cost shall be borne by the Contractor.

C. Projects that come into contact with drinking water: (NSF-61 certification)
   1. Furnish NSF/ANSI 61 certified products that have undergone testing for any device, valve, instrument, or assembly that will come into contact with drinking water.
   2. The certification determines what contaminants may migrate or leach from the product into drinking water and confirms if they are below the maximum levels allowed to be considered safe.
   3. Flowmeters, pressure transmitters, and chemical analyzers are a few of the products that may fall into this category requirement.

D. Provide all devices, valves, tubing, fittings, wiring, terminal blocks, calibration consumables, initial calibration equipment, accessories, sunshades and enclosures as specified herein and as shown on Contract Drawings.

E. The Contractor shall furnish all tools, calibration equipment, calibration materials, specialized parts and incidentals necessary to integrate the instrument to the application.

F. Contractor shall furnish labor for installation, verification, start-up, calibration, testing and commissioning. Contractor shall prove proper function of instrument prior project completion.

1.02 REFERENCES

A. Electrical Specifications [Electrical General]

B. Electrical Specifications [Factory and Field Testing]

1.03 SUBMITTALS AND DRAWINGS

A. Submit shop documents and drawings for approval in accordance with this subsection and as specified in Electrical Specifications [Electrical General, Submittal Requirements].

B. Submit Operating Instructions (O&M Manuals) for each instrumentation device prior to equipment installation.

1.04 OPERATING AND MAINTENANCE INFORMATION

A. Provide operating instructions as specified in Electrical Specifications [Electrical General, Operating and Maintenance Instructions].

PART 2 PRODUCTS

2.01 QUALITY

A. Electrical Specifications [Electrical General, Quality].

B. All equipment shall be designed and constructed so that in the event of a power interruption, the equipment specified hereunder shall resume normal operation without requiring a manual reset.

C. Signal transmission from remote or field electric and electronic devices shall be 4 20 mA, sourced by a 24 VDC supply internal to the instrument or from a 24 VDC power supply located within the panel that is to receive the signal. Nonstandard transmission

methods such as impulse duration, pulse rate, and voltage regulated will not be permitted except where specifically noted.

D. Transmitters or devices located in Class 1, Division 1 hazardous areas shall be rated for hazardous location installations per NEC and UL. Explosion proof enclosures and raceways or current/spark limiting devices located inside or outside of the classified area shall be furnished to comply with code requirements.

E. Outputs of equipment that are not of the standard signals as outlined, shall have the output immediately converted to 4-20 mA signals for remote transmission.

2.02 INSTRUMENT IDENTIFICATION

A. All major instrumentation and equipment items or systems specified in this Division and/or on the P&IDs are identified by tag numbers. Tag field equipment with assigned instrumentation tag number and functional description.
   1. Tags shall be 1/2" stainless steel DYMO impressed tape with 3/16"(minimum) height characters.
   2. Metal tape embosser shall feature a built in hole punching device and scissor cutoff tool.

B. Attach tags to equipment with a 4" long, 20-gage stainless steel wire leash for small devices, or two stainless steel screws for larger instruments; however, such permanent attachment shall not be on an ordinarily replaceable part or in an area that will be subject to unintended overuse fatigue. Make the tag plainly visible.

2.03 LEVEL COMPONENTS

A. Not used

2.04 PRESSURE COMPONENTS

A. Gauge, Absolute, or Differential Pressure Transmitter:
   1. The pressure indicating transmitter shall be a loop powered, two wire, 4 20 mA signal transmitting device with signal derived from the applied sensor pressure. Transmitter shall be capable of driving 0 to 500 ohm loads with 24 VDC supply.

2. The transmitter shall have the following features:
   a. Programmable 4-digit Liquid Crystal Display (LCD) process indicator.
   b. HART programming with programming selections for square root extraction, output calibration, and adjustable dampening 0.0 to 36.0 seconds, minimum.
   c. Integral microprocessor based circuitry with RFI filtering and shielding.
   d. The transmitter shall have accuracy of +/- 0.1% of span over a range of minimum 10 to 1 turndown. Elevated zero setting capable of 0-30% upper calibration limit.
   e. Operating temperature range shall be -40 to 185°F (minimum). Process wetted materials shall be compatible with fluid being measured with minimum hastalloy or ceramic diaphragm and 316 stainless steel wetted parts.
   f. Process connection shall be as follows:
      1) Low solids content - 1/2" MNPT with calibration valve.
      2) High solids content - 1-1/2” or 2” flange with flushing ring and valve.
      3) And as required per installation detail.
   g. The transmitter shall be scaled as shown in the instrument schedule.
3. Provide mounting bracket per mounting requirements shown in Contract drawings.
4. The gauge pressure transmitter shall be Endress and Hauser Cerabar M PMC 71, Rosemount Smart 3051, or equal.

B. Calibration Valve:
1. Calibration valve for use with gauge transmitters shall have the following features:
   a. Stainless steel body with integral blocking valve and calibration valve and port.
   b. Calibration port shall be 1/4” FNPT with 1/4” MNPT x 1/2” FNPT adapter.
   c. Valve shall have a non-rotating stem tip and a fully backseated bonnet.
   d. Process and transmitter connections shall be 1/2” MNPT. Include 1/2” stainless steel close nipple as required.

2. Calibration valve shall be Hex HB59, Anderson Greenwood, or equal.

C. Pressure Gauge:
1. The pressure gauge shall be 1% accurate with C-type bourdon tube. The bourdon tube, socket and connection tube of the gauge shall be 316 stainless steel. The case and bezel ring shall be constructed of type 304 stainless steel. The dial shall be 4" in diameter with a black pointer and a white gauge face with black print. The gauge shall be filled with liquid glycerin. A bottom mount process connection shall include a snubber as a separate component. The process connection shall be 1/2" stainless steel. The pressure gauge shall be Ametek gauge model 1550, Ashcroft 1009, or equal.

2.05 FLOW COMPONENTS

A. Magnetic Flow Meter:
1. The magnetic flow meter shall consist of a flow tube FE and a converter FIT, complete with interconnecting cables.
2. The magnetic flow meter shall be of the low frequency electromagnetic induction type and shall produce a DC pulse signal directly proportional and linear to the flow rate, with the duration not less than 100 milliseconds. Complete zero stability shall be an inherent characteristic of the metering system. Meters requiring field zero adjustment will not be acceptable. The meter accuracy shall not be affected by changes in fluid pressure, temperature, viscosity, or conductivity.
3. Accuracy
   a. The maximum error of the complete metering system including flow element and flow indicating transmitter shall be 0.50% of actual flowrate (in specified units) and readout over the range of full scale velocity settings from 1 to 30 feet per second. Variations in temperature, voltage, and frequency within the ranges listed herein shall not affect the overall measuring accuracy.
   b. Measured variables: volume flow, mass flow, and conductivity indications and signal transmission

outputs as required and shown in the P&IDs. Accuracy on conductivity shall be 5% of range.

c. Suitable for 0xDN applications where inlet and outlet straight pipe length pipe requirements are 1 pipe diameter or less. Flowmeter accuracy shall exceed 0.75% of actual flowrate over the range 0.5 to 1 M/S and 0.5% for 1 to 30 feet per second.

4. Flow Element (FE)
   a. The flow element shall be based on a carbon steel pipe spool with ANSI class 150 flange connections or be flangeless construction as required by mechanical drawings. Class 300 flanges shall be provided where shown or when the pressure and temperature of the process fluid exceeds the rating of a 150 lb flange. The flow element size shall be as shown in the mechanical drawings and listed in the Instrumentation Schedule. Flange type and bolt pattern shall be coordinated with the mechanical Contractor prior to submittal.
   b. The flow element shall have Hastalloy C4 coil and grounding electrodes.
   c. Stainless steel grounding rings shall be provided at both ends of the flow element for all flowmeter applications. Grounding rings shall be manufactured from stainless steel, 2 mm thickness with grounding tab for electrical wire connection, and fit within the flange bolt circle. Grounding ring shall be self centering within pipe.
   d. The flow element internal liner material shall be Teflon, polyurethane or hard rubber, unless recommended otherwise by the manufacturer for the application and approved.
   e. Nema rating as defined in the Instrumentation Schedule.
5. Flow Indicating Transmitter (FIT)
   a. The electronic flow indicating transmitter shall be mounted remotely from flow tube as shown on Contract drawings.
   b. The electronic transmitter shall be provided in a NEMA rated enclosure per the Instrumentation Schedule.
   c. The transmitter shall be interchangeable with all sizes of flow elements and shall be field replaceable (without

replacing flow element) in the event of transmitter failure.

d. The transmitter shall be microprocessor controlled, utilizing digital signal processing with automatic zero correction to provide a linear 4 20 mA signal proportional to flow rate.

e. The transmitter shall incorporate a high impedance amplifier of 100,000 Megohms or greater, eliminating the need for electrode cleaning systems.

f. The transmitter shall contain a self test mode to allow the operator to manually simulate the output 4 20 mA signal to any value between 0% and 100% to check out any driven devices in the loop.

g. Rate indicator and totalizer: An alphanumeric LCD backlit display shall be provided to continuously display the flowrate and totalizer with units and all programming functions.

h. All programming configuration of the Flowmeter shall be completed through the transmitter's pushbutton interface. A communication device shall not be necessary to configure the flow transmitter.

i. PC based software shall be available and included for configuration and troubleshooting. Connection to flowmeter shall be via computer USB port and include interface cables as required.

j. The transmitter shall be designed for operation from a power source of 120 volts AC, with a power consumption of less than 20 watts. The flow element shall be powered from the transmitter.

k. The transmitter shall operate continuously without fault in an ambient temperature range from 14 to 140 °F. The flowmeter shall be suitable for operation in direct sunlight without the use of a sunshade. If a sunshade becomes required after installation for any operational reason, one shall be furnished and installed free of charge.

l. The following configurable parameters shall be provided at a minimum:
   1) Field adjustable flow signal dampening.
   2) Low flow cutoff (forces zero flow signal) between 0.0-5.0% of full scale rate.

3) Empty pipe detection (forces zero flow signal) if the pipe is not full.
4) Selection for forward/reverse/both flow directions.

6. Flow Indicating Transmitter (FIT) I/O Interface
   a. Network Communication
      1) The transmitter output(s) shall be integral to the magnetic flowmeter transmitter electronics; and must be located within the transmitter housing. Using an external signal converter is not acceptable.
      2) Protocols
         a) Ethernet Schneider Automation Modbus TCP
         b) Ethernet Allen Bradley EtherNet/IP™
         c) No equal.
      3) The transmitter output selected must be supported by add-on instructions (AOI), add-on profiles (AOP), that can be imported to the Programmable Logic Controller specified in the is project. AOIs and AOPs include device drivers, instructions and pre-engineered PLC code.
   b. Flow Signal: 4-20 mA signal proportional to the flow. The signal shall be field configurable for the flow calibration specified and others within the flow tube accuracy range. The flow signal shall be capable of measurement for forward and reverse flows combined by offsetting zero to mid scale (12 mA).
7. If the flow indicating transmitter (FIT) is shown in the Contract drawings to be mounted remotely from the flow element (FE), the manufacturer shall provide all cabling between flow element and flow indicating transmitter.
8. All mounting hardware and/or devices necessary to complete the installation shall be provided by the manufacturer at no additional cost to the Owner.
9. The meter shall be hydraulically calibrated at a facility located in the United States and the calibration shall be traceable to the National Bureau of Standards. A certified copy of the calibration test results shall be submitted to the Owner prior to shipment of the meter.

10. The magnetic flowmeter shall be Endress and Hauser Promag, or equal.

2.06 INSTRUMENTATION SUN PROTECTION

A. Instrument Sunshade
   1. Provide wall mount bracket or pole mounted sunshade where instruments are exposed to direct sunlight. Sunshades shall be fabricated from stainless steel with hinged rubber flap on front for viewing of displays and performing calibrations. Sunshade shall be custom manufactured for the instrument protected and sized such that there is 3" free space around sides and front of instrument.

2.07 INSTRUMENTATION SCHEDULE

A. The Instrumentation Schedule spreadsheet (located at the end of this section) is intended to be a summary of instrumentation equipment required for this project. Not all instrumentation details are shown on the schedule. Some requirements may be shown in the Instrumentation Schedule such as enclosure rating and instrument span that are not described in the specifications. Both are required for a complete specification.

B. If an instrument is shown in the P&IDs or on the site plan, then the device shall be provided whether or not it is shown on the Instrumentation Schedule.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. Instrumentation work shall conform to workmanship standards specified in Electrical Specifications [Electrical General, Workmanship].

B. The Contractor shall employ personnel who are skilled and experienced in the installation and connection of equipment defined in this section. Contractor qualifications are specified in Electrical Specifications [Electrical General].

C. Verify that all equipment and materials fit properly.

D. All instrumentation configuration, programming and calibration shall be completed prior to the start of field tests.

E. Equipment without approved submittals shall not be installed.

F. All equipment shall be properly stored indoors while awaiting installation. Protect installed equipment from construction debris or mishaps. The Contractor will replace any equipment that is not in new condition at the time of installation and/or start-up.

G. Perform work to remedy non-compliant installations after inspection.

3.02 INSTALLATION

A. Install and supply all products necessary to provide an operational instrumentation system. This shall include the following:
   1. Contract Drawings are intended to show the basic functional requirements of the instrumentation system. Insufficient detail does not relieve the Contractor from the responsibility to provide a complete and functioning system. If additional detail or clarification is required, the Contractor shall request such information prior to installation.
   2. Provide relays, signal converters, isolators, boosters, power conditioners, circuit cards, and other miscellaneous devices as required for the compatible and functional interface.
   3. Provide analog loop isolators where required to eliminate "ground loops."
   4. The instrumentation and accessory equipment shall be installed in accordance with the manufacturer's instructions and located as shown on the Drawings or as approved. When manufacturer's installation literature specifies a particular location or orientation in a process line due to measurement accuracy considerations, the installation shall be in conformance with the manufacturer's instructions.

B. Instrument installation methods.
   1. Install instruments at the location shown on the Plans or approved. Instruments enclosures shall be NEMA rated for the installed location.
   2. Install level and plumb.

3. All instruments shall be provided with floor stands or wall brackets as shown in installation details or as required for functional installation.
4. Mounting stands shall be custom manufactured of aluminum channel with base plate unless otherwise noted in installation detail.
5. Mounting channels (unistrut), and spacers shall be galvanized steel above ground outdoors and stainless steel below ground (wetwell), unless otherwise noted in installation details.
6. All screws, bolts and anchors shall be stainless steel.

C. Wiring and raceway installation methods:
1. Terminal blocks shall be provided at all instrument cable junctions and all wires shall be identified at such junctions.
2. Instrumentation wiring shall be run without splices between instruments, terminal boxes, or panels.

D. Wiring, grounding, and shielding: The following practices shall be observed unless modified by manufacturer's standards.
1. Each electronic equipment chassis shall be grounded to power ground.
2. Shielded twisted pair, shielded triad, or manufacturer supplied cables only shall be used for analog signals and communications signals.
3. Drain wire of shielded cables used for analog inputs to the PLC shall be connected at the PLC unit only. Shield shall be isolated from ground at all other termination points including transmitters.
4. Drain wire of shielded cables used for analog outputs from the PLC shall be connected at signal receiving device only. Shield shall be isolated from ground at all other termination points.
5. If electrical interference noise is imposed on DC status and alarm signals, then they shall be re-routed or wire changed to shielded twisted pair cables.
6. Each shield drain wire which is not connected to ground shall be cut off covered with a heat shrink insulating boot at cable jacket end. Shields shall be connected together at each transition from one cable to another for an effectively continuous shield circuit.

3.03 SUPPLIER SERVICES

A. The Contractor shall be responsible for each supplier of equipment to provide the following minimum services for each type of instrument supplied. Each supplier shall provide a qualified instrumentation field technician to perform services listed herein. Contractor shall supply all calibration materials necessary to commission unit and shall not use any consumable materials that are intended to be furnished for the first period of use.
   1. Advise and instruct Contractor on proper installation requirements.
   2. Inspect, calibrate, test, and place equipment in operation. Calibrate instruments to values as shown in the instrument index or as noted herein. If instrument spans are required to change (within instrument range) during startup for process reasons, the Contractor shall change them as directed by the Engineer.
   3. Programmable devices shall be programmed and tested prior to startup. Programming shall be adjusted or changed as directed by the Engineer at any time prior to final acceptance.
   4. Perform testing in the presence of Engineer.
   5. Visit the project site as often as required and spend as much time as necessary to ensure accurate and operational instrumentation.
   6. Provide training as specified in FIELD ASSISTANCE.

B. The Contractor shall coordinate with each supplier of instrumentation to confirm that primary elements are provided in a timely manner, meeting critical path scheduling. The Contractor shall coordinate process connection size, equipment size, and material type when applicable and oversee the installation, calibration, and acceptance testing.

3.04 FIELD ASSISTANCE

A. The instrument supplier shall provide a minimum of one (1) hour of field training to instruct Owner’s personnel in the use, operation, calibration, programming, and maintenance on each type of "field" instrument.

3.05 SPARE PARTS

A. Provide spare parts as described in each products section herein and specified in Electrical Specifications [Electrical General, Spare Parts].

B. Contractor shall supply all calibration materials necessary to commission unit and shall not use any consumable materials that are intended to be handed over to the Owner as defined in the instrument specifications.

3.06 WARRANTY

A. Provide warranty as specified in Electrical Specifications [Electrical General, Warranty].

3.07 FINAL ACCEPTANCE

A. Final Acceptance per Electrical Specifications [Electrical General].

END OF SECTION

INSTRUMENTATION INDEX

DWG # P&ID	Tag No.	DESCRIPTION	Type	Specification Section	Min. NEMA Rating	Size	SP/ Range	Units	DWG. DET. Reference	Notes
I4	FIT 371	Flow Indicating Transmitter	Magnetic	16940-2.05 A	4X	10"	0-2500	GPM	FM/FLG	
I5	FIT 372	Flow Indicating Transmitter	Magnetic	16940-2.05 A	4X	10"	0-2500	GPM	FM/FLG	
I6	FIT 373	Flow Indicating Transmitter	Magnetic	16940-2.05 A	4X	10"	0-2500	GPM	FM/FLG	
I7	FIT 374	Flow Indicating Transmitter	Magnetic	16940-2.05 A	4X	10"	0-2500	GPM	FM/FLG	
I8	FIT 375	Flow Indicating Transmitter	Magnetic	16940-2.05 A	4X	10"	0-2500	GPM	FM/FLG	
I10	FIT 471	Flow Indicating Transmitter	Magnetic	16940-2.05 A	4X	12"	0-5000	GPM	FM/FLG	
I3	PI 262 A	Pressure Gauge	Gauge	16940-2.04 C	4X	-	0-100	PSI	PIT	
I4	PI 361 A	Pressure Gauge	Gauge	16940-2.04 C	4X	-	0-100	PSI	PIT	
I4	PI 361 B	Pressure Gauge	Gauge	16940-2.04 C	4X	-	0-100	PSI	PIT	
I5	PI 362 A	Pressure Gauge	Gauge	16940-2.04 C	4X	-	0-100	PSI	PIT	
I5	PI 362 B	Pressure Gauge	Gauge	16940-2.04 C	4X	-	0-100	PSI	PIT	
I6	PI 363 A	Pressure Gauge	Gauge	16940-2.04 C	4X	-	0-100	PSI	PIT	
I6	PI 363 B	Pressure Gauge	Gauge	16940-2.04 C	4X	-	0-100	PSI	PIT	
I7	PI 364 A	Pressure Gauge	Gauge	16940-2.04 C	4X	-	0-100	PSI	PIT	
I7	PI 364 B	Pressure Gauge	Gauge	16940-2.04 C	4X	-	0-100	PSI	PIT	
I8	PI 365 A	Pressure Gauge	Gauge	16940-2.04 C	4X	-	0-100	PSI	PIT	
I8	PI 365 B	Pressure Gauge	Gauge	16940-2.04 C	4X	-	0-100	PSI	PIT	
I4	PIT 262 A	Pressure Indicating Transmitter	Gauge	16940-2.04 A	4X	-	0-100	PSI	PIT	Calibration Valve
I4	PIT 361	Pressure Indicating Transmitter	Gauge	16940-2.04 A	4X	-	0-100	PSI	PIT	Calibration Valve
I5	PIT 362	Pressure Indicating Transmitter	Gauge	16940-2.04 A	4X	-	0-100	PSI	PIT	Calibration Valve
I6	PIT 363	Pressure Indicating Transmitter	Gauge	16940-2.04 A	4X	-	0-100	PSI	PIT	Calibration Valve
I7	PIT 364	Pressure Indicating Transmitter	Gauge	16940-2.04 A	4X	-	0-100	PSI	PIT	Calibration Valve
I8	PIT 365	Pressure Indicating Transmitter	Gauge	16940-2.04 A	4X	-	0-100	PSI	PIT	Calibration Valve
I11	PIT 561	Pressure Indicating Transmitter	Gauge	16940-2.04 A	4X	-	0-100	PSI	PIT	Calibration Valve
I12	PIT 562	Pressure Indicating Transmitter	Gauge	16940-2.04 A	4X	-	0-100	PSI	PIT	Calibration Valve

PART 1 – GENERAL

1.01 Summary

A. This Section includes the following:

1. Hot-mix asphalt patching.

B. Related Sections include the following:

1. Section 01 33 13 – Submittals
2. Section 31 20 00 – Earthwork
3. Section 31 22 00 – Grading
4. Section 32 13 13 – Concrete Paving
5. Section 32 16 13 – Curbs and Gutters

1.02 References

A. The term “Cal Trans Specifications” refers to the Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation (Cal Trans), 2010 edition. In case of conflict between the Cal Trans Specifications and these specifications, these specifications shall govern. Any provisions for measurement and payment specified within the Cal Trans Specifications shall be disregarded and the provisions of this contract shall govern.

B. Asphalt Institute (AI): AI MS-22: Principles of Construction of Hot-Mix Asphalt Pavements

C. American Society for Testing and Materials (ASTM): ASTM D8: Standard Terminology Relating to Materials for Roads and Pavements

D. ASTM D3666: Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials

E. ASTM E329: Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

F. ASTM D977: Standard Specification for Emulsified Asphalt

G. ASTM D1556: Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

H. ASTM D698: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort

1.03 System Description

A. Provide hot-mix asphalt paving according to materials, workmanship, and other applicable requirements of the Cal Trans Specifications.

B. Measurement and payment provisions and safety program submittals according to the Cal Trans Specifications do not apply to this Section.

1.04 Submittals

A. The Contractor shall prepare all submittals in accordance with Section 01 33 13 Submittals.

B. Product Data: Submit for each type of product indicated. Include technical data and tested physical and performance properties.

C. Mix Designs: Submit proposed mix design for each asphaltic concrete mixture and seal coat to be used in the Work, covering the specific materials to be used in the mixes. Include test data in support of each proposed mix design.

D. Qualification Data: Submit for each manufacturer proposed.

E. Material Test Reports: Submit for each paving material proposed.

F. Material Certificates: Submit for each paving material proposed, signed by the manufacturer certifying the material complies with the requirements of this Section and referenced sections.

1.05 Quality Assurance

A. Manufacturer Qualifications: Manufacturer shall be a paving-mix manufacturer registered with and approved by Cal Trans.

B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated, as documented according to ASTM E 329.

C. Regulatory Requirements: Comply with the Cal Trans Specifications for asphalt paving work.

1.06 Delivery, Storage, and Handling

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturers' labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.07 Project Conditions

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, or if the following conditions are not met:

1. Asphalt Base Course: Minimum surface temperature of 40°F and rising at time of placement.
2. Asphalt Surface Course: Minimum surface temperature of 60°F at time of placement.

1.08 Protection

Protect concrete pavements, curbs, gutters, concrete swales, and filter slabs, and other improvements adjacent to the operations with suitable materials. The Contractor shall be responsible for any damage caused by the Contractor's employees or equipment and shall make the necessary repairs. Buildings and other surfaces shall be covered with paper or other protection where required. All damage caused by the Contractor's operations shall be repaired or replaced as required at the Contractor's expense.

PART 2 – PRODUCTS

2.01 Base Course Material

Aggregate for Base Course: Class "2", 3/4-inch maximum grading as specified in Section 26-1.02B in the Cal Trans Specifications.

2.02 Tack Coats

A. Tack Coat: Diluted SS-1 or SS-1h emulsion in conformance with Section 94 of the Cal Trans Specifications.

2.03 Asphalt Concrete

A. Type "B", 1/2-inch maximum, medium grading as specified in Section 39 of the Cal Trans Specifications.

2.04 Asphalt Paving Mixes and Mix Design

A. Use dry material to avoid foaming. Mix uniformly.

B. Submit proposed mix design of each class of mix for review prior to beginning of work.

2.05 Source Quality Control

A. If tests indicate materials do not meet specified requirements, change material and retest.

B. Provide materials of each type from same source throughout the Work.

2.06 Asphalt Materials

A. Tack Coat: ASTM D 977 emulsified asphalt.

B. Water: Potable.

C. Asphalt Binder: PG 64-10.

PART 3 – EXECUTION

3.01 Examination

A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.

B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.02 Patching

A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Re-compact existing unbound-aggregate base course to form new subgrade.

B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd.:

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

C. Patching: Fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.

3.03 Surface Preparation

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving:

1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

B. Weed Control: Apply pre-emergent herbicide under all area of aggregate base paving.

3.04 Placing Asphalt Pavement

A. Install Work in accordance with Cal Trans Standard Specifications, Section 39, Latest Version.

B. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

C. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

D. A tack coat shall be applied to all vertical surfaces of existing pavement; to curbs, gutters, and construction joins against which asphalt concrete will be placed; to pavements to be surfaced; and where specified at the approximately rate of 0.05 gallons per square yard. Application shall comply with Caltrans Standard Specifications, May 2006, Section 39-4.02. Immediately prior to placing asphalt concrete, additional tack coat shall be applied to areas where the tack coat has been damaged.

3.06 Joints

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course:

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
3. Offset transverse joints, in successive courses, a minimum of 24 inches.
4. Construct transverse joints as described in AI MS-22.
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.07 Installation Tolerances

A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch.
2. Surface Course: Plus 1/4 inch, no minus.

B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Surface Course: 1/4 inch.

C. The final grade of the asphalt concrete shall vary not more than the surface course tolerance as specified from the elevations indicated on the Drawings. All areas shall be graded to drain.

3.09 Field Quality Control

A. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D 1556 and per Section 31 20 00, Earthwork.

B. Results will be evaluated in relation to compaction curve determined by testing un-compacted material in accordance with ASTM D 698 ("Standard Proctor").

C. If tests indicate work does not meet specified requirements, remove work, replace, and retest.

3.10 Flood Test

A. Prior to acceptance of pavement construction, reconstruction or overlay work, the Contractor shall perform a flood test. The flood test shall be performed with a water tank truck. If a depression is found where water ponds to a depth of more than 1/8 inch, the Contractor shall fill or otherwise correct to provide proper drainage.

**** END OF SECTION ****

Concrete Filter Pad

PART 1 - GENERAL

1.01 Summary

A. This Section includes details on the concrete filter pad and pedestal that will be used to support and secure the three new filters and the future fourth filter.

B. Related sections include the following:

1. Section 01 33 13 – Submittals

1.02 References

A. American Concrete Institute (ACI): ACI 301 Specifications for structural Concrete for buildings.

B. American Society for Testing and Materials (ASTM): AST A185 – Welded Steel sire fabric for concrete reinforcement.

C. AST< D1751: Performed expansion joint fillers for concrete paving and structural construction.

D. ASTM A615: Deformed and plain billet-steel for concrete reinforcement.

E. ASTM C2600: Air entraining admixtures for concrete.

F. ASTM C309: Liquid membrane forming compounds for curing concrete.

1.03 Related Specifications

A. 22 05 48 Seismic Requirements

B. 46 61 22 Manganese Filter Installation

C. 01 22 13 Submittals

1.04 Submittals

A. The Contractor shall prepare all submittals in accordance with Section 01 33 13 Submittals.

B. Product Data: For each type of manufactured material and product indicated reinforcement and forming accessories, color admixtures, expansion joint systems, noncolor and color curing agent, and form release agent.

C. Design Mix: For the concrete pavement mix. Included alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

D. Samples:

1. Expansion Joint Filler Material: Submit one 12-inch length.

E. Laboratory test reports for evaluation of concrete materials and mix design tests.

F. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:

1. Cementitious materials and aggregates
2. Steel reinforcement, keyways, and reinforcement accessories
3. Admixtures
4. Curing compounds
5. Bonding agent or adhesive
6. Joint fillers

G. Maintenance Data: Clearly describe type of cleaner and cleaning methods required to maintain completed concrete pad.

1.05 Quality Assurance

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment:

1. Manufacturer must be certified according to the National Ready Mix Concrete Association's Plant Certifications Program.

B. Testing Agency Qualifications: The Contractor shall provide an independent testing agency, acceptable to the Engineer, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

C. ACI Publications: Comply with ACI 301, "Specifications for Structural Concrete."

1.06 Warranty

A. Refer to General Conditions:

B. Quality of aggregate system materials which are not within manufacturing tolerances.

C. Non-conformance with formwork requirements.

PART 2 - PRODUCTS

2.01 Forms

A. Form Materials: Wood, plywood, metal-framed plywood, or other acceptable panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces. Use flexible or curved forms for curves of a 100-ft or less radius.

B. Form Release Agent: Provide commercial formulation form-release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces

2.02 Reinforcement Materials

A. Reinforcing Bars and Tie Bars: ASTM 615, grade 60, deformed.

B. Plain, Cold-Drawn Steel Wire: ASTM A 82.

C. Deformed-Steel Welded Wire Reinforcement: ASTM A 497. Furnish in flat sheets, not rolls.

D. Fabricated Bar Mats: Welded or clip-assembled steel bar mats, ASTM A 184. Use ASTM A 65, grade 60 steel bars, unless otherwise indicated.

E. Joint Dowel Bars: Plain steel bars, ASTM A 615, grade 60. Cut bars true to length with ends square and free of burrs.

F. Hook Bolts: ASTM A 307, grade A bolts, internally and externally threaded. Design hook bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

G. Supports for Reinforcement: Chairs, spacers, dowel bar supports and other devices for spacing, supporting, and fastening reinforcing bars, welded wire fabric, and dowels in place. Use wire bar-type supports complying with Concrete Reinforcing Steel Institute specifications. Use supports with sand plates or horizontal runners where base material will not support chair legs.

2.03 Concrete Materials

A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.

B. Materials:

1. Portland cement concrete shall conform to the provisions of Section 73 of the Cal Trans Specifications.
2. Aggregate shall conform to the provisions of Section 90-2.02C of the Cal Trans Specifications.
3. Water shall conform to the provisions of Section 90-2.02D of the Cal Trans Specifications.

2.04 Admixtures

A. General: Admixtures certified by manufacturer to contain no more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.

B. Form Release Agent: Non-staining material.

C. Chemical Admixtures: ASTM C 494, colored and water-reducing and/or retarding compatible, Type A or Type D, as required.

D. Curing Compounds for Concrete Paving: Clear, ASTM C 309, non-staining.

2.05 Concrete Mix

A. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the trial batch method.

C. Proportion mixes to provide concrete with the following properties:

1. Concrete Paving:
    a. Class 3 concrete as defined by the Cal Trans Specifications
    b. Compressive Strength (28 Days): 3,250 psi
    c. Maximum Water-Cementitious Materials Ratio: 0.65
    d. Slump Limit: 4 inches

D. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals.

2.06 Concrete Mixing

A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94 and ASTM C 1116. When air temperature is between 85°F and 90°F, reduce mixing and delivery time for 1.5 hours to 75 minutes; when air temperature is above 90°F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 Filter Pad

A. The MTS will provide the Contractor a filter pad design report that details the concrete reinforcement and filter anchoring details. The filter pad and pedestal shall be designed to resist seismic wind loads in Plumas Lake, CA.

B. The concrete pad design shall be stamped by a Professional Engineering registered in the State of California and submitted to the Engineer for approval prior to construction of the pad.

C. For estimating purposes, the concrete pad shall be and 25-ft wide by 47-ft long and 18-inches thick. The concrete pad shall have 8 pedestals. There shall be two pedestals for each of the three new filters and two pedestals for the future filter. The pedestals shall be 12-inches wide by 6-inches high.

D. The Contractor shall submit concrete reinforcement details for the filter pad and pedestals. The reinforcement design criteria and details will be provided to the Contractor by the MTS.

3.02 Edge Forms and Screed Construction

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for paving to required lines, grades, and elevations. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.

3.02 Steel Reinforcement

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least 1 full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.

F. Expansion Joint Dowel Bars: spaced horizontally a minimum of 24 inches on-center in slab and parallel to edge of paving and each other. Dowels are to be no more than 6 inches from the edge of pavement.

3.03 Joints

A. General: Construct construction joints, expansion joints, and sawn score joints true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to the centerline, unless indicated otherwise:

   2. When joining existing paving, place transverse joints to align with previously placed joints, unless indicated otherwise.

B. Construction Joints: Set construction joints at side and end terminations of paving, back of curbs and at locations where paving operations are stopped for more than 0.5 hour, unless paving terminates at expansion joints:

   1. Continue reinforcement across construction joints unless indicated otherwise. Do not continue reinforcement through sides of strip paving adjacent to curbs unless indicated.

   2. Use epoxy bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Expansion Joints: Form expansion joints of pre-formed joint filler strips abutting concrete curbs, retaining and freestanding walls, ramps, stairs, catch basins, utility access holes, inlets, structures, building walls, walks, other fixed objects, and where indicated on the Drawings.

1. Locate expansion joints in pavement as detailed in the Drawings.
2. Install dowel bars and support assemblies at all expansion joints. Lubricate one-half of dowel length with heavy grease.
3. Locate expansion joints in curbs, curbs and gutters and concrete bands 25 feet on center to align with expansion joints in adjacent concrete paving, and in no case more than 40 feet on center.
4. Extend joint fillers full width and depth of joint.
5. Terminate joint filler not less than 0.5 inches below finished surface where joint sealant is indicated. Place top of joint filler flush with finished concrete surface when no joint sealant is indicated.
6. Furnish joint fillers in one-piece. Where more than one length is required, lace or clip joint-filler sections together.
7. Protect top edge of joint filler during concrete placement with a metal, plastic, or other temporary pre-formed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Saw Cut Joints: Construct after the concrete has hardened sufficiently so that it will not be damaged by the sawing, but before shrinkage cracking can occur. The initial saw cut should be 0.125 to 0.188 inches in width:

1. At building walls, site walls, sign bases, and curbs, finish saw cut with hand-held grinder or equal to extend cut or joint to face of vertical surface.

E. Score Joints: Form weakened-plane score joints, sectioning concrete into areas as indicated. Construct score joints for a depth equal to at least a quarter of the concrete thickness, as follows:

1. Locate score joints in pavement as detailed.
2. Locate score joints in curbs, curbs and gutters and concrete bands every 5-feet and align with score joints in adjacent concrete paving and in no case more than 10 feet on center.
3. Tool score joints after initial floating by grooving and finishing each edge of joint with groover tool to a 0.25-inch radius. Repeat grooving of

score joints after applying surface finishes. Eliminate groover marks on concrete surfaces.

F. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 0.5-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.04 Concrete Placement

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Permit installation of other work.

B. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around utility access holes or other structures until they are at the required finish elevation and alignment.

C. Comply with requirements and with ACI 304R for measuring, mixing, transporting, and placing concrete.

D. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

E. Screed paved surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface.

F. Cold-Weather Placement: Comply with provisions of ACI 306R and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures:

1. When air temperature has fallen to or is expected to fall below 40°F uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50°F and not more than 80°F at point of placement.

2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

G. Hot-Weather Placement: Place concrete complying with ACI 305R and as specified when hot weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90°F. Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

H. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.

I. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.05 Concrete Finishing

A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared, and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture:

1. Paving: medium textured broom finish. Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

2. Bands: smooth formboard with smooth trowel surface. After concrete has adequately cured strip formwork and apply smooth trowel texture on the top and exposed faces of the curb and band.

3.06 Concrete Protection and Curing

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with the recommendations of ACI 306R for cold weather protection and ACI 305R for hot weather protection during curing.

B. Protect surrounding areas, landscaping, and adjacent horizontal and vertical surfaces.

3.07 Curing

A. Apply curing compound for non-colored cement concrete per manufacturer's instructions.

3.08 Pavement Tolerances

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 0.25 inches
2. Thickness: Plus 0.75 inches, minus 0.25 inches
3. Surface: Gap below 10 feet long, unleveled straightedge not to exceed 0.25 inches
4. Lateral alignment and spacing of tie bars and dowels: 1 inch
5. Vertical alignment of tie bars and dowels: 0.25 inches
6. Alignment of tie-bar end relative to line perpendicular to pavement edge: 0.5 inches
7. Alignment of Dowel-Bar End Relative to line Perpendicular to Pavement Edge: Length of dowel 0.25 inches per 12 inches
8. Joint Spacing: 0.5 inches
9. Score Joint Depth: Plus 0.25 inches, no minus
10. Joint Width: Plus 0.125 inches, no minus

3.09 Field Quality Control Testing

A. Testing Agency: The Contractor shall engage a qualified testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Section.

B. Testing Services: Testing shall be performed according to the following requirements:

1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
2. Slump: ASTM C 143; 1 test at point of placement for each compressive-strength test but no less than 1 test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
3. Air Content: ASTM C 231, pressure method; 1 test for each compressive-strength test but no less than 1 test for each day's pour of each type of air-entrained concrete.

4. Concrete Temperature: ASTM C 1064; 1 test hourly when air temperature is 40 degrees F and below and when 80 degrees F and above, and 1 test for each set of compressive-strength specimens.
5. Compression Test Specimens: ASTM C 31/C 31M; 1 set of 4 standard cylinders for each compressive-strength test, unless directed otherwise. Cylinders shall be molded and stored for laboratory cured test specimens unless field-cured test specimens are required.
6. Compressive-Strength Tests: ASTM C 39; 1 set for each day's pour of each concrete class exceeding 5 cu. yd. but less than 25 cu. yd., plus 1 set for each additional 50 cu. yd. Test 1 specimen at 7 days, test 2 specimens at 28 days, and retain 1 specimen in reserve for later testing if required.

C. When frequency of testing will provide fewer than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used:

1. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
2. Strength level of concrete will be considered satisfactory if averages of sets of 3 consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 pounds per square inch.

D. Test results shall be reported in writing to the Engineer, the concrete manufacturer, and Contractor within 48 hours of testing:

1. Reports of compressive strength tests shall contain the following:
    a. Project identification name and number
    b. Date of concrete placement
    c. Name of concrete testing agency
    d. Concrete type and class
    e. Location of concrete batch in paving
    f. Design compressive strength at 28 days
    g. Concrete mix proportions and materials
    h. Compressive breaking strength, and type of break for both 7-day and 28-day tests

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

F. Additional Tests: The testing agency will make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by the Engineer. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as approved by the Engineer.

3.10 Repairs and Protection

A. Remove and replace concrete paving that is broken, damaged, or defective, or does not meet the requirements of this Section.

B. Drill test cores where directed by the Engineer when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

**** END OF SECTION ****

PART 1 – GENERAL

1.01 Description

This section contains requirements for the commissioning of the facility. All commissioning work, as described in this section, shall be performed by the Contractor in coordination with the Manganese Treatment System Supplier.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 Commissioning Period

After completion of the operational test, the Contractor shall remove all temporary piping, controls and other alterations to the permanent systems that may have been needed during the facility testing and shall perform the tasks necessary to make the improvements constructed under this contract fully operational.

The commissioning period system shall be continuous period of 28 days. Should the commissioning period be interrupted at any time due to the Contractor's work, the commissioning period shall be restarted from the beginning of the full 28-day period. No additional compensation will be provided.

During the commissioning period, the District 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, required to keep the facility operational.

The Contractor shall be always available during commissioning periods to provide immediate assistance in case of trouble or failure of any portion of the facility. The commissioning period shall be considered ended when all corrections required by the Engineer to assure a reliable and completely operational facility are complete. The completion of the commissioning period is required prior to final acceptance.

3.02 Facility Cleanup

Prior to final acceptance of the facility, the Contractor shall clean the facility. This shall include at a minimum the following:

A. Removal of concrete, asphalt, or mud from any metal, painted surfaces or concrete block.

B. Wash down of the asphalt to remove dirt or mud

C. Removal of any project debris, equipment or stockpiles of material that the District does not want

D. Wipe down of the interior of control building to remove surface dust

E. Removal of debris and dusting all electrical, sample station, and generator enclosures

F. Removal of mud and debris from all underground vaults

G. Clean all debris from the reservoir roof

H. Clean the gutter of the control building

I. Remove debris, leaves and trash from the landscaping areas

****END OF SECTION****

Piping Systems
(Piping, Fittings, Valves and Meters)

PART 1 – GENERAL

1.01 Description

This Section specifies all piping, fittings, valves, meters, and accessories as shown on the drawings.

1.02 References

All pipe, fittings, valves, and coating shall be furnished, installed, tested, and disinfected per Section 33 13 00 Disinfection.

1.03 Submittals

A. Submit data to show that the following items conform to the Specification requirements:

1. Pipe, fittings, and accessories (Product Review)
2. Pipe couplings, flexible pipe pieces (Product Review)
3. Valves, and accessories (Product Review)

B. Fittings and Coupling Compatibility: To assure uniformity and compatibility of piping components, fittings and couplings shall be furnished by the same manufacturers.

C. Manuals: Furnish manufacture's installation and operation manuals, bulletins, and spare parts lists for the following items:

1. Valves 4 inches and larger
2. Actuated valves
3. Motorized actuators
4. Instrumentation

1.04 Quality Assurance

Field Quality Control:

The Contractor shall be responsible for the costs of additional inspection, retesting or repair incurred by the District resulting from non-compliance of defective materials provided by the Contractor.

1.05 Piping Systems

The various piping systems are identified on the Drawings and Specifications.

Piping Systems
(Piping, Fittings, Valves and Meters)

1.06 Appurtenances

Furnish and install all necessary guides, inserts, anchors and assembly bolts, washers and nuts, hangers, supports, gaskets, couplings, and flanges; all other appurtenant items shown on the Drawings, specified, or required for the proper installation and operation of the piping; devices included in or on the piping equipment; and piping accessories.

PART 2 – PRODUCTS

2.01 General

A. Pipe and valve sizes are nominal inside diameter unless otherwise noted.

B. All pipes, fittings and valves shall be lead free and NSF 61 certified.

C. All pipe, fittings and appurtenances shall be painted, coated, and/or encased per section 09 96 56.

2.02 Piping Materials

All piping shall be as follows unless stated otherwise on the plans:

A. Potable Water Pipe:

1. All exposed pipes shall be standard steel epoxy lined and coated per Section 09 96 56
2. All underground pipe smaller than 4 inches shall be schedule 80 PVC
3. All underground pipe 4-inches and larger shall be Class 50 ductile iron pipe per AWWA C104 except for the following:
   a. Pipe transitions from below ground to above ground shall be standard steel

2.03 Pipe Couplings and Adapters

A. General: For typical pipe joints refer to the pipe material specifications. Other joint devices shall be furnished where called for on the drawings and as specified below.

1. Flexible Couplings:
   - Connecting pipe with identical outside diameters:
   - Dresser style 38 or equal.
2. Banded Flexible Couplings (restrained):

- Dresser style 38 or equal with two all thread bolts bolted through the coupling to flanges or welded ears both sides to prevent the pulling out of the pipe from the coupling.

3. Transition Couplings:
   - Connecting pipe with slightly different outside diameters: Dresser style 162 or equal.
4. Flange Coupling Adaptors:
   - For sizes 12-inches and smaller: Dresser Style 127 or equal.
   - For sizes 14-inches and larger: Dresser Style 128 or equal.

2.04 Valves

A. General Requirements for Valves:

1. Valves of the same size and service shall be provided by a single valve manufacturer.
2. Packing shall be non-asbestos material.
3. Unless otherwise noted or indicated, all valves 2 inches and larger shall have flanged ends; all valves smaller than 2 inches shall have threaded IP ends. All valves installed in each pipe shall be designed to withstand the pressure rating of the pipe.
4. Buried valves shall use Type 316 stainless steel for the bolts and nuts.
5. All above grade valves 2 inches and larger shall be furnished with operator hand wheels.
6. All threaded stem valves shall open by turning the valve stem counterclockwise.
7. All buried valves 12 inches or smaller shall be resilient wedge flanged or mechanical joint gate valves with valve box manufactured by Clow Valve Company or equal.
8. All buried valves 14 inches and larger shall be flanged butterfly valves with side actuators and valve box manufactured by Bray or equal.
9. All check valves shall be flanged with a spring-balanced assembly manufactured by Clow or equal. Check valves shall meet the material and design requirements of AWWA specification C508.

B. Motorized Valve Actuators (MOV):

1. General

a. The actuators will be controlled using Ethernet communications and Modbus TCP protocol. Provide on-board communications module within actuator such that Category 6 ethernet may be connected at actuator with internal wiring and mounting completed. Furnish one Ethernet communication module per actuator.
b. The actuators shall also have the ability to connect control open and close command inputs and output dry contacts for the following connections: remote selected (AUTO), fully closed (CLOSE), fully open (OPEN).
c. Ethernet Modbus TCP controlled actuators shall allow for specific valve angle commands but may not need full modulation duty cycle. See specific application as noted herein.

1. Open-close Actuators:

Shall be a Rotork IQT and shall be added to new butterfly valves in the following locations:

a. Existing filter influent – actuator on 12-inch valve at 2 locations
b. Existing filter backwash – actuator on 12-inch valve at 2 locations
c. Existing filter rinse to waste – actuator on 12-inch valve at 2 locations
d. New filter Influent – actuator on 12-inch valve at 3 locations
e. New filter Backwash – actuator on 12-inch valve at 3 locations
f. New filter rinse to waste – actuator on 12-inch valve at 3 locations

2. Modulating Actuator:

Shall be a Rotork IQTM. The Modulating Actuators shall be added to new butterfly valves in the following locations:

a. Existing Filter Effluents – 12-inch Valve at 2 locations
b. New Filter Effluents – 12-inch valve at 3 locations
c. Common rise to waste – 10-inch valve at 1 location
d. Combined Filter Effluent – 16-inch valve at 1 location

3. Actuators shall operate on 120 VAC.

C. Butterfly Valves:

1. Valves 12 inches or smaller shall be a wafer type manufactured by Bray or an approved equal.
2. All valves 14 inches or larger shall be a flanged AWWA C504 or Bray Series 31 Lugged Style with buried service gear side actuator.

D. Gate Valves: Gate valves 4 inches and larger shall be resilient wedge AWWA C509 manufactured by Clow Valve Company or an approved equal and shall be coated per Section 09 96 56 and AWWA C550.

E. Combination Air Valves: Combination air valves shall be manufactured by ARI or an approved equal.

2.05 Fittings

A. General Requirement for Fittings:

1. All below grade fittings smaller than 4 inches shall be PVC schedule 80 glue fittings.
2. All below grade fittings 4 inches and larger shall be cast iron mechanical joint type (restrained) with thrust blocks sized by the Contractor.
3. All above grade bends and tees shall be standard long radius welded fittings.
4. All tapping sleeves shall be full wrap and stainless steel.

2.06 Meters and Gauges

A. Flow Meters:

1. Meters shall be the following:
   a. Existing Filter Effluents: Two (2) 10-inch McCrometer Ultra Mag UM06
   b. New filter Effluents: Three (3) 12-inch McCrometer Ultra Mag UM06
   c. Existing Filter Pump to Waste: One (1) 12-inch McCrometer Ultra Mag UM06
   d. Or an approved equivalent
2. Each meter will be equipped with the following:
   a. Flow Signals: Separate 4-20 mA output signal each proportional to the flow for forward and reverse flows
   b. Digital Flow Indication Range from 0 to 10,000 gpm
   c. Flow Totalization:

i. Totalizer reading in units of 100 cubic feet (CCF) for one direction

d. HART Protocol compatibility

e. Stainless steel grounding ring, gaskets, and #10 AWG copper ground conductor with green insulation to connect the grounding ring to the ground lug on the meter and to the #4/0 AWG grounding electrode conductor in the flow meter vault. Provide a suitable mechanical copper ground fitting to connect the #10 ground wire to the #4/0 ground wire. Grounding ring and gaskets shall be supplied by the flow meter manufacturer.

B. Requirements for Pipeline Pressure Transmitters

1. New Pressure Transducers shall be installed at the following locations:
   i. Filter Influent (One location)
   ii. Each filter effluent (five locations)
2. A 3-way, ball type shutoff valve and snubber shall be included for all pressure transmitters.
3. Configure 3-way valve to allow blowing out the supply line to the transmitter.
4. Pressure transmitter shall be loop powered (2-wire), 4-20mA, silicone filled, 316L stainless steel isolating diaphragm, LCD display, 0-150 psi, Rosemount 2051 or approved equal.
5. Configure the LCD display to display the psi reading.
6. Snubber shall be an Omega PS-2E or equal.
7. A 1/4-inch brass ball valve shall be included for all manifolds containing a pressure gauge, pressure transmitter and or sample tube to permit isolation of the manifold from the pipeline for calibration.

C. General Requirements Pressure Gauges:

1. A pressure gauge shall be installed on the system side of the reservoir control valve.
2. The pressure gauge shall be an Omega PGM Series (liquid filled) with a pressure range from 0 to 100 psi or equal. A snubber shall be an Omega PS-2E or equal on the pressure gauge.
3. A three-way ball type valve shall be included for all pressure gauges and a 1/4-inch sample tube shall be piped to the three-way valve.

Piping Systems
(Piping, Fittings, Valves and Meters)

2.07 Flange Assemblies

A. Flanges:

1. General:
   Flanges shall either be flat flanges or convoluted ring flanges as specified in the following paragraphs.
2. Flat Flanges:
   Cast iron flanges shall be faced in accordance with ANSI B 16.1. Where companion flanges are used, the flanges on pipe shall be refaced to be flush with the companion flange face. Class 150 and Class 300 forged steel flanges shall be raised face conforming to ANSI BI6.5. Lightweight slip-on flanges shall be plain face conforming to A WWA C207, Class B and ANSI BI6.5. Unless otherwise specified, steel flanges shall be ANSI BI6.5, Class 150 or AWWA C207, Class D. Class EAWWA flanges shall be provided where test pressure exceeds 175 psi. Plain faced flanges shall not be bolted to raised face flanges.

B. Gaskets:

Gaskets for plain faced flanges shall be the full-face type. The 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 3-1/2 inches and less in diameter and 1/8 inch thick for pipe 4 inches and larger.

C. Bolts:

Flange assembly bolts shall be ANSI B 18.2.1 standard square or hexagon head bolts with ANSI B 18.2.2 standard 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 B 16.5.

Unless otherwise specified, bolts shall be carbon steel machined bolts with hot pressed hexagon nuts. Bolts for submerged service shall be made of Type 316 stainless steel in conformance with ASTM F593, marking F593F. Nuts for submerged service shall be made of copper-silicon alloy bronze conforming to ASTM B98, alloy C65100, designation H04 or alloy C65500, designation H04. Bolts and nuts for buried service shall be made of noncorrosive high-strength, 1ow-alloy steel having the characteristics specified in ANSI/AWWA C111/A21,

regardless of any other protective coating. Where washers are required, they shall be of the same material as the associated bolts.

PART 3 – EXECUTION (NOT USED)

**** END OF SECTION ****

PART 1 – GENERAL

1.01 Scope of Work

A. The Contractor shall disinfect and flush all water distribution facilities in accordance with ANSI AWWA C651 Standard for Disinfecting Water Mains and these specifications.

B. The District will provide bacteriological testing.

C. The Contractor shall furnish the sodium hypochlorite chemical for disinfection

D. All chlorination, flushing and sampling events shall be scheduled at least 48 hours in advance with the District

1.02 Submittals

Submit in accordance with Section 01 33 00 Submittals:

A. Shop drawings and manufacturer's literature for all materials

B. Affidavit of Compliance for sodium hypochlorite with AWWA B300 and B301 from the manufacturer

C. Plan for disposal of chlorinated water

PART 2 – PRODUCTS

2.01 General

A. Provide chlorine disinfection in accordance with Section 4.1 of ANSI AWWA C651 and the provisions of ANSI AWWA B300 Standard for Sodium Hypochlorite.

B. Provide backflow protection in accordance with ANSI AWWA B301 Standard for Liquid Chlorine Backflow Protection.

PART 3 – EXECUTION

3.01 General

The Contractor shall follow the basic disinfection procedure in accordance with Section 4.2 of ANSI AWWA C651 or the District’s Standards which ever is more stringent.

3.02 Construction Procedures

The Contractor shall follow the preventive and corrective measures during construction in accordance with Section 4.3 of ANSI AWWA C651.

3.03 Methods of Chlorination

A. The Contractor shall use a chlorination method in accordance with Section 4.4 of ANSI AWWA C651.

B. The District will furnish water for filling and flushing the new water mains and filter vessels through a Contractor provided and installed backflow prevention device approved by the District.

3.04 Final Flushing

A. The Contractor shall follow the final flushing procedures in accordance with Section 4.5 of ANSI AWWA C651.

B. Chlorinated water in excess of 100 ppm shall not remain in contact with pipe and appurtenances for more than 48 hours after the applicable retention period.

C. Chlorinated water shall be neutralized prior to discharging into the storm drain system.

D. The Contractor shall be solely responsible for disposal of chlorinated water in accordance with all applicable Federal, State, and local NPDES discharge requirements.

3.05 Final Connection to Existing Mains

A. The Contractor shall follow the final connection procedures in accordance with Section 4.6 of ANSI AWWA C651.

B. Temporary blow-offs shall be removed by the Contractor and final connection pipe shall be provided and installed by the Contractor as indicated on the drawings.

C. The Contractor shall assist the District with any additional flushing the District may perform associated with this project.

3.06 Cutting in Existing Mains

The Contractor shall install pipe and fitting assemblies shown on the drawings in accordance with Section 4.7 of ANSI AWWA C651, these assemblies shall be installed prior to chlorination of any water mains, to ensure that the final connection can be installed, as indicated on the drawings.

3.07 Bacteriological Tests

A. The District shall perform the bacteriological tests in accordance with Section 5.1 of ANSI AWWA C651

B. Bacteriological tests shall demonstrate complete absence of coliform organisms and heterotrophic plate counts (HPC) of less than 500 CFU/mL. If tests show presence of coliform organisms or HPCs higher than 500 CFU/mL, the Contractor will be required to perform

additional flushing and disinfection of the pipeline and filter vessels until such time acceptable tests are obtained, all at no additional cost to the District.

C. The Contractor will not be charged for the additional water provided or bacteriological testing performed by the District.

****END OF SECTION****

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PART 1 - GENERAL

1.01 Description

A. This Section describes the installation of the three manganese treatment pressure filters (filters) along with their appurtenances that will be provided by the Manganese Treatment Supplier (MTS) under a separate contract.

B. Three filters will be delivered to the project site by the MTS. The Contractor will be responsible for providing labor and equipment to remove the filters from the delivery truck and storing them at the project site until the concrete filter pad is constructed.

C. When the filter pad is constructed and ready to support the filters, the Contractor will be responsible for providing labor and equipment to relocate and anchor the filters on their respective concrete pedestals.

1.02 References

A. Section 32 13 13 Concrete Paving

B. Appendix A.1

The Appendix A.1 contains the specification of the Manganese Treatment System that was the Manganese Treatment Supplier (MTS) responsibility to provide under a separate contract. This Specification is included for informational purposes only and not a part of this contract.

1.03 Concrete Filter Pad

The Contractor will be responsible for constructing the filter pad as designed by the MTS.

1.04 Seismic Protection

The Contractor shall anchor the filters to meet all seismic forces as stated in Section 32 13 13 Concrete Paving. The MTS will provide the anchoring details for the Contractor to install and anchor the filters.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 Filter Delivery and Installation

A. Initial Delivery

The Contractor shall provide a schedule to the Engineer of a two week look a head of when they will be available to remove the filters from the

delivery truck and located temporarily at the WTP. The filter should be located as to not interfere with the plant current operation and at a location agreed to by the District.

B. Filter Placement:

1. Once the filter pad has been constructed and can support the filters. the Contractor shall move and anchor the filter vessels onto the filter pedestals.

**** END OF SECTION ****

Manganese Treatment Training (By MTS)

PART 1 – GENERAL

1.01 Description

This section contains requirements for training the District's personnel by the Manganese Treatment Supplier (MTS) **that OPUD has contracted with under a separate contract.** The training is specifically associated with the proper operation and maintenance of the expanded manganese treatment system is part of the Manganese Expansion Project (Project).

All training shall be coordinated with the manganese treatment portion of the programable logic controller's plant operation training that is part of the overall Project.

1.02 Quality Assurance

The MTS shall provide on-the-job training of the District's personnel. The training sessions shall be conducted by qualified and experienced employees of the MTS.

Training shall include instruction in both operation and maintenance of the manganese treatment system.

1.03 Submittals

The following information shall be submitted to the Engineer in accordance with the provisions of Section 01 33 13. The material shall be reviewed and accepted by the not less than 3 weeks prior to the provision of training.

A. Lessons plans for each training session to be conducted by the MTS. In addition, training manuals, handouts visual aids, and other reference materials shall be included.

B. Subject of each training session, identity, and qualifications of individuals to be conducting the training and tentative date and time of each training session.

PART 2 – PRODUCTS

2.01 General

Where specified, the Contractor shall conduct training sessions for the District's personnel to instruct District Staff on the proper operation, care, and maintenance of the manganese treatment system. Approved operation and maintenance manuals shall be available at least 30 days prior to the date scheduled for the individual training session.

2.02 Location

Manganese Treatment Training
(By MTS)

Training shall take place at the site of the Plumas Lake WTP in Plumas Lake California.

2.03 Format and Content

As a minimum, training session shall cover the training of the manganese treatment system for the following sections:

A. Familiarization:

1. Review parts lists, drawings, and etc., which have been previously provided for the District's files and operation and maintenance manuals
2. Check out the installation of the specific equipment items

B. Safety:

1. Review safety references
2. Discuss proper precautions around equipment

C. Operation:

1. Review reference literature
2. Explain all modes of treatment operation (including emergency)
3. Observe District's personnel on proper use of the equipment
4. Demonstrate the treatment system and how to determine backwash frequency, rates, and duration along with flush to waste duration

D. Preventive Maintenance:

1. Review preventive maintenance (PM) lists including:
   a. Reference material
   b. Daily, weekly, monthly, quarterly, semiannual, and annual jobs
2. Show how to perform PM jobs
3. Show District Staff what to look for as indicators of equipment problems

E. Corrective Maintenance:

1. List possible problems
2. Discuss repairs – point out special problems
3. Open up equipment and demonstrate procedures, where practical

F. Parts:

1. Show how to use previously provided parts list and order parts
2. Check over spare parts on hand. Make recommendations regarding additional parts that should be available

G. Local Representatives:

1. Where to order parts: name, address, telephone

2. Service problems:
   a. Who to call
   b. How to get emergency help

H. Operation and Maintenance Manuals:

1. Review any other material submitted
2. Update material, as required

PART 3 – EXECUTION

Training shall be conducted in conjunction with the operational testing and commissioning periods of the treatment system. The MTS shall arrange to have the training conducted in no more than 6 hours in one day. Concurrent classes shall not be allowed.

Acceptable operation and maintenance manuals for the specific equipment shall be provided to the District prior to the start of any training.

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. Perform backwash, rinse to waste, and return to normal operations

F. Review and perform the safety procedures

G. Perform District approved practice maintenance and repair job(s), including troubleshooting filter problems

****END OF SECTION****

Manganese Treatment Training
(By MTS)

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Manganese Treatment System
(By MTS)

PART 1 – GENERAL

1.01 Description

This Section describes the three manganese treatment pressure filters along with their appurtenances to be provide by the Manganese Treatment Supplier (MTS).

These filters will be delivered to the project site at the request of the Engineer as part of the Plumas Lake Water Treatment Plant (WTP) Treatment Expansion Project (Project). This Project has not been bid and a General Contractor (Contractor) has not been selected.

Each filter will be a horizontal single cell horizontal pressure filter that includes media and internal piping. The MTS shall provide support services during construction for the installation of the underdrain support concrete and filter media and during startup. The filters will be required to meet performance and design data requirements as specified herein.

1.02 References

Appendix A contains the raw water quality data from Wells 31 and 32 that are being treated for Manganese at the WTP. This water quality data is for informational purposes only.

1.03 Quality Assurance

A. The MTS shall be regularly engaged in providing horizontal pressure filters for manganese treatment for a minimum of 10 years.

B. The MTS shall provide a list of references based on five similar municipal potable water manganese treatment systems that have been completed within the last 10 years. Each reference shall include a contact name, phone number, and address.

C. The MTS' trained field representative shall have overseen the installation and startup of not less than three pressure filter installations for manganese treatment systems.

D. The MTS shall provide a filter performance guarantee and two-year warrantee of the new pressure filters.

1.04 Submittals

A. Provide the following submittals in accordance with Section 01 33 13.

B. Fabrication (Shop) Drawings:

1. Plan and elevation views showing penetrations
2. Internal piping details

3. Filter support saddles and anchor bolt size and locations
4. Filter media type and arrangement
5. Material list

C. Updated Filter Operation Plan (New and Existing Filters) Including:

1. Rinse to waste duration
2. Service cycle flow rate
3. Service cycle duration
4. Backwash duration
5. Backwash flow rate
6. Backwash initiation set points based on service cycle run time and pressure differential
7. Recommended chlorine dosage

D. Any other operational requirements needed to optimally operate the expanded Manganese Treatment System

E. Submit detailed step-by-step test procedures describing the methods, equipment, data collection, and method of chemical analysis to be used in performance testing specified in Part 3 of this Section.

F. Provide NSF 61 compliance certificates for concrete used within the filters for the filter media support along with necessary facilities for sampling and testing of the concrete for compliance.

G. Provide certification compliance with ANSI/NSF 61 requirements for all equipment that comes in contact with the water.

H. The MTS shall provide seismic anchorage calculations in accordance with Section 22 05 48.

I. Provide a list of references as detailed in Paragraph 1.03.

J. Furnish manufacturer's installation and operation manuals, bulletins, and spare parts list.

K. Provide specific step-by-step instructions for operation of the filter system in all modes, and for extended-period shutdown and maintenance of any filter vessel (new and existing) or combination of vessels.

L. PLC program certification that it meets the intended operation of the MTS system per Paragraph 1.06.

1.05 Seismic Protection

The MTS shall be responsible submitting design calculations showing that the manganese filter and all its components will resist the total seismic forces in accordance with Section 22 05 48.

1.06 Unit Responsibility

A. The MTS shall be responsible for furnishing, and coordinating the assembly and installation, testing, and starting up of the manganese treatment system. This responsibility shall include the new pressure vessels and internals, and gravel support, and filter media. Internal concrete to be supplied by the Contractor.

   The external filter piping and valves, and field instrumentation, accessories, control panel, and miscellaneous controls will be provided by others.

B. The filter supplier shall provide a control strategy to the PLC integrator for them to program the integration of the existing and new filters into the operation of the water plant.

C. The supplier shall provide five-separate 8-hour meetings with the PLC integrator to develop, review, and factory test the operation of the MTS program.

D. The supplier shall submit to the Engineer a certification that the PLC program meets the intended operation of the MTS system prior to operational testing.

PART 2 – PRODUCTS

2.01 Acceptable Manufacturers

A. All equipment furnished under this Section shall be from a filter supplier who has been regularly engaged in the design and construction of manganese treatment system as stated in Paragraph 1.03.

B. The filter vessel shall be fabricated in an ASME certified manufacturing facility.

C. The filter vessel shall have the manufacturer's name, serial number, dimension, and pressure rating on a plate welded to the end bell of the vessel.

2.02 Filtration System Design Requirements

A. The pressure filter system shall consist of adding three filters piped in parallel with the existing two filters and shall be specifically designed to add filtration and treatment capacity for manganese removal based on the water quality sampling results. Media shall be silica sand with anthracite along with a graded gravel support. The graded gravel support bed shall be layers of sand and gravel designed to disperse the backwash water uniformly across the entire filter area without channeling or excessive flows along the vessel walls. A chlorine feed system shall serve

to continuously regenerate the silica sand to oxidize the soluble manganese.

1. Total treatment capacity is 6,200 gpm (capacity from Well 31 and 32) that will be split between the pressure filters operating in parallel with one filter out of service (4 operating filters).
2. Design requirements per individual filter are as follows:
   a. The pressure filter equipment shall be designed based on the following requirements:
      1) Design flow rate..... 1,560 GPM
      2) Filter loading rate at design flow (max)..... 7.5 GPM/FT2
      3) Maximum operating pressure..... 60 PSI
      4) Minimum Service Cycle ..... 120 Hours
      5) Maximum filter backwash rate..... 15 GPM/FT2
      6) Maximum filter backwash flow rate..... 3,120 GPM
      7) Maximum filter backwash waste volume..... 45,000 gallons

B. The raw well water (raw water) will be pumped through the manganese filters and into a 24-ft high welded steel tank.

C. Chlorination at the facility will be provided from a sodium hypochlorite liquid chlorine feed system that will is injected at the discharge of the two wells. The chemical feed system will vary the supply of chlorine based on the flow of the wells to maintain a constant dosage rate.

D. Maximum flow velocity in piping connections to filters or within filters shall not exceed 6 fps except during the backwash operation.

E. The system backwash water supply is to be a self-generated treated water source where the online filters will provide treated supply to the filter that is being backwashed. The source of the backwash water will be from the wells.

F. During filter operation, maximum pressure drop from the inlet header connection to the filtered effluent shall not exceed three psi differential under clean filter bed conditions or ten psi differential prior to backwash.

G. Backwash rate shall be between 12 to 15 gpm/sf. A minimum of 140 percent of the recommended media bed expansion shall be possible during backwashing before the media reaches the invert of the inlet/backwash outlet header.

2.03 Filter Vessel

A. There are to be three new filter vessels that will be piped in parallel to the

existing two filter vessels.

B. Each vessel shall be of welded steel construction using SA-516 Grade 70 steel and shall be tested to withstand a hydrostatic pressure 30% in excess of the designed working pressure of 60 psi. Each tank shall be designed shall be constructed per ASME code section VIII.

C. The filter system characteristics shall be as follows:

1. Each filter shall be a single cell horizontal vessel.
2. The backwash water shall be drawn from the effluent of the other parallel filters with the source water coming from either Well 31 or Well 32.
3. Media shall be sand and anthracite over graded support gravel.

D. Each filter vessel shall be nominally 8-foot diameter by 26-foot-long shell to match the existing two filters.

E. The orientation of the filter inlet and outlet nozzles are shown on Drawing MF-1. Orientation of side elliptical manholes will differ based on maintaining optimal access for media replacement to each new filter.

F. Each vessel is to include the following features:

1. Two (2) 14” x 18” upper elliptical manhole
2. Two (2) 14” x 18” lower elliptical manhole
3. One (1) 12” flanged nozzle for inlet/backwash end bell connection
4. One (1) 12” flanged nozzle for filter effluent end bell connection
5. Two (2) lifting lugs
6. Two (2) saddle support legs

2.04 Filter Coating:

A. Interior Lining:

1. Surface preparation shall be an abrasive blast in conformance with the requirements of SSPC-SP10 "Near White Blast Cleaning". Paint all blasted surfaces within 8 hours of blasting. Remove all weld splatter by grinding prior to sandblasting.
2. All material shall be applied in strict accordance with manufacturer’s instructions. Apply first coat immediately after surface preparation. Apply each coat to a uniform, even coating; lay material in one direction and finish at right angles. Allow material to thoroughly dry

between coats. Scuff, sand and remove all runs, sags, over spray, surface roughness and other defects between each coat.

3. All products to be used shall be NSF/ANSI 61 certified for potable water application and meet the requirements of NSF 600.
4. Product to be a 100% solids epoxy, Tnemec Series 22 or equal, applied to a minimum DFT of 16 mils.

B. Exterior Coating

1. Surface preparation shall be an abrasive blast in conformance with the requirements of SSPC-SP6 "Commercial Blast Cleaning". Paint all blasted surfaces within 8 hours of blasting. Remove all weld splatter by grinding or chipping prior to sandblasting.
2. All material shall be applied in strict accordance with manufacturer's instructions. Apply first coat immediately after surface preparation. Apply each coat to a uniform, even coating; lay material in one direction and finish at right angles. Allow material to thoroughly dry between coats. Scuff, sand and remove all runs, sags, over spray, surface roughness and other defects between each coat.
3. Prime coat to be a high solids epoxy, Tnemec Series 69 or equal. One coat is to be applied to provide a finish DFT of 2 - 4 mils.
4. Exterior topcoat shall be polyurethane, Tnemec Series 1075 or equal, color to be selected by District.

C. Coating Inspection

Prior to filter delivery to the Project Site, the MTS will provide a third-party NACE III certified inspector to test the interior and exterior coating of the filters per ASTM D5162-15. All inspection results will be provided to Engineering within 14 days of inspection and prior to delivery.

G. Field Paint Touch-Up

The Contractor shall provide all field touch-up painting after the filters have been delivered.

2.05 Filter Media

A. The MTS shall provide sufficient media for initial startup and operation of the filters.

B. Spare media shall be shipped in on cubic foot double bagged containers, sealed and on pallet with each bag marked as to its contents. Each spare media type shall be equal to 10 percent of the total type of media being

provided.

C. All filter media and graded gravel support material shall be the product of a company experienced in the production of media for water filtration use.

D. Filter media materials, testing shipment, placement, and preparation of filter for service shall conform to AWWA B100 or 102 latest revision.

2.06 Filter Piping, Valves and Other Appurtenances

A. Filter Inlet Distributor

1. Each filter shall be furnished with a full-length header inlet distributor/backwash collector system, constructed of stainless-steel pipe.

B. Underdrain System

1. Each filter shall be furnished with a header lateral underdrain system designed to uniformly distribute backwash water and for collection of filtered water. The header and laterals shall be stainless steel. The laterals shall be slotted, wedge flow, pipe-based design.

C. Surface Wash System

There will be no surface wash system used. The surface wash system for the existing two pressure filters shall be removed.

D. Filter Valves and Accessories:

All filter valves, meters, pressure gauges, air release /vacuum breakers, and pressure transmitters shall be provided by others

2.07 Performance Guarantee and Warranty

A. Performance Guarantee:

1. The MTS shall review the filter influent raw water quality as stated shown in the Appendices and other requirements of these Specifications, and shall guarantee that the filter equipment supplied will consistently produce filtered water having manganese concentrations and operational characteristics as noted below:

Manganese concentrations in filter effluent	<0.01 ppm average 0.02 ppm maximum
Filter clogging rate	<0.5 ft/hr. at 4 gpm/sf.
Backwash consumption	<1 Percent of

	throughput volume

2. Submit a performance guarantee stating that the MTS will meet the performance requirements stated.
3. The Contractor shall provide all valves, actuators, instruments, fittings, external piping, and filter control program. The District will provide all chemicals and power.
4. The MTS shall be available during startup and testing for a period of not less than 15 days or until filter performance, as guaranteed, has been achieved for a continuous 10-day period, whichever is longer, at no additional cost to the District.
5. The MTS shall operate the manganese treatment system with a District certified Operator during the startup and testing.

B. Warranty:

1. The MTS shall provide a written warranty for the satisfactory performance of the three new filters for two years following system testing and acceptance by the District.
2. If the filtration process does not meet the treated water manganese concentration limit or operation requirements as specified in this paragraph or if there is a difficulty or failure in controls or equipment, the MTS will be notified by telephone and must provide advice on the corrective action within 24 hours.
3. If the performance or operation condition deficiency continues for more than three days, the MTS shall come to the project site and provide the necessary equipment, materials and/or labor to correct the condition at no cost to the District and to their satisfaction.

PART 3 – EXECUTION

3.01 Installation

A. Delivery

1. The Engineer shall notify the MTS that the Contractor is ready to install the filters. The MTS shall coordinate the delivery of the filters and its associated internals and media to the WTP for installation. The Delivery of the filters shall meet the requirements of Section 01 00 00 Delivery Time and Liquidated Damages.

B. Field Service:

1. The MTS shall be onsite for a minimum of five 8-hour days during

installation and four 8-hour days during startup to review the installation instructions with the Engineer and Contractor, witness the installation of the filter systems, train the Contractor's personnel in cautionary procedures critical to proper installation, and assist in startup. This will include the MTS being present during placement of concrete fill in the vessels, installation of filter internal piping and internal components, testing of underdrain piping for clogging and slow distribution, placement of gravel support and filter media, initial washing of media, media conditioning and placing the completed filter system in service. The requirements of this Paragraph will not be waived or diluted.

C. Filter Placement (by Contractor):

1. The Contractor shall remove the filters from the delivery trucks and set the filter vessels in place on the concrete pads. Once set the Contractor will anchor the filters into place.

D. Underdrain and Media Installation (by Contractor):

1. After the filter vessels are set in place, the Contractor shall vacuum clean the underdrain area prior to the installation of the concrete and underdrain laterals.

2. This cleaning must be favorably reviewed by the MTS prior to placement of concrete, gravel support material, and media. The Contractor shall test the underdrain for uniform water distribution by backwash, at a rate of 12 to 15 gpm/sf, or as recommended by the MTS.

E. Media Placement:

1. The Contactor shall place filter media, wash, scrape, and add makeup media per AWWA B100 and B102. Sample and test media for conformance with the specification.

2. The MTS shall sample and test media and verify the conformance with AWWA B100 and B102.

F. Filter Disinfection (by Contactor):

The Contractor shall be responsible for disinfecting the filters and their internal piping and media prior to placing in service.

3.02 Filter Startup

A. Commissioning

MTS shall assist in the commissioning all systems and equipment to

verify performance, function, and correct operation of the manganese treatment system by performing procedures to activate, startup, adjust, test, and demonstrate that the work is in operating order in accordance with these general requirements of this Section and the detailed requirements of the technical sections under the system or equipment specified.

B. Notification:

The Contractor shall notify the MTS and Engineer at least five days prior to starting each system or piece of the manganese treatment system.

C. Coordination:

During the startup period, the MTS shall coordinate the operation of the equipment with the District's operators and Contractor.

D. Test Equipment:

The MTS shall furnish any required test equipment, measuring devices and supplies required to conduct tests in the performance of the manganese treatment system. Maintain this equipment until acceptance.

E. Startup References:

Refer to following specification sections

- 01 11 01 (Summary of Work)
- 01 14 16 (Coordination and Meetings)
- Section 01 79 01 (Testing, Training and Facility Startup) for additional facility startup requirements.

3.03 Performance Testing

A. Filter Operation

1. The MTS shall be present and work with the Contractor to startup the filters, make necessary adjustments, and demonstrate to the District that the complete filter system is in proper operating condition.
2. Demonstrate proper operation by operating the system continuously for a period of not less than four (4) consecutive calendar days. Accomplish at least two backwash events during this period under program control, one of which shall be induced by simulating a high headloss condition.
3. During the initial filter start-up, the water through the filter must be discharged to waste until favorable water quality results are achieved (meet requirements of Paragraphs 1.06).

B. Water Quality Sampling

The MTS shall be present a minimum of 7 days during the 15-day operational testing period. Over a period of fifteen (15) days, the Contractor shall collect samples and complete analyses of influent and effluent manganese levels twice per day as the silica sand media develops a manganese dioxide coating. The MTS and Contractor under supervision of the District will be allowed to alter, adjust, add, or replace system components as necessary to meet the performance requirements provided that these requirements are met prior to the contract completion date.

3.04 Training

A. Operation Training:

During the performance testing period, the MTS and Contractor shall team to conduct an 8-hour training session for the District's operating personnel in the theory, function, operation, and maintenance of the filter system and PLC controls as well as the other PLC controls other than the manganese treatment system.

B. 90 Day Inspection and Training:

As part of the treatment system training, provide the services of the MTS during the third month after system has been placed into service, to conduct a 4-hour inspection of the system operation in addition to a 4-hour onsite operation and maintenance refresher training session for the District's Operating Staff. Submit a report of the field trip to the Engineer, pointing out any deficiencies and offering recommendations on maintenance activities, as appropriate.

3.05 Field Service Summary

A. The following is the minimum number of days of field service that will be provided by MTS as summarized below:

1. Installation: ..... 2 days
2. Facility Startup: ..... 4 days
3. Performance Testing: ..... 4 days
4. 15-Day Operation: ..... 7 days
5. Training: ..... 1 days
6. 90 Day System Inspection: ..... ½ Day
7. 90 Day Refresher Training: ..... ½ Day

Manganese Treatment System
(By MTS)

**** END OF SECTION ****

SANDERS & ASSOCIATES GEOSTRUCTURAL ENGINEERING

sage

INTEGRATING EARTH & STRUCTURE

October 22, 2008
Project No. SE08-043

Mr. Jim DeHart
Forsgren Associates, Inc.
3110 Gold Canal Drive, Suite C
Rancho Cordova, CA 95670

Re: Geotechnical Investigation Report
Olivehurst Public Utility District Well #34 Facility
Yuba County, California

Dear Mr. DeHart:

This report presents the results of our geotechnical investigation for the proposed Olivehurst Public Utility District (OPUD) well #34 facility on Algodon Road in Olivehurst, California. Our services have been provided in accordance with our authorized proposal dated June 19, 2008.

SITE AND PROJECT DESCRIPTION

The project site is located on the northwest side of Algodon Road, approximately 0.7 miles south-southwest of the intersection of Algodon Road and Plumas Lake Boulevard (see Figure 1). The site occupies the southeast corner of Assessor's Parcel Number 016-040-101.

The proposed project site consists of a rectangular lot approximately 100 feet square (see Figure 2). The site is comprised of level ground occupying an unused corner of a large agricultural field and is bounded along the southeastern margin by an irrigation/drainage ditch adjacent to Algodon Road.

We understand that the proposed facility will comprise a well, a 150,000 gallon backwash tank, a chlorine building, and associated improvements. The backwash tank will be approximately 35 feet in diameter and about 25 feet high. We understand the base of the tank will be founded on-grade and the walls will be supported on a concrete ring-wall foundation. The chlorine building is expected to consist of a 12-foot by 12-foot single-story structure. Other anticipated improvements include asphalt-paved roads and parking areas; foundations for a pressure filter, a generator, and transformers; and underground pipelines and utilities.

SCOPE OF SERVICES

Our scope of services, as defined in our June 19, 2008 proposal, consisted of drilling one soil boring beneath the center of the proposed backwash tank location to evaluate site-specific subsurface conditions for the proposed project. Based on the results of our field investigation, we performed engineering analyses to develop conclusions and recommendations regarding: criteria for structure foundation design; estimates of total and differential foundation/tank settlement; active and passive earth pressures; soil corrosion potential; site preparation, grading and fill quality; and flexible and rigid pavement design.

SUBSURFACE CONDITIONS

We explored subsurface conditions at the site by drilling one (1) soil boring, designated as boring B-1, on August 20, 2008. The boring was advanced to a depth of 51.5 feet below existing grade. The approximate location of the soil boring is shown on Figure 2. A description of our field exploration program, as well as logs of the boring, is presented in Appendix A.

Based on the results of our field exploration, we conclude the site is covered by alluvial strata consisting of alternating layers of silts and sands locally interbedded with clay lenses. The upper 4.5 feet of soils at the site are comprised of sandy clay. Granular soils vary from medium dense to dense, and cohesive units vary from stiff to hard.

Atterberg limit tests performed on near surface (0 to 6.5 feet) clay soil samples indicates that these materials have a plasticity index (PI) ranging from 11 to 17, suggesting that they have a low to moderate expansion potential.[1] The laboratory test results are summarized on the boring logs in Appendix A and presented in Appendix B.

Groundwater was encountered in the soil boring at a depth of 14 feet below existing grade. However, soil samples obtained below a depth of approximately 18 feet were not saturated, suggesting that the water encountered at 14 feet is locally perched. Saturated soil samples indicative of groundwater were not encountered in any other samples to the maximum exploration depth.

SEISMIC CONSIDERATIONS

Regional Seismicity

Seismicity is defined as the geographical and historical distribution of earthquakes, or more simply, earthquake activity. The potential for ground shaking at the site is related to earthquake activity that might occur along nearby or distant faults. Based on historical earthquake activity and fault hazard mapping, the Sacramento Valley is considered to have a relatively low potential for seismic activity.

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1 Expansive soils change volume (i.e., shrink or swell) due to changes in moisture content.

The major active fault[2] systems that might impact the site are the San Andreas fault system located in the Coast Range, the Great Valley thrust fault system along the western margin of the Central Valley, and the Eastern California Shear Zone along the eastern side of the Sierra Nevada. In addition to these active fault systems, the nearby potentially active[3] Foothills fault system east of the site is also considered to be a significant potential source of ground shaking. The maximum moment magnitude[4] earthquake estimated for the Foothill fault system is M_w 6.5, with a recurrence interval of about 12,500 years (CDMG, 1996). The Foothills fault system is not currently zoned as active under the State of California Alquist-Priolo Earthquake Fault Zoning Act (CDMG, 1997a). Within the Great Valley thrust system, the nearest known potentially active fault is the Dunnigan Hills fault (Jennings, 1994), which has been estimated to have a maximum credible earthquake potential of M_W 6.5 (Mualchin and Jones, 1992; Mualchin, 1996).

Seismic Hazards

We expect the site will experience low to moderate ground shaking during a major earthquake on the Foothills fault or Great Valley fault systems. The intensity of ground shaking at the site depends on many factors, including the size of the fault generating an earthquake event, the distance from the fault rupture to the project site, and the duration of strong ground shaking. As discussed above, the nearest faults to the project site include fault strands of the Foothills fault system and Great Valley thrust system.

Based on review of the United States Geologic Survey (USGS) Probabilistic Hazard Curves (2002) and design parameters for use with ASCE 7-05, the estimated peak ground acceleration (PGA) at the site for a 10 percent probability of exceedance in 50 years is 0.19 g for Site Class D (stiff soil), which corresponds to a low to moderate level of shaking. Design parameters for use with ASCE 7-05 are presented later in this report.

Historically, ground surface displacements closely follow the trace of geologically young faults. The site is not within an Earthquake Fault Zone, as defined by the Alquist-Priolo Earthquake Fault Zoning Act, and no known active or potentially active faults exist on the site. We therefore conclude the risk of fault offset at the site from a known active fault is negligible.

Soil Liquefaction

Soil liquefaction is the sudden and rapid reduction in the shear strength of a soil due to an increase in excess pore pressure caused by cyclic loading under undrained loading conditions, most commonly, strong ground shaking. In the case of complete soil liquefaction, physical properties of the soil become similar to a heavy fluid rather than a soil, and a nearly complete loss of shear strength can occur. Soils most prone to liquefaction are clean, fine-grained, uniformly

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2 Active faults are defined as those exhibiting either surface ruptures, topographic features created by faulting, surface displacements of Holocene (younger than about 11,000 years old) deposits, tectonic creep along fault lines, and/or close proximity to linear concentrations or trends of earthquake epicenters.

3 Potentially active faults displace geologic deposits of Pleistocene age (about 2 million to 11,000 years old).

4 Moment magnitude (M_w) is directly related to average slip and rupture fault area, while the Richter magnitude scale reflects the amplitude of a particular type of seismic wave.

graded sands. However, sand with varying amounts of silt and clay, non-plastic silts, some fine gravel, and sensitive clays may also liquefy and/or lose strength during strong cyclic loading. Phenomena associated with liquefaction include sand boils, flow failure, lateral spreading, differential settlement, loss of bearing strength, and ground fissures.

Because liquefaction occurs due to the build up of pore-water pressure within the soil skeleton, potentially liquefiable soils are generally below the groundwater table. Although we believe that the relatively shallow (14 feet below existing grade) groundwater encountered in our soil boring is likely a locally perched zone, previous investigations in this area indicate that groundwater may be encountered at similar depths during the wet season. We therefore performed liquefaction analyses assuming a shallow groundwater table. Given the relatively high blow counts noted in the silt and sand layers, our analyses indicate that the potential for soil liquefaction on the site is negligible.

DISCUSSION AND RECOMMENDATIONS

From a geotechnical standpoint, the proposed construction is feasible as planned provided the recommendations presented in the remainder of this report are incorporated into the proposed construction. The following subsections present recommendations for site grading, foundation design and construction, slabs-on-grade, retaining wall design, pavement design, and seismic design.

Site Grading

Grading at the site is generally expected to consist of minor cuts and fills on the order of 2 to 3 feet. We expect excavation and grading can be accomplished with conventional construction equipment. Grading should occur during the dry summer months, as the near surface clay will perform poorly if graded during the rainy season. If wet-weather grading is anticipated, an allowance should be made in the project budget for subgrade stabilization measures such as lime treatment.

The material removed from site excavations, including utility trench excavations, is expected to consist predominantly of silt and clay. We believe most of the material excavated will be suitable for reuse as engineered fill, provided the material is moisture conditioned to a moisture content that will limit the potential for future moisture content change. On-site material used as engineered fill should be free of organics, trash, and other debris; should have a plasticity limit of 17 or less; and should not contain oversize particles larger than three inches in diameter.

If imported select fill is required, it should be free of organics, trash, and other debris; should not contain oversize particles larger than three inches in diameter; and should have a relatively low expansion potential (defined by liquid limit less than 40 and a plasticity index lower than 12).

All fill material, including on-site fill, should be submitted to the Geotechnical Engineer for approval at least 72 hours before it is to be used on site. Where imported fill is required, the fill supplier should provide analytical test results or other suitable environmental documentation at

least three days before use at the site indicating the proposed fill material is free of hazardous materials, such as heavy metals, NOA, or petroleum hydrocarbons.

Where fill is required, the exposed subgrade should be scarified to a depth of eight inches, moisture-conditioned to at least two percent above optimum moisture content, and compacted to at least 90 percent relative compaction.[5] Any proposed fill that will extend more than five feet below finished grade should be compacted to at least 95 percent relative compaction below the five-foot depth. The upper six inches of subgrade in pavement and roadway areas should be compacted to at least 95 percent relative compaction. Where sand with less than 10 percent fines (material passing the No. 200 sieve) is used, it should be moisture conditioned to above optimum moisture content and compacted to at least 95 percent relative compaction.

Retaining wall backfill (where required) should be placed using light (hand-operated) compaction equipment. If heavy equipment is used within five feet of the wall, the wall may require design for the additional surcharge pressure exerted by the equipment.

Permanent Slopes

If permanent slopes are required at the site boundaries, they should be constructed with a maximum inclination of 2H:1V. Fill materials, subgrade preparation, and compaction requirements should be as described above in the "Site Grading" section. To reduce the potential for off-site erosion, the slope should be overbuilt by at least three inches and trimmed back to design grade. Alternatively, the face of the slope can be compacted or track-walked.

If the fill slopes will exceed five feet in height, the toe of the fill should be keyed into the subgrade soil. The keyway should be at least three feet wide and extend at least two feet below existing site grades. The base of the keyway should be scarified and recompacted as described above, resulting in a firm and unyielding subgrade prior to fill placement.

Foundation Support

The proposed backwash tank will be founded on-grade and will have perimeter ring-wall foundations. Prior to foundation construction, the soil subgrade beneath the tank should be overexcavated to a depth of at least three feet. The overexcavation should extend at least three feet horizontally beyond the limits of the tank foundations. The base of the overexcavation should be scarified to a depth of eight inches, moisture conditioned to at least two percent above optimum moisture content, and compacted to at least 90 percent relative compaction.

The foundation for the proposed backwash tank can consist of a continuous ring-wall foundation bearing in native or recompacted silt or clay. The ring-wall foundations should be at least two feet wide and extend at least 18 inches below the lowest adjacent grade. Allowable bearing pressures of 3,000 and 4,000 pounds per square foot (psf) can be used for dead plus live load and total load conditions (including wind and seismic), respectively. These values include factors of safety of

[5] Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material, as determined by ASTM D1557-07 laboratory compaction procedure.

about 2.0 and 1.5 for dead plus live load and total load conditions, respectively. We estimate total settlement using these values will be less than one inch, with less than 1/2 inch of differential settlement across the width of the tank.

The foundations for the proposed chlorine building can consist of continuous or isolated spread footings bearing in native clay. Footings should be at least 18 inches wide and 12 inches deep. Allowable bearing pressures of 2,000 and 3,000 psf can be used for dead plus live load and total load conditions, respectively. We estimate total settlement using these values will be less than 1/2-inch.

Lateral loads can be resisted by a combination of passive pressure acting on the vertical face of the footings and friction on the base of the footings. Passive pressure on the face of the footing should be computed using an equivalent fluid weight (triangular distribution) of 260 pounds per cubic foot (pcf) for sustained loads, assuming level soil in front of the footing. For transient loads, a uniform pressure of 1,000 psf can be used. The upper foot of soil should be neglected unless the ground surface is confined by a slab or pavement. Frictional resistance should be computed using a value of 0.35. The values presented for passive and frictional resistance can be used in combination and include factors of safety of at least 1.5 to reduce the potential for lateral movement.

The footing excavations should be free of standing water, debris, and disturbed materials prior to placing concrete. We should check foundation excavations after cleaning but prior to placement of reinforcing steel to confirm the excavations are bottomed in suitable bearing material and have been cleaned properly. If loose soil is encountered at the bottom of a footing excavation, it should be removed and replaced as described above. The bottoms and sides of footings should be maintained in a moist condition until concrete is placed.

Concrete Slabs-on-Grade

Exterior concrete slab-on-grade equipment pads should be at least four inches thick and reinforced with minimum temperature steel per American Concrete Institute (ACI) 318. Thicker slabs may be required for anchorage requirements. The slabs should be underlain by at least eight inches of Class 2 aggregate base (AB) conforming to Section 26-1.02A (3/4-inch max) of the most recent CalTrans Standard Specifications. The AB should be moisture conditioned to near optimum moisture content and compacted to at least 90 percent relative compaction. The soil subgrade beneath the aggregate base should be moisture conditioned to at least two percent above optimum moisture content and compacted to at least 90 percent relative compaction and be firm and unyielding.

The soil subgrade beneath the slab-on-grade floor for the chlorine building should be prepared as described above. If the subgrade is disturbed during excavation for footings and utilities, it should be recompacted. Soft, disturbed materials should be excavated and removed during final subgrade preparation.

If it is desired to reduce water vapor transmission through the chlorine building floor slab, we recommend a capillary moisture break and a water vapor retarder be installed beneath the floor. A capillary moisture break consists of at least four inches of clean, free-draining gravel or crushed rock. The vapor retarder should meet the requirements for Class C vapor retarders stated in ASTM E1745-97 (2004). All seams in the vapor retarder should be overlapped by at least six inches, taped, and sealed. All penetrations should be similarly sealed. The vapor retarder should be covered with two inches of sand to aid in curing the concrete and to protect the vapor retarder during slab construction. The particle size of the gravel/crushed rock and sand should meet the gradation requirements presented in Table 1.

TABLE 1
Gradation Requirements for Capillary Moisture Break

Sieve Size	Percentage Passing Sieve
Gravel or Crushed Rock	
1 inch	90 – 100
3/4 inch	30 – 100
1/2 inch	5 – 25
3/8 inch	0 – 6
Sand	
No. 4	100
No. 200	0 – 5

The sand overlying the membrane should be moist at the time concrete is placed; however, there should be no free water present in the sand. Excess water trapped in the sand could eventually be transmitted as vapor through the slab. If rain is forecast prior to pouring the slab, the sand should be covered with plastic sheeting to avoid wetting. If the sand becomes wet, concrete should not be placed until the sand has been dried or replaced.

Concrete mixes with high water/cement (w/c) ratios result in excess water in the concrete, which increases the cure time and results in excessive vapor transmission through the slab. Therefore, concrete for the floor slab should have a low w/c ratio - less than 0.50. If approved by the project structural engineer, the sand can be eliminated and the concrete can be placed directly over the vapor retarder, provided the w/c ratio of the concrete does not exceed 0.45 and water is not added in the field. If necessary, workability should be increased by adding plasticizers. In addition, the slab should be properly cured. If a floor covering is placed, the contractor should check that the concrete surface and the moisture emission levels (if emission testing is required) meet the manufacturer's requirements.

The recommendations presented above represent the minimum requirements for the vapor retarding system, and it should be expected that some vapor will still be transmitted through slab-on-grade. Additional measures, such as using a polyolefin, Class A vapor retarding membrane (Stegowrap 15 mil or equivalent), can help to further reduce the risk of vapor transmission through the slab.

Seismic Design

For design in accordance with ASCE 7-05, the site should be classified as Site Class D. Based on the site location, the following seismic parameters are appropriate for the site:

- $S_S = 0.495$
- $F_a = 1.404$
- $S_1 = 0.223$
- $F_v = 1.953$
- $S_{MS} = 0.696$
- $S_{M1} = 0.436$
- **$S_{DS} = 0.464$**
- **$S_{D1} = 0.291$**

The peak ground acceleration (PGA) consistent with the values presented above is 0.19 g.

Lateral Earth Pressures

At the time we prepared this report, retaining walls were not proposed for the project. However, we understand short retaining walls may be required in localized portions of the site. In general, the on-site clayey soils are acceptable for reuse as retaining wall backfill for conventional cantilever wall construction such as cast-in-place concrete or concrete masonry unit. For static conditions and level backfill, walls designed to rotate at the top can be designed for "active" earth pressure conditions using an equivalent fluid weight of 40 pcf. If the walls are fixed against rotation, they should be designed for "at-rest" conditions using an equivalent fluid weight of 60 pcf. This value assumes the walls are properly backdrained to prevent hydrostatic water pressures from acting on the outside of the wall, as discussed below.

Walls retaining more than 10 feet of soil (if required) should also be checked for the potential lateral pressure increase associated with seismic loading. For seismic conditions, we recommend all walls be checked for an active earth pressure of 40 pcf as described above plus a seismic pressure increment. The seismic pressure increment can be computed using a uniform pressure of 5H in psf, which is distributed over the entire retained height (H) of the wall. This distribution results in an equivalent resultant force that acts at a height of 0.6H from the base of the wall.

Where traffic will act behind the walls, a vehicle surcharge should be included in the design. The vehicle surcharge should consist of a uniform pressure (rectangular distribution) of 120 psf applied over the entire height of the wall. Alternatively, the vehicle surcharge can be modeled as a 250 psf uniform vertical surcharge placed behind the wall.

Wall Drainage

All walls should be properly backdrained over the entire height and width of the wall. Backdrains can consist of a prefabricated drainage panel (Miradrain 6000 or equivalent) placed against the backside of the wall or an at least 12-inch-wide zone of granular drainage material. The drainage material can consist of 3/4-inch clean crushed rock[6] wrapped in filter fabric (Mirafi 140N or equivalent) or Class 2 permeable material conforming to Section 68-1.025 of the CalTrans Standard Specifications (most recent edition). Where Class 2 permeable material is used, the filter fabric is not required.

The drainage system should extend down to a perforated PVC collector pipe (perforations facing down) at the base of the wall. The pipe should be surrounded on all sides by at least four inches of granular drainage material. Where drainage panels are used, prefabricated collection strips (i.e., AdvanEDGE pipe or equivalent) may also be used in lieu of the PVC pipe surrounded by crushed rock. We should review the manufacturer's specifications for all proposed drainage materials to verify they are appropriate for the intended use. The pipe or collector strip should be sloped to drain to a closed pipe system emptying to a suitable outlet.

Wall Foundations

Retaining walls can be supported on spread footings. Spread footing foundations should be designed using the values previously provided for the chlorine building.

Segmental Block Wall Design

If mechanically stabilized earth (MSE) walls with a segmental block facing (such as Keystone™) will be used at the site, the clayey, on-site soils are not appropriate for use as backfill around the geogrid reinforcement due to the elevated PI and fines content. Therefore, it will be necessary to import granular, low plasticity backfill material for the reinforced soil zone, which will increase the relative cost of segmental block walls. The wall designer should select appropriate design parameters consistent with the proposed import material. Foundation (bearing) capacity and wall drainage should be addressed as described previously for the chlorine building.

Pavement Design

Concrete (Rigid) Pavement

Concrete pavements should be designed to a maximum single-axle load of 20,000 pounds and a maximum tandem axle of 32,000 pounds. For these axle loads, we recommend using an 6-inch-thick section of reinforced Portland concrete cement (PCC). The PCC pavement should be supported on at least six inches of Class 2 aggregate base. The upper six inches of the soil subgrade in pavement areas should be moisture-conditioned to above optimum moisture content and compacted to at least 95 percent relative compaction. The entire thickness of aggregate base

6 Clean crushed rock should have 100% of the particles passing a 1" sieve and no more than 10% and 5% passing the 3/8-inch and No. 4 sieves, respectively.

should also be moisture-conditioned to near optimum moisture content and compacted to at least 95 percent relative compaction.

The compressive strength of the PCC should be at least 3,000 psi at 28 days and the modulus of rupture should be at least 400 psi at 28 days. Control joints (3/4-inch) should be constructed at 12-foot spacings. Expansion joints should be constructed on 24-foot spacing and sealed with an elastomeric sealant and prefabricated joint filler. We recommend concrete pavement be reinforced with a minimum of No. 4 bars at 18 inches on center in both directions as a minimum.

Asphalt Concrete Pavements

The preliminary design of asphalt concrete (AC) pavements was performed in accordance with the flexible pavement design methodology developed by CalTrans. This method utilizes a measure of the stiffness and deflection potential of the soil under saturated conditions (R-value) and the expected traffic loading for the site (Traffic Index, TI) to develop the minimum pavement section required.

An R-value test was performed on a sample of near surface clay collected at the site. The reported R-value for this test is 35, which is relatively high for the clayey soils encountered at the site. To allow for variations in the surficial clay materials, an R-value of 20 was used for design. Therefore, any material imported to the site and used beneath asphalt pavement should also have an R-value of at least 20.

Because we anticipate traffic on the site will be light, we selected a TI of 5.5 for design. This value should be confirmed by the design engineer. The computed pavement section for a TI of 6 and R-value of 20 is 3 inches of AC over 9 inches of AB.

The minimum R-value for AB should be 78. All AB and AC used at the site should also conform to the requirements presented in the most current version of Sections 26 and 39 of the CalTrans Standard Specifications, respectively. Recommendations for subgrade preparation and compaction are the same as those we previously described for PCC pavement.

To prevent irrigation water from entering the pavement section, vertical curbs adjacent to landscaped areas should extend at least three inches into the underlying native subgrade. If pavements are constructed adjacent to heavily watered landscaped areas, installation of a subdrain adjacent to the vertical curb may also be required.

Corrosivity

Sunland Analytical of Rancho Cordova, California performed corrosivity testing on a representative sample of the surficial native clay retrieved from boring B-1. The bulk sample was retrieved from the upper two feet of soil. The testing indicates the native clay has a minimum resistivity of 1,530 ohm-cm, indicating the soil is moderately to highly corrosive. The pH of the soil is 6.06, which is acceptable. Accordingly, all buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion

depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron fire protection pipelines should be protected against corrosion. The use of non-corrosive materials or corrosion inhibitors, such as cathodic protection, protective painting, or coating should be considered for underground pipes or structures.

The measured chloride ion concentration is 9.8 parts per million (ppm). Because the chloride ion concentration does not exceed 500 ppm or greater, we believe it is insufficient to attack steel embedded in a concrete or mortar coating.

The measured sulfate ion concentration is 48.2 ppm. Because sulfate ion concentrations do not exceed 2,000 ppm, we believe they are insufficient to damage reinforced concrete structures and cement mortar-coated steel at these locations.

The recommendations presented above are general in nature. We recommend a corrosion expert be consulted to provide specific corrosion protection recommendations, particularly for critical structures.

LIMITATIONS

This report has been prepared for the sole use of Forsgren Associates, Inc. and their agents specifically for the design of the project described herein. The opinions, conclusions and recommendations contained in this report are based upon the information obtained from our site reconnaissance and exploration, our engineering studies, experience, and engineering judgment, and have been formulated in accordance with generally accepted geotechnical engineering practices that exist at the time this report was prepared. No other warranty, expressed or implied, is made or should be inferred. In addition, the recommendations presented in this report are based on the subsurface conditions encountered in a single soil boring. Actual conditions may vary. If subsurface conditions encountered in the field differ from those described in this report, we should be consulted to determine if changes to our conclusions or supplemental recommendations are required.

The opinions presented in this report are valid as of the date of this report for the property being evaluated. Changes in the condition of a property can occur with the passage of time, whether due to natural processes or the works of man. If site conditions vary from those described herein, we should be consulted to evaluate the impact of the changes, if any. In addition, changes in applicable standard of practice can occur, whether from legislation or the broadening of knowledge. Accordingly, the opinions presented in this report may be invalidated, wholly or partially, by changes outside of SAGE's control. In any case, this report should not be relied upon after a period of three years without prior review and approval by SAGE.

We trust this provides the information you require. If you have any questions please call us.

Sincerely yours,
Sanders & Associates Geostructural Engineering, Inc.

Darren A. Mack
Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
DARREN A. MACK
GE2634
Exp 12/31/09
GEOTECHNICAL
STATE OF CALIFORNIA

T. Nathan Manley
Professional Geologist

PROFESSIONAL GEOLOGIST
T. NATHAN MANLEY
No. 8339
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Attachments: Figure 1 – Site Location Map
Figure 2 – Site Plan
Appendix A- Logs of Soil Boring and Field Exploration Program
Appendix B- Laboratory Test Results

REFERENCES

American Society of Civil Engineers (ASCE), 2006, *Minimum Building Loads for Buildings and Other Structures*, ASCE Standard ASCE/SEI 7-05.

California Building Standards Commission, 2001, *California Building Code (CBC)*, California Code of Regulations, Title 24, Part 2, Volume 2, Chapter 16.

California Building Standards Commission, 2007, *California Building Code (CBC)*, California Code of Regulations, Title 24, Part 2, Volume 2, Chapter 16.

California Code of Regulations (CCR), 2005, *Register 2005, No. 17, Title 8, Division 1 – Department of Industrial Relations, Chapter 4 – Division of Industrial Safety, Subchapter 4 – Construction Safety Orders, Article 6 – Excavations, Sections 1539 through 1547*, April 29.

California Division of Mines and Geology (CDMG), 1996, *Probabilistic Seismic Hazard Assessment for the State of California*: Open-File Report 96-08, published also as U.S. Geological Survey Open-File Report 96-706.

CDMG, 1997a, *Fault-Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zones Maps*: Special Publication 42.

Jennings, C.W., 1994, *Fault Activity Map of California and Adjacent Areas with Locations and Ages of Recent Volcanic Eruptions*, Geologic Data Map No. 6, California Division of Mines and Geology, Scale: 1:750,000.

Mualchin, L., 1996, *A Technical Report to Accompany the Caltrans California Seismic Hazard Map 1996*: California Department of Transportation Office of Earthquake Engineering, July 1996, 65 p.

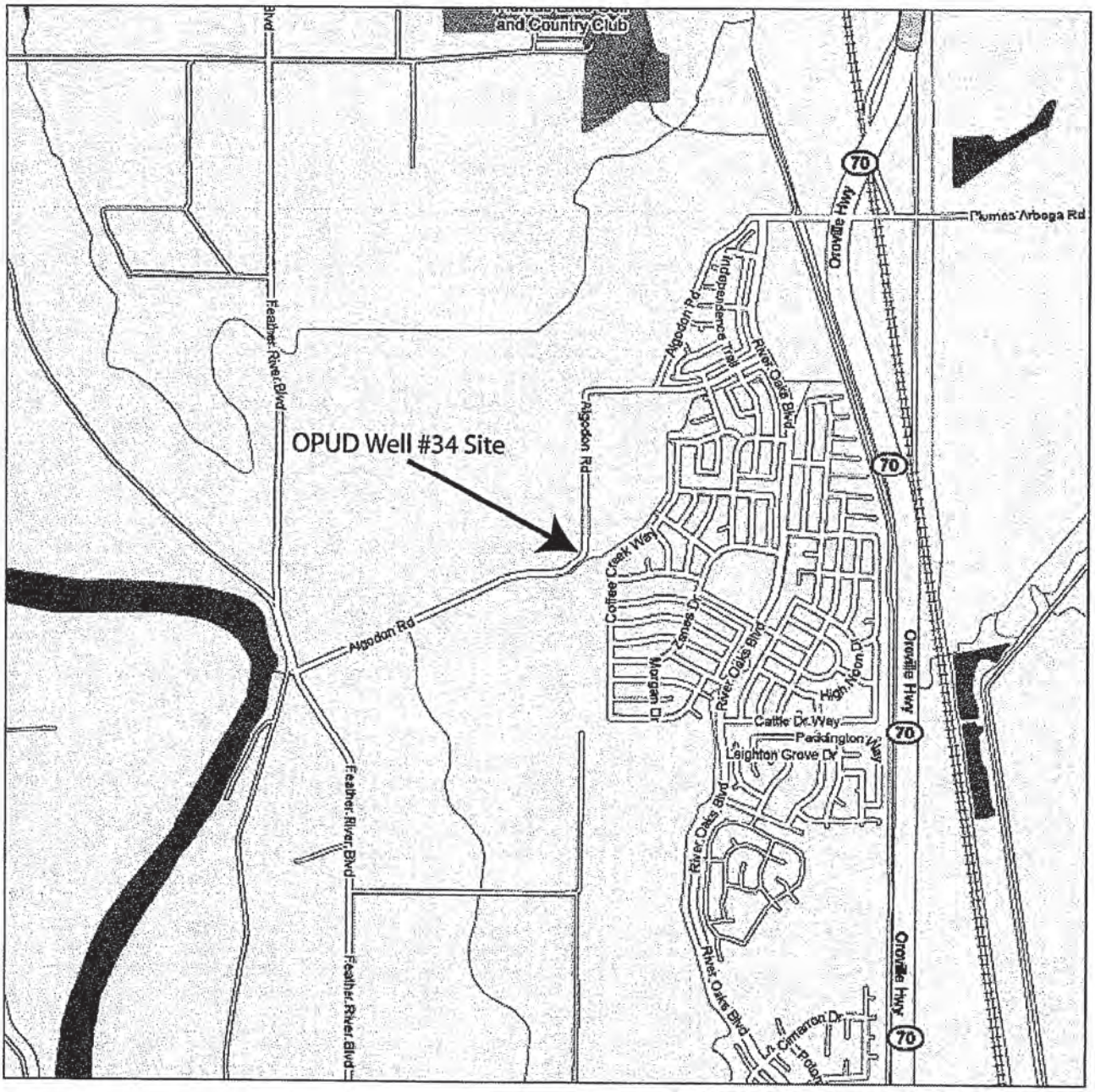
Mualchin, L., and Jones, A.L., 1992, *Peak Acceleration from Maximum Credible Earthquakes in California*, California Department of Conservation, Division of Mines and Geology Open-File Report 92-01

Seed, H.B., and Idriss, I.M., 1971, *A Simplified Procedure for Evaluating Soil Liquefaction Potential*, JSMFD, ASCE, Volume 97, Number SM 9.

Seed, H.B., and Idriss, I.M., 1982, *Ground Motions and Soil Liquefaction During Earthquakes*, EERI Monograph, Earthquake Engineering Research Institute.

United States Geological Survey (USGS), 2002, Probabilistic Hazard Curves for the 48 Conterminous States, Open File Report 02-420 and http://earthquake.usgs.gov/research/hazmaps/design/index.php.

FIGURES



Base Map: 2008 Google Maps - Map Data 2008 Tele Atlas

N

0 2,500 feet

Approximate scale

OPUD Well #34 Facility

Yuba County California

SITE LOCATION MAP

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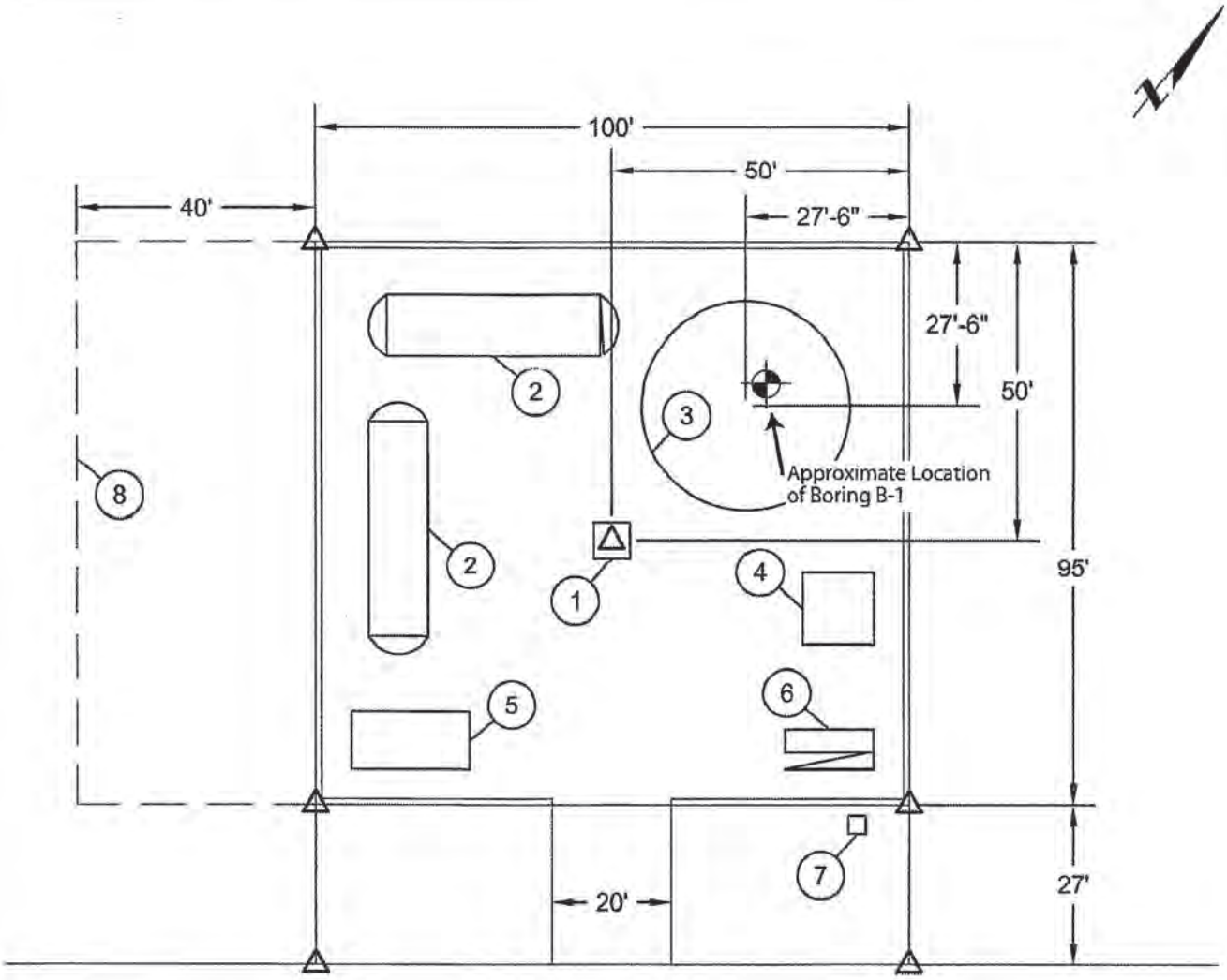
Project No. SE08-043

Date: 10/03/2008 Figure: 1



ALGODON ROAD
(FUTURE ALIGNMENT)

0 30 feet
Approximate scale

LEGEND:

1. WELL
2. PRESSURE FILTERS (2)
3. BACKWASH TANK
4. CHLORINE BUILDING
5. GENERATOR
6. ELECTRIC PANEL
7. UTILITY TRANSFORMER
8. ADDITIONAL PROPERTY FOR METHANE TREATMENT (IF REQUIRED)

△ LOCATIONS OF SURVEY MARKERS

Reference: "OPUD Well 34 Sept 30.pdf", prepared by Forsgren Associates, Inc., dated 9/30/08.

OPUD Well #34 Facility

Yuba County California

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SITE PLAN

Project No. SE08-043

Date: 10/03/2008 Figure: 2

APPENDIX A
Log of Soil Boring and Field Exploration Program

A.1 Field Exploration Program

Our field exploration program consisted of drilling one small-diameter geotechnical test boring to obtain data necessary to evaluate subsurface conditions for the proposed project. The approximate boring location, designated as B-1 is shown on Figure 2.

Based on discussions with personnel at the Yuba County Environmental Health Department (YCEHD), we were informed that a drilling permit was required for this project. A permit was obtained from the YCEHD prior to drilling. In addition, we obtained utility clearances by marking the boring location with white paint and notifying Underground Service Alert (USA) at least 48 hours prior to the start of drilling.

Boring B-1 was drilled on August 20, 2008 by Taber Consultants, Inc. using a trailer-mounted CME-45 drill rig equipped with four-inch-diameter solid flight augers and mud rotary drilling equipment. The boring was drilled to a depth of 51.5 feet below the existing ground surface. The upper portion of the boring, above the perched groundwater, was drilled using solid flight augers. Below the first encountered groundwater, drilling was performed using mud rotary equipment. During drilling, our geologist logged the materials encountered and obtained representative samples for visual classification and laboratory testing. The materials encountered were classified in general accordance with the Unified Soil Classification System (USCS) as summarized on Figure A-1. The log for boring B-1 is presented as Figure A-2.

Representative soil samples for this investigation were recovered using the following sampler types:

- California split-barrel sampler with a 2.5-inch-outside diameter fitted with 2.0-inch-inside-diameter, six-inch-long brass liners; and
- Standard Penetration Test (SPT) split-barrel sampler with a 2.0-inch-outside diameter, without liners.
- Thin-walled Shelby tube with a 3.0-inch nominal diameter.

Both split-barrel samplers were driven with a 140-pound safety hammer with a rope and cathead system and a fall of 30 inches; the Shelby tube was pushed hydraulically. The blow counts required to drive the samplers over a standard 18-inch-drive were recorded in six-inch increments in the field. Where refusal was encountered (defined as greater than 50 blows over any six-inch increment) drive lengths less than 12 inches were also recorded. The final 12-inches of the drive (less in the case of refusal) were added to develop the reported blow count. The blow counts for the California sampler were corrected for the effects of sampler size and converted to SPT N-values using a conversion factor of 0.83. The final, corrected values for each drive are presented on the boring logs and represent N_{60} values.

Upon completion of drilling, the hole was backfilled with cement-bentonite grout in accordance with YCEHD. The cuttings generated during drilling were spread out on the ground adjacent to the boring location.

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		Symbols	Typical Names
Coarse-Grained Soils (more than half of soil > No. 200 sieve size)	Gravels (More than half of coarse fraction > No. 4 sieve size)	GW	Well-graded gravels or gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	Sands (More than half of coarse fraction > No. 4 sieve size)	SW	Well-graded sands or gravelly sands, little or no fines
		SP	Poorly-graded sands or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
Fine-Grained Soils (more than half of soil < No. 200 sieve size)	Silts and Clays LL = < 50	ML	Inorganic silts and clayey silts of low plasticity, sandy silts, gravelly silts
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
		OL	Organic silts and organic silt-clays of low plasticity
	Silts and Clays LL = > 50	MH	Inorganic silts of high plasticity
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic silts and clays of high plasticity
Highly Organic Soils		PT	Peat and other highly organic soils

GRAIN SIZE CHART

Classification	Range of Grain Sizes	
	U.S. Standard Sieve Size	Grain Size in Millimeters
Boulders	Above 12"	Above 305
Cobbles	12" to 3"	305 to 76.2
Gravel coarse fine	3" to No.4 3" to 3/4" 3/4" to No. 4	76.2 to 4.76 76.2 to 19.1 19.1 to 4.76
Sand coarse medium fine	No. 4 to No. 200 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No. 200	4.76 to 0.074 4.76 to 2.00 2.00 to 0.420 0.420 to 0.074
Silt and Clay	Below No. 200	Below 0.074

TYPES OF STRENGTH TESTS

PP	Pocket Penetrometer
TV	Field Torvane
LVS	Laboratory Vane Shear
UC	Unconfined Compression
TXUU	Triaxial, unconsolidated, undrained
DS	Direct Shear

▽ Unstabilized (initial) groundwater level

▼ Stabilized groundwater level

SAMPLER TYPE

C — Core barrel

O — Osterberg piston sampler using 3.0-inch outside diameter, thin-walled Shelby tube

PT — Pitcher tube sampler using 3.0-inch outside diameter, thin-walled Shelby tube

ST — Shelby tube (3.0-inch outside diameter, thin-walled tube) advanced with hydraulic pressure

BULK — Disturbed grab sample

CA — California split-barrel sampler with 2.5-inch outside diameter and 1.93-inch inside diameter

MCA — Modified California split-barrel sampler with 3.0-inch outside diameter and 2.5-inch inside diameter

SPT — Standard Penetration Test (SPT) split-barrel sampler with a 2.0-inch outside diameter and a 1.5-inch inside diameter

o — Sampling attempted without recovery

OPUD WELL #34 FACILITY

Yuba County — California

SOIL CLASSIFICATION CHART

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Project No. SE08-043

Date 10/03/08 | Figure A-1

PROJECT:	OPUD WELL FACILITY # 34 Yuba County, CA	LOG OF BORING B-1	Sheet 1 of 2
BORING LOCATION:	See Site Plan, Figure 2	DRILLING SUBCONTRACTOR:	Taber Consultants, Inc.
DATE STARTED: 8/20/2008	DATE FINISHED: 8/20/2008	DRILL RIG:	Trailer-mounted CME-45
LOGGED BY:	T. N. Manley	DRILLING METHOD:	Solid Flight Auger/Mud Rotary
ELEVATION (FT): N/A	DATUM: N/A		
GW DEPTH (FT): 14.0	GW DATE: 8/20/2008	HAMMER TYPE:	Rope and cathead (safety)
CASING NOTES:	N/A	HAMMER WT (LBS): 140	HAMMER DROP (IN): 30
BACKFILL MATERIAL:	Neat Cement Grout	SAMPLERS:	SPT, CA

DEPTH (FT)	ELEV. (FT)	SAMPLE TYPE	SAMPLE	SPT N60 VALUE	LITHOLOGY	DESCRIPTION	LABORATORY TEST DATA: MOISTURE CONTENT (%)	DRY DENSITY (pcf)	FINES (%)	TYPE of TEST	UNCONFINED STRENGTH (tsf)	SHEAR STRENGTH (ksf)	PLASTICITY: LL	PI
0														
2		BULK			CL	CLAY WITH SAND (CL) brown, medium stiff to stiff, moist, sand is fine-grained with pyrite flecks R-value = 35 (collected adjacent to B-1)								
4		SPT		4			15.0						26	11
6		CA		41	ML	SANDY SILT (ML) yellow-brown, hard, moist, fine sand							46	17
8		SPT		24		SILT WITH SAND (ML) gray-brown, medium dense to very stiff, moist, mottled with reddish brown oxidized inclusions, interbedded with CLAY with SAND (CL)								
10		CA		25		grades sandy, moisture content higher than previous sample								
12					ML	8/20/2008 09:55 AM								
14														
16		ST				grades yellow brown, medium dense to hard, wet pushed Shelby 12" @ 1200 psi								
18					SM	SILTY SAND (SM) brown, medium dense, moist, fine to medium sand with pale brown silt interbeds								
20		CA		22										
22					SP	SAND (SP) gray brown, dense, moist, fine grained								
24														
26		SPT		32										
28														
30		CA		29		gray, dense, moist, medium to course sand with fine, rounded gravel lenses								
32														
34						SILTY SAND (SM) brown, medium dense, moist, fine sand with pyrite flecks and silty interbeds								

CA and SPT blow counts converted to SPT N60 values using conversion factors of 0.83 and 1.0, respectively.

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Project No: SE08-043
Figure: A-2

LOG OF BORING 08-043.GPJ SAGE.GDT 10/3/08

PROJECT: OPUD WELL FACILITY # 34
Yuba County, CA

LOG OF BORING B-1

Sheet 2 of 2

DEPTH (FT)	ELEV. (FT)	SAMPLE TYPE	SAMPLE	SPT N60 VALUE	LITHOLOGY	DESCRIPTION	LABORATORY TEST DATA: MOISTURE CONTENT (%)	DRY DENSITY (pcf)	FINES (%)	TYPE of TEST	UNCONFINED STRENGTH (tsf)	SHEAR STRENGTH (ksf)	PLASTICITY: LL	PLASTICITY: PI
36		SPT		22	SM	SILTY SAND (SM) (Con't)	34.5		25.0					
38														
40		CA		30		dense								
42														
44														
46		SPT		14	ML	mostly coarse sand with silt interbeds / siltier layers SANDY SILT (ML) gray brown, medium dense to stiff, moist, with medium-grained sand interbeds								
48														
50		SPT		23		olive brown, medium dense to very stiff, moist, with clay lenses, (47.8 % silt, 5.6% clay)	35.7		53.4					
52														
54														
56														
58														
60														
62														
64														
66														
68														
70														
72														
74														

Boring terminated at a depth of 51.5 feet.
CA and SPT blow counts converted to SPT N60 values using conversion factors of 0.83 and 1.0, respectively.

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Project No: SE08-043
Figure: A-2

LOG OF BORING 08-043.GPJ SAGE.GDT 10/3/08

APPENDIX B
Laboratory Test Results

B.1 Laboratory Testing

Representative soil samples obtained from the borings were reviewed in our office to confirm field classifications and selected samples were submitted to Sierra Testing Laboratories (STL) in El Dorado Hills for laboratory testing; R-value samples were subcontracted to Wallace-Kuhl & Associates by STL. Laboratory testing was performed to determine the following properties:

- Resistance Value (R-value) of Soil per ASTM D2844;
- Moisture content per ASTM D2216;
- Atterberg Limits (Plasticity Index) per ASTM D4318;
- Particle Size Analysis, Percent Passing No. 200 sieve (Fines Content) per ASTM D1140;
- Hydrometer with sieve analysis to No. 200 per ASTM D422
- pH and Minimum Resistivity per CA DOT Test 643
- Sulfate per CA DOT Test 417
- Chloride per CA DOT Test 422

The laboratory reporting sheets for the laboratory testing follow.

MOISTURE CONTENT & UNIT WEIGHT TEST RESULTS

Sample Identification	Depth, ft.	Wet Unit Weight, lb/ft.^{3}	Dry Unit Weight, lb/ft.^{3}	Moisture Content, %
B-1, #1	2.5			15.0
B-1, #12	35			34.5
B-1, #16	50			35.7

Test Method: ASTM D2216, ASTM D2937

PROJECT NUMBER: 08-291 | September 4, 2008

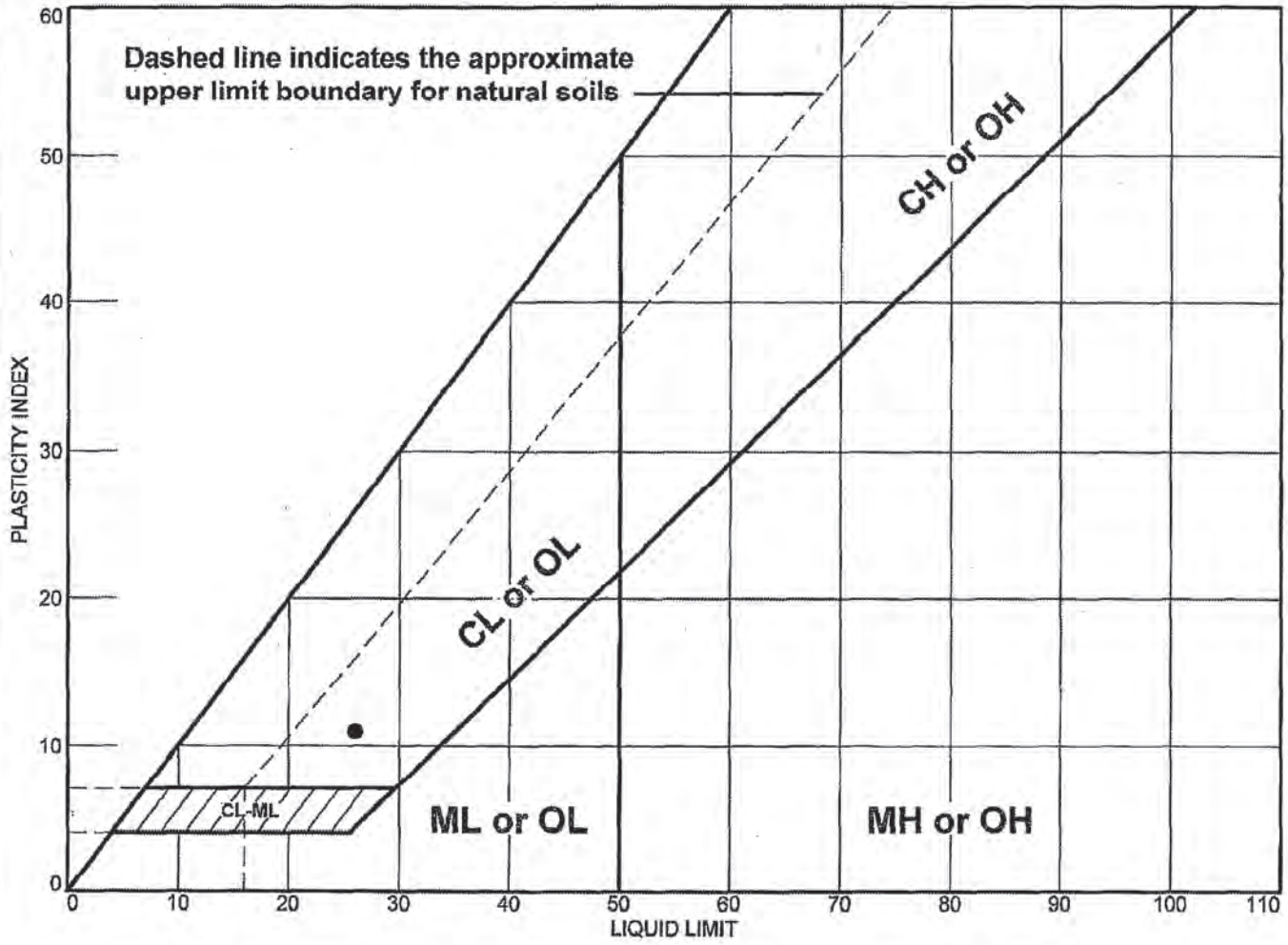
OPUD Well #34

SE08-043

SIERRA TESTING LABORATORIES, INC.
GEOTECHNICAL AND MATERIALS TESTING SERVICES

5040 Robert J. Mathews Blvd., El Dorado Hills, CA 95762
Phone: (916) 939-3460 FAX: (916) 939-3607

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●		26	15	11			

Project No. 08-291 **Client:** Sanders & Associates Geostructural Engineering, Inc

Project: OPUD Well #34

#SE08-043

● **Location:** B-1, #1 **Depth:** 2.5 **Sample Number:** S6630

Remarks:

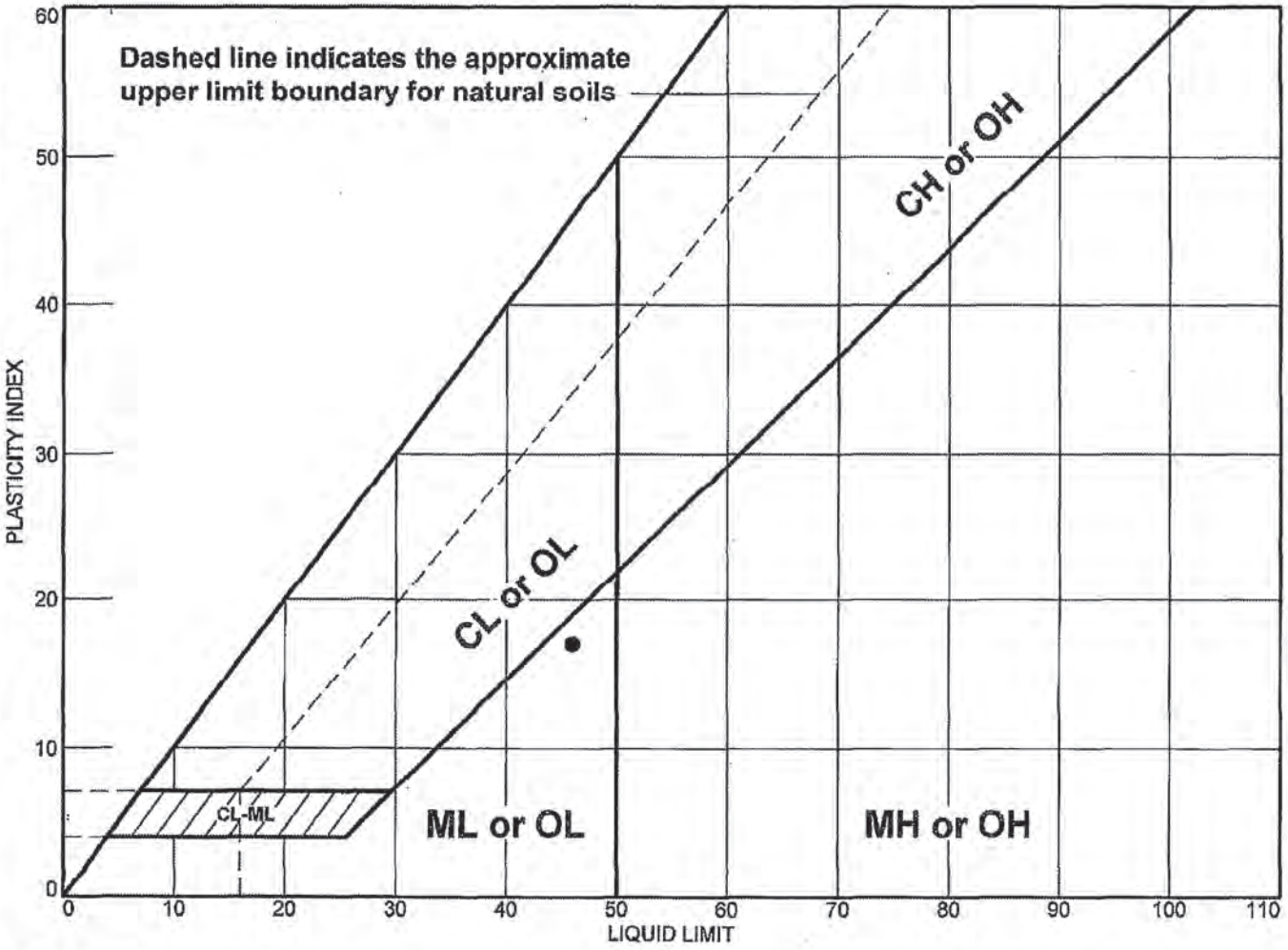
SIERRA TESTING LABS, INC.

El Dorado Hills, CA

Figure

Tested By: JS **Checked By:** MN

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●		46	29	17			

Project No. 08-291 **Client:** Sanders & Associates Geostructural Engineering, Inc

Project: OPUD Well #34

#SE08-043

● **Location:** B-1, #2 **Depth:** 5.0 **Sample Number:** S6631

Remarks:

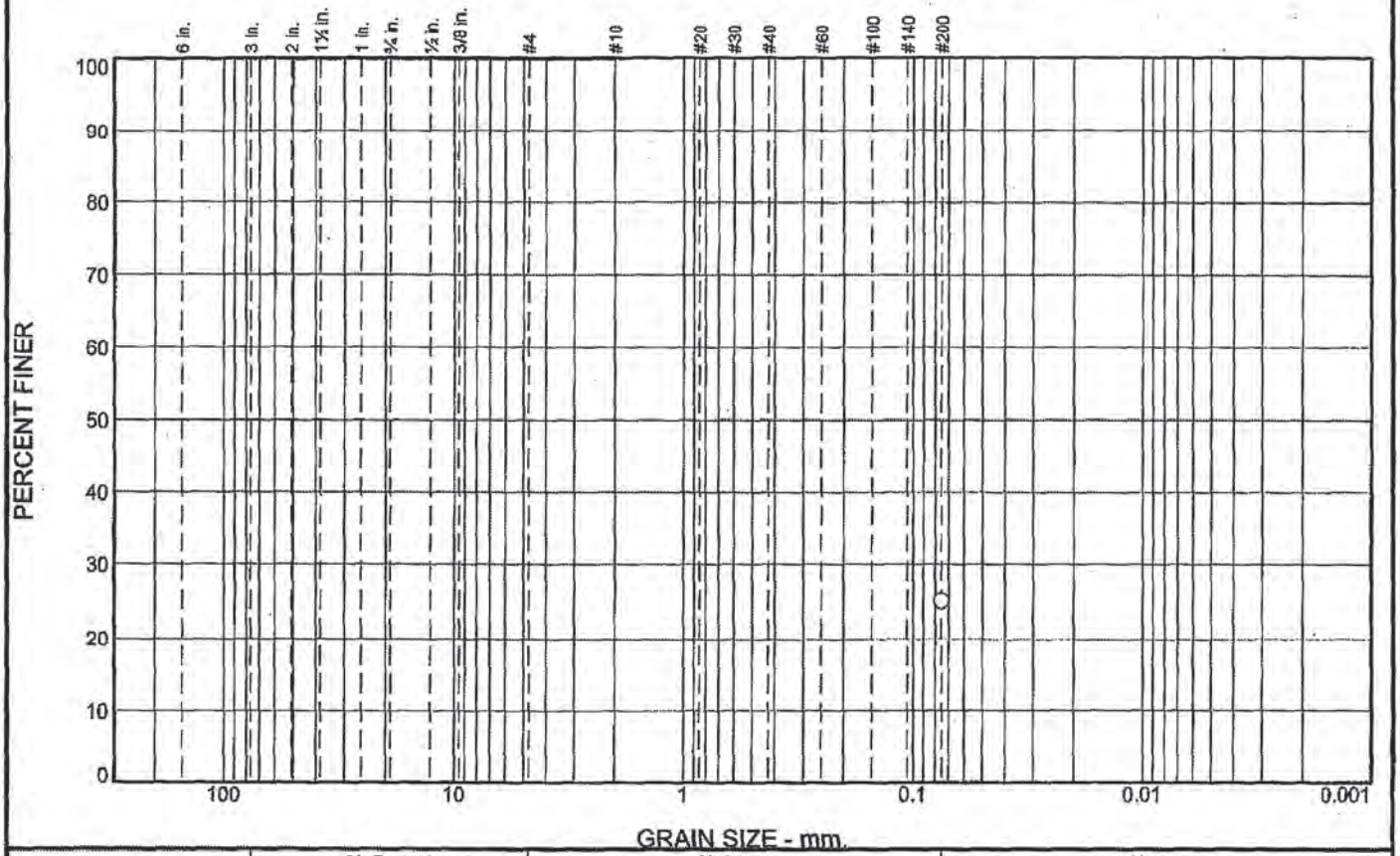
SIERRA TESTING LABS, INC.

El Dorado Hills, CA

Figure

Tested By: JS **Checked By:** MN

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						25	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	25		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

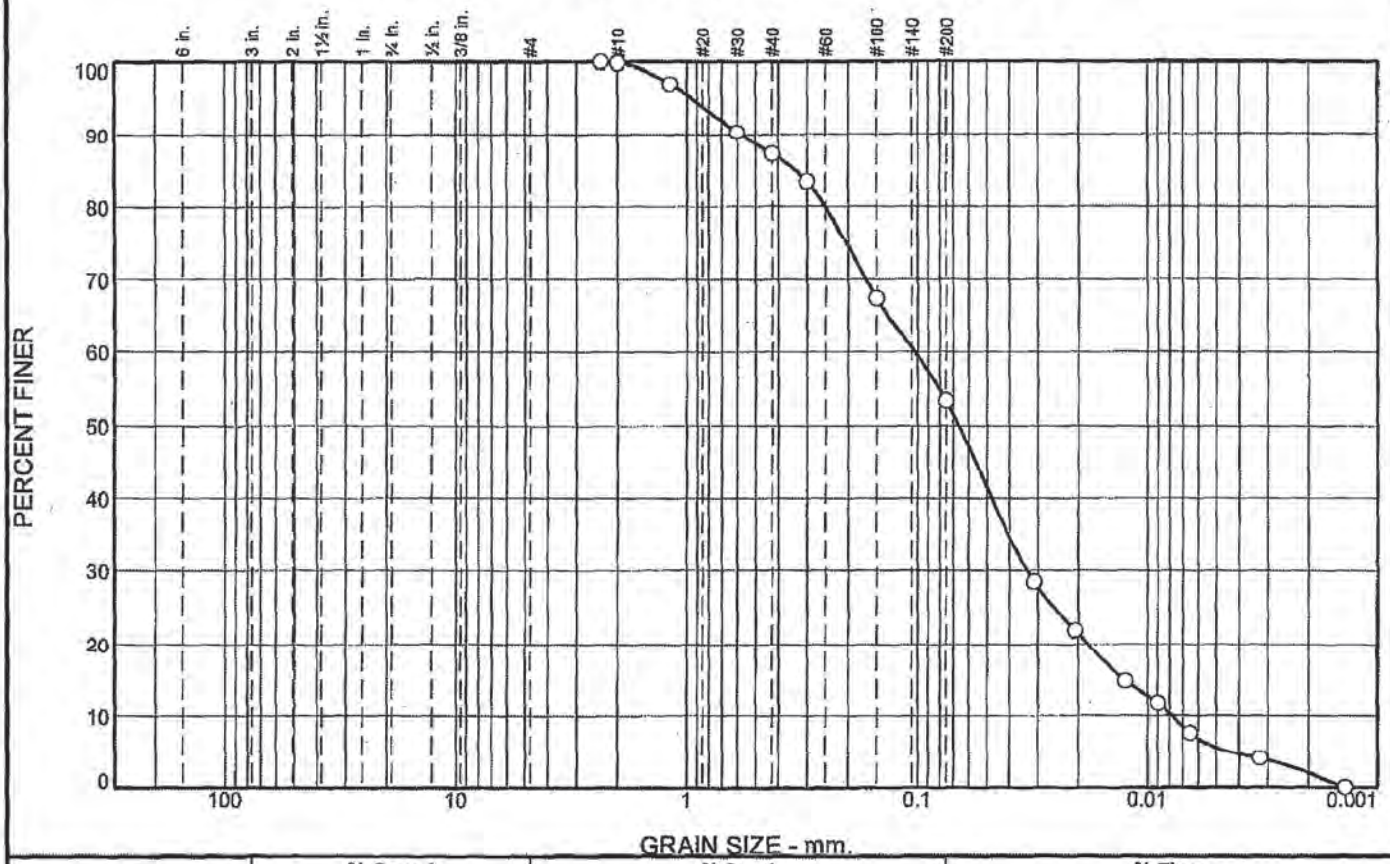
Location: B-1, #12
Sample Number: S6632 **Depth:** 35.0 **Date:** 9/4/08

SIERRA TESTING LABS, INC.
El Dorado Hills, CA

Client: Sanders & Associates Geostructural Engineering, Inc
Project: OPUD Well #34
#SE08-043
Project No: 08-291 **Figure**

Tested By: MPW **Checked By:** MN

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	12.7	33.8	47.8	5.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#8	100.0		
#10	99.9		
#16	97.0		
#30	90.3		
#40	87.2		
#50	83.4		
#100	67.5		
#200	53.4		
0.0310 mm.	28.5		
0.0206 mm.	21.9		
0.0124 mm.	14.8		
0.0090 mm.	11.7		
0.0065 mm.	7.7		
0.0032 mm.	4.1		
0.0014 mm.	0.1		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.5805 D_{85}= 0.3364 D_{60}= 0.1024
D_{50}= 0.0661 D_{30}= 0.0332 D_{15}= 0.0127
D_{10}= 0.0078 C_u= 13.14 C_c= 1.38

Classification

USCS= AASHTO=

Remarks

Location: B-1, #16
Sample Number: S6633 **Depth:** 50.0 **Date:** 9/4/08

SIERRA TESTING LABS, INC.
El Dorado Hills, CA

Client: Sanders & Associates Geostructural Engineering, Inc
Project: OPUD Well #34
#SE08-043
Project No: 08-291 **Figure**

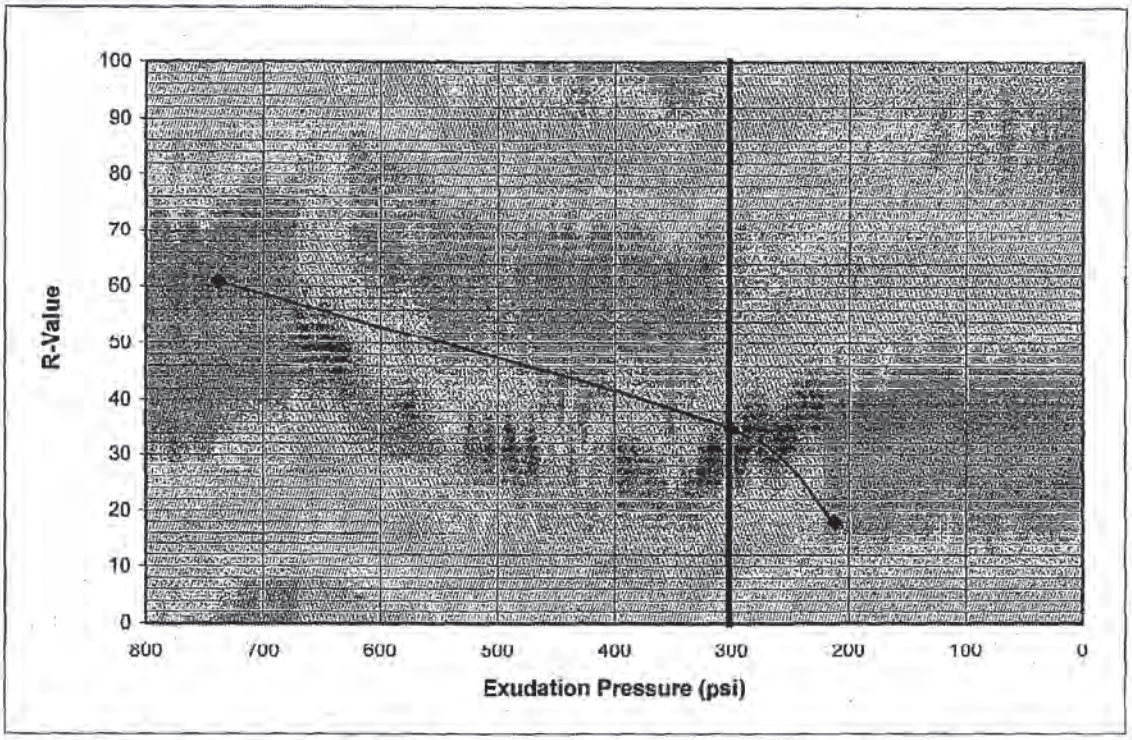
Tested By: MW/RL **Checked By:** CMW

SIERRA TESTING LABORATORIES, INC.
GEOTECHNICAL AND MATERIALS TESTING SERVICES

Resistance Value

Test Procedure: CAL 301

Client Project:	OPUD Well #34
STL Project Number:	08-291
Client Project Number:	SE08-043
Sample Number:	Bulk 0-2', S6629
Sample Received Date:	9/4/2008
Material Description:	VISUAL:Brown sandy, clayey silt



Specimen Number:	*1*	*2*	*3*	
Moisture at Test (%)	**15.3**	**13.4**	**11.9**	
Dry Unit Weight at Test (pcf)	**113.0**	**117.0**	**123.0**	
Expansion Pressure (psf)	**52**	**74**	**312**	
Exudation Pressure (psi)	**212**	**301**	**738**	
Resistance Value	**18**	**35**	**61**	
Resistance Value at 300 psi exudation pressure			**35**	

NOTE: Wallace Kuhl & Assoc. Proj. No. 8276.03

Sunland Analytical
11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 09/05/2008
Date Submitted 09/02/2008

To: Darren Mack
Sanders & Assoc. Geostructural Eng.
4180 Douglas Blvd. Ste #100
Granite Bay, Ca 95746

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : SE08-043 OPUD WELL34 Site ID : B-1 BULK 0-2'.
Thank you for your business.

* For future reference to this analysis please use SUN # 54328-109019.

EVALUATION FOR SOIL CORROSION

Soil pH	6.06	
Minimum Resistivity	1.53 ohm-cm (x1000)	
Chloride	9.8 ppm	00.00098 %
Sulfate	48.2 ppm	00.00482 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

SANDERS & ASSOCIATES GEOSTRUCTURAL ENGINEERING
sage
INTEGRATING EARTH & STRUCTURE

MEMORANDUM

TO: Mr. Jim DeHart

FROM: Darren A. Mack, Geotechnical Engineer

DATE: April 20, 2010

PROJECT: SE08-043

RE: Supplemental Geotechnical Recommendations
Olivehurst PUD Well #34
Olivehurst, California

As requested, we have reviewed the updated site grading plans, dated March 1, 2010, and prepared by Affinity Engineering Inc. In general, the proposed site improvements remain consistent with those noted in the Site and Project Description of our *Geotechnical Investigation Report* dated October 22, 2008. The revised plan, however, shows additional fill placement that increases the backwash tank foundation to 6 feet above existing grade.

Based on our review of our geotechnical report, the previous recommendations are generally applicable to the revised plan. However, in accordance with our proposal dated April 2, 2010, we have prepared the following revisions to our recommendations:

Site Grading

- Grading at the site is generally expected to consist of cuts and fills on the order of two to six feet.
- We believe most of the material excavated will be suitable for reuse as engineered fill, provided the material is moisture conditioned to a moisture content that will limit the potential for future moisture content change. **The upper three feet of placed fill should consist of imported select fill and have a plasticity index of less than 12.**
- **Select fill should be moisture conditioned to above optimum moisture content and compacted to at least 90 percent relative compaction.** See below for fill requirements beneath the tank foundation.

Foundation Support

- Native soil beneath the tank foundation should be vertically overexcavated at least three feet. The overexcavation should extend at least three feet horizontally beyond the limits of the tank foundations. The base of the overexcavation should be scarified to a depth of eight inches and compacted to 90 percent relative compaction.
- **Overexcavated and recompacted native material beneath the tank should be moisture conditioned to at least two percent above optimum moisture content and compacted to at least 95 percent relative compaction. Select fill should be moisture conditioned to above optimum moisture content and compacted to at least 95 percent relative compaction.**
- **Passive pressure on the face of the footing should be computed using an equivalent fluid weight (triangular distribution) of 300 pounds per cubic foot (pcf) for sustained and transient loads, assuming level soil in front of the footing.**

The remaining recommendations in our October 22, 2008 report remain valid. Please call if you have any questions.