ADDENDUM NO. 4

Date: September 14, 2018
Project: **Secondary Treatment Plant Upgrade & Recycled Water Expansion**
Job No.: 12600-07/16650-02

To: All Planholders and Prospective Bidders

This addendum consists of **two hundred forty-three (243) pages** including this page and all attachments with cover sheets broken down as follows:

Main Addendum #4 Document (including cover, signature page, and this sheet) – 30 pages
Attachment A – 117 pages (including cover sheet)
Attachment B – 12 pages (including cover sheet)
Attachment C – 9 pages (including cover sheet)
Attachment D – 20 pages(including cover sheet)
Attachment E – 12 pages (including cover sheet)
Attachment F – 5 pages (including cover sheet)
Attachment G – 2 pages (including cover sheet)
Attachment H – 2 pages (including cover sheet)
Attachment I – 9 pages (including cover sheet)
Attachment J – 25 pages (including cover sheet)

Acknowledge receipt of this addendum in the space provided on page 2-5, Proposal Cover Page and Bid Schedule, of the Bid Forms, and by signing in the space provided below. Submit original copy of this addendum cover page along with the bid. Failure to do so may disqualify the bidder.

Las Gallinas Valley Sanitary District: Bidder: _____

_____

Michael P. Cortez, PE, District Engineer (Authorized Signature) (Date)
Tel. No. (415) 472-1033, ext. 18

The following changes and/or clarifications are hereby made to the Contract Documents, and shall become a part of the Contract Documents dated July 2018.

Volumes 1 & 2:

1. **Volume 2 BID SCHEDULE**: After reviewing the options for final coating systems for the two (2) secondary clarifier mechanism (an Owner Selected Equipment Item), the District has elected to replace the prime coat from the supplier's scope with a supplier-furnished hot-dipped galvanized (HDG) finish. The contractor will **not** be required to apply a finish coat to the clarifier mechanisms. The cost adder from the supplier of $6,550 total for both mechanisms has been updated in the revised Bid Schedule. **A copy of this revised Bid Schedule page is included as an attachment to this addendum.** Details of the new cost breakdown are discussed below with the Volume 3A items. The contractor is responsible to touch up the HDG coating per the requirements of Section 098000 to repair any incidental damage due to unloading, handling, storage, and installation.

2. **Volume 2 page 2-22**: Note 4 on this page is hereby removed as it appears to confuse the intent of Item 7.1 in the Instruction to Bidders (Volume 1 page 1-10). To confirm and clarify, award basis will be as stated in Item 7.1 in the Instruction to Bidders.

3. **Volume 2** – Regarding the good faith effort and required forms for MBE/WBE, the District will allow submittal of these forms that are listed as "due at bid opening" to be furnished within 3 business days ***after*** bid opening. This was allowed for the previous bid and is acceptable in this case as well.

Volume 3 Appendix

4. The original Request for Proposals (RFP) as released for Owner Selected Equipment procurement is hereby added as **Appendix C** to Volume 3. **A copy of this document is provided as an attachment to this addendum**. Note that not every piece of equipment specified in the RFP was selected and incorporated into this project.

Volume 3A

1. **Section 011000**: This section is updated as follows:

   Add the following paragraph to Section 1.2
   E. Owner's Programmer: ArcSine Engineering 530/222-7204

   Add the following sentence to Paragraph A:
   25. Coordination with the District's Programmer, including startup and testing.

2. **Section 013100**: Section1.9 of this specification is updated as follows:

   Replace paragraph A.2 with the following
   2. Control Systems Supervisor, whose role is defined in Section 440900.

   Edit Paragraphs H.10 and H.11 are updated to require a **4** hour teleconference in lieu of 2 hours as currently specified.

The following paragraphs are added to the end of Section 1.9.H:

12. WS #12 Factory Testing (teleconference, 4 hours). Review the scope and timing of control system-related factory testing. Include consideration of testing specified in Section 440900, testing specified in Section 260000, and testing specified elsewhere. Address timing, location(s), and sequencing to meet overall project requirements.
13. WS #13 – Topic to be determined (in person). Allow for an additional on-site workshop to cover control system-related topics.
14. WS #14 - Topic to be determined (teleconference, 4 hours). Allow for an additional teleconference to cover control system-related topics.

3. **Section 017500**: This section is updated as follows:

   a. Article 1.4.A Commissioning Work, add the following paragraph:
      Phases 1 and 2 shall be undertaken on portions of the Plant as construction progresses, with sequence and timing as needed to meet project phasing requirements.

   b. Article 2.1.F Commissioning Plan, add the following paragraph:
      8. The Contractor shall include in the commissioning schedule adequate for complete testing of automation, including creating a wide range of process conditions (normal and out of range), and repeats to allow for system tuning. The cases where variables are "forced" shall be minimized, and process planning and adequate schedule are necessary to do so.

   c. Table 2 (page 13), listing the items that require startup includes structures/processes that are no longer part of this project. The following items are removed from this table:
      Group #1: Modified Primary Biofilter
      Group #3: Secondary Scum Pump Station
      Independent Systems: Secondary Clarifier #3, EQ Basin, PC/Headworks, Odor Control, DAFT Thickeners, Solar Awnings, Biogas Flares, Restroom, and Storage Building.

4. **Section 151100**: The cost table for the secondary clarifier equipment has been updated to reflect the recent change to a hot-dipped galvanized (HDG) coating that will be provided by the supplier. The table, as provided in Section 1.3.C.4 is updated as follows:

(2) Secondary Clarifier Mechanisms	Bid Item #16.c
Base Equipment Package	$ 300,214.00
Submittals	$ 32,000.00
Spare Parts	$ -
Sales Tax (9%)	***Included***
Base Package Subtotal	**$ 332,214.00**
Post RFP Changes	
Addition of Picket Rail	$ 15,065.00
316 SS Walkways/Platforms	$ 55,185.00
Hot Dip Galvanize Mechanism	$ 6,550.00
Adjusted Total	**$ 409,014.00**
Submittals Already Paid	$ 32,000.00
Net Amount Remaining	**$ 377,014.00**

This cost change has been updated in the Bid Schedule as discussed above.

Volume 3B

1. **Section 260000:** See re-issued specification. Article 3.3 was inserted referencing Motor Control Test. Existing articles have been shifted accordingly.

2. **Section 262419:** Article 2.1 (Motor Control Centers)
    a. Paragraph Q – Remove the sixth sentence and replace with the following: Intelligent MCC shall be equipped with Moxa EDS-510A-1GT2SFP or Moxa EDS-
    b. Add the following paragraphs:
        i. Factory test in accordance with manufacturer standard testing. Submit test results.
        ii. Undertake an interconnected factory test (Motor Control Test – MCT) as specified in Section 260000. This test requires assembling all networked motor controllers and PLCs in a single location.

3. **Section 262923:** Article 2.9 (Source Quality Control)
    a. In Paragraph A insert Field before Test and inspect VFDs.
    b. Insert the following paragraphs:
        i. Factory test in accordance with manufacturer standard testing. Submit test results.
        ii. Undertake an interconnected factory test (Motor Control Test – MCT) as specified in Section 260000. This test requires assembling all networked motor controllers and PLCs in a single location.

4. **Section 316329 Drilled Concrete Piers and Shafts**: This section is hereby added to Volume 3B; it provides additional direction and requirements specific to the deep foundation

caisson piers associated with this project. **A copy of this specification is provided with this addendum for reference.**

5. **Section 321313 Concrete Paving**: The following changes are made to this section to incorporate requirements for Pervious Concrete:

   a. Add the following to Section 1.1.A:
      4. Pervious Concrete

   b. Add Section 2.9 as follows:

2.9 PERVIOUS CONCRETE

A. Experience: The placing Contractor shall furnish owner/engineer/ a statement attesting to qualifications, experience, sample of workmanship and installed product (e.g. references and project addresses).
B. If either the Pervious Placing Contractor or the Pervious Concrete Producer have no prior experience with Pervious Concrete Pavement, the Contractor shall retain an experienced Consultant to supervise base preparation, production, placement, finishing and curing. Expense of the consultant shall be the responsibility of the Contractor.
C. Concrete Mix Design: Contractor shall furnish a proposed mix design with proportions of materials to Owner or Gent prior to commencement of work. Cement content shall be a minimum of 580 pounds per cubic yard, with total cementations content to be a minimum of 630 pound per cubic yard. Water cement ratio shall be a maximum of 0.30. The data shall include unit weights determined in accordance with ASTM C29 paragraph 11, jigging procedure. Based on the unit weight of the mix, compacted void content of the mix shall be a minimum of 10% and a maximum of 20%.
D. Cement: Portland cement Type II conforming to ASTM C150 or Portland cement Type IP or IS conforming to ASTM C595.
E. Aggregate: Use 3/8 coarse aggregate that meets 3/8 to No. 16 per ASTM C33, or meeting 3/8 to No. 50 per ASTM D448. Smooth rock aggregate is recommended and has been found to perform better than crushed rock aggregates. If other gradation of aggregate is to be use, submit data on proposed material to owner for approval. Larger aggregate sizes increase pore size but decrease workability. Aggregates that are well graded reduce porosity, and may require reduction of minimums require written approval from the Owner's Representative.
F. Chemical Admixtures:
   - Air entraining agents shall comply with ASTM C260.
   - Type A Water Reducing Admixtures shall comply with ASTM C494.
   - Type B Retarding Admixtures shall comply with ASTM C494.
   - Type D Water Reducing/Retarding Admixtures shall comply with ASTM C494.
   - Hydration stabilizer shall meet the requirement of ASTM C494 Type B Retarding Admixtures or Type D Water Reducing /Retarding Admixtures.
     Note: *A hydration stabilizer can be utilized and is recommended in the design and production of pervious concrete. Hydration stabilizer suspends cement hydration by forming a protective barrier around the cementitious particles, which delay the particles from achieving initial set.*

G. Mineral Admixture:

• Fly ash conforming to ASTM C618 may be used in amounts not to exceed 20% of total cementitious materials.
• Ground Iron Blast-Furnace Slag conforming to ASTM C989 may be used in amounts not to exceed 50% by weight of total cementitious material.

H. Bituminous mixtures shall be delivered to the roadbed at temperatures specified in Section 39 of the current State Standard Specifications. Spreading of the mixture shall be in accordance with Section 39 of the State Standard Specifications. All loads shall be covered with tarpaulin or other material during transportation.
I. Pervious concrete shall match the existing adjoining pavement in thickness as a minimum, or as indicated in the design drawing standards, whichever is greater.

6. **Sections 400558 (Stainless Steel Channel Gates) and 400559 (Stainless Steel Weir Gates)**: These sections do not specify requirements for field service for installation observation/inspection, startup/testing, and training. General field service requirements are discussed in Section 014000 paragraph 1.8.B (page 7) and 017419 paragraph 1.5 (page 3). In summary, the Contractor (and its suppliers) are expected to provide the supplier/manufacturers recommended amount of field service for installation supervision/inspection, startup/testing, and training (unless specifically stated otherwise in individual specification sections). However, after recent inquires from specific suppliers, the following service requirements are hereby added for gates (including channel and weir style gates):

   Installation Supervision/Training: **1 trip - total of 1 day**
   Installation Inspection: **3 trips – total of 6 days**
   Startup/Testing/Training: **2 trips – total of 6 days;** training to be coordinated and completed during one of these trips.

   Both of these spec sections have the following statement in Section 2.1.C.2: "The gate frame shall be made of formed plates or structural members creating the clear opening of the specified dimensions in a rigid one-piece unit." The following sentence is added to this statement in both specifications:

   "*Guides bolted together are not acceptable*."

   Also, our input from manufacturers is that the bolted frames will not have the rigidity and strength required in the specifications nor be compatible with nor be able to accommodate the style of gusset that will required for certain applications.

7. **Section 409000:** Refer to re-issued specification with the following changes: Article 1.4 (I&C System Requirements)
   a. In Paragraph A.3 "Systems Integrator" was replaced with "Programmer"
   b. In Paragraph A.3 "Systems Integrator" was replaced with "Programmer"
   c. The following paragraph was added (A.5): All PLC and OIT Owner-selected equipment specified in Volume 3, Appendix A, shall be programmed by the equipment manufacturer. Those manufacturers shall provide complete control

strategies, tag/register lists, and participate in all aspects of network system integration.

d. Paragraph B.5 was replaced with the following: The IS shall conduct a Pre-Submittal Conference before producing any submittals. The conference should include all parties involved with the I&C System including Contractor Representatives, the Engineer, Package System PLC Vendors, Owner, and Owner's Programmer. The purpose of the conference shall be to review the project as a whole, make sure all parties understand their roles and responsibilities and to review submittal and coordination requirements
e. Paragraph B.6 item e was replaced with the following: PLC Tag list submittal for Owner selected equipment (programmed by the equipment manufacturer)
f. Paragraph B.6 item f was replaced with the following: OIT tag list submittal for Owner selected equipment (programmed by the equipment manufacturer)
g. Paragraph B.14.c.6 was replaced with the following: Recommend Spare Parts List and sources.
h. In Article 1.8 (Quality Assurance) the following was added: Experience requirements for the Control Systems Supervisor are specified later in this Section.
i. Added Article 1.9 (Control Systems Supervisor)
j. Added Article 1.10 (Workshops)
k. Added Article 1.11 (Summary of Responsibilities)
l. Replaced article 3.4 in its entirety.

8. **Section 409443:** Article 2.6 (Spare Parts)
    a. Replace Article 2.6 with the following:
        i. In addition to the spare parts requirements of Section 409000, provide the following:
            1. Two spare processors for each type of PLC processor supplied for the project.
            2. Two spare I/O cards for every type of I/O card supplied for the project.
            3. Two spare PLC power supplies for every type supplied for the project.
            4. Two spare network adapters for each type of network adapter supplied for the project
            5. Two spare bases of each type supplied, for rack-style PLC's
        ii. The Contactor shall ship to the District's Programmer, one of each of the items above, for use in program development. While in the possession of the District's Programmer, the Programmer will be responsible for properly handling and protecting the components. In the event of a warranty failure, the Contractor shall cooperate in effecting a warranty claim
        iii. The parts shipped to the District's Programmer shall be provided no later than 90 days from Contract NTP

iv. The remainder of the spares shall be kept in the Contractor's possession and be available throughout the commissioning process, should failures or other circumstances require the parts

9. **Section 409533:**
   a. Under article 2.3 remove H.2 and replace with the following: Fiber Optic Connectors shall utilize the LC type connector.
   b. Under article 2.6 paragraph E strike "ST" and replace with "LC"

10. **Section 409600:**
   a. Replace paragraphs under article 2.1 with the following:
      i. PLC Programming software for PLCs, except for PLC software for owner-selected will be procured by the District/District's' Programmer outside of this contract.
      ii. PLC programming software for Owner selected equipment (Appendix A Owner Selected Equipment) Shall be furnished with the equipment.
   b. Replace paragraphs under article 2.2 with the following
      i. OIT Programming software shall be provided with the associated equipment. See Appendix A Owner Selected Equipment.
   c. Add the following Article.
      i. SCADA System Software
         1. SCADA licensing/software will be procured by the District/District's Programmer.

11. **Section 409635**
   a. Replace paragraphs under article 2.1 with the following:
      i. PLC Programming for PLC's specified in Section 409000 will be by the District's Programmer.
      ii. Programming of Appendix A Owner Selected Equipment is by the equipment vendors. Vendors shall coordinate and comply with District standards for tagging and communications. Vendors shall provide control strategies during program development and as-built the strategies at project conclusion. Provide3 complete automated PLC programs prior to factory testing for use by the District's Programmer. Provide "as-left" PLC programed, annotated, unlocked (no password protection) at project conclusion.
   b. Replace paragraphs under article 2.2 with the following:
      i. All OIT programming is to be provided by the equipment vendors (Appendix A Owner selected equipment) Vendors shall coordinate and comply with District standards for tagging and communications. Vendors shall provide configurations software and the resulting applications unlocked (no password protection) at project conclusion.
   c. Replace paragraphs under Article 2.3 with the following:
      i. SCADA system programming will be by the District's Programmer.

12. **Section 432313**: **Self-Priming Centrifugal Pumps**: This type of pump is no longer required for the project and no pumps of this type are listed in the pump schedule. Accordingly, this section is hereby removed from Volume 3B.

13. **Section 432420**: **Horizontal Axial Flow Pumps**: This section was omitted from the bid package Volume 3B **and is included as an attachment to this addendum for reference**. This is associated with the axial flow pumps (36-P-1100/1200/1300) as listed on the pump schedule.

Volume 4A

1. **Sheets D-1, D-4, and D-16**: The District has already begun tree removal and salvage work at the site. Accordingly, the requirements to salvage trees (see Sheet D-16) is no longer a part of this project. Accordingly sheet D-16 is removed from Volume 4A. In addition, the District has removed trees, shrubs, and other plants from the pond area to be demolished and backfilled for the new process basins (see Sheets D-1 and D-4). Regarding trees, they have been removed and the stumps ground to 18-inches below finish grade. However, the Contractor is still responsible to remove any remaining roots and other foliage from this area.

2. **Sheet C-5**: The southern portion of paving along the hillside (where new asphalt is planned) currently has a block wall along the road and hill. The District has elected to preserve and maintain this block wall rather than installing Type 'E' curb along the asphalt as currently indicated on sheet C-5. Thus, curbing is no longer required along this portion of the pavement and the Contractor is just to preserve and protect the existing wall. **A copy of Sheet C-5 is provided with this addendum** indicating which segment of curbing has been removed from the work.

3. **Sheet C-9**: This yard piping plan sheet has been updated to add another connection between existing 6-inch sludge lines to facilitate future plant operation (labeled as Pipe #128B on this sheet). The connection will a tee-fitting to connect to the existing pipe and an additional wye fitting on the new sludge line (Pipe #128) similar to connection detail #9 as already provided on sheet C-24. Note that the yard piping schedule on sheet C-6 will be updated in the construction set to include Pipe #128B.

   In addition, this installation requires replacing one (1) 6-inch plug valve and installing a new 6-inch plug valve (both exposed and above ground) on existing piping. **An updated version of this sheet is provided as an attachment to this addendum**. In addition **Sheet C-50** has been added to Volume 4A to detail the replacement and additional 6-inch valves on the existing piping. **A copy of sheet C-50 is also provided as an attachment to this addendum**.

4. **Sheet C-13**: The routing of some pipelines has been adjusted to provide more space between pipelines that will be installed in Phase 1 (and 2) and the secondary clarifier #1 structure that cannot be installed until Phase 3. The updates are summarized as follows:

a. Pipe #116 (14" secondary clarifier #2 RAS) has been shifted east so that it no longer runs beneath the footing of the future clarifier. It still boarders the required drain-field around SC #1, but it is a deeper line and will be beneath activity associated with SC #1 footing and drain field.
b. Pipe #119 (30" secondary clarifier influent line has the same plan view route, but the vertical profile has been adjusted to maintain this pipe beneath the drain field. See comments for Sheet C-21 for details.
c. Pipe #126 (4" secondary clarifier #2 scum line) has been rerouted to be farther away from SC #1 and now connects at a different location with SC #2 (see comments for SC #2 drawings below).
d. Pipe #125 (4" secondary clarifier #1 scum line) has been rerouted to feed scum into the Process Basin Drain Sump; this coordinates with the changes discussed on sheets PSM-1, PMS-3 and PSM-5 below.
e. Pipe #132B (15" storm drain) has been rerouted to be farther away from SC #1.

Even with these adjustments, space is very limited and precautions, shoring, and careful coordination will be required to ensure that critical lines can continue to operate during installation of later project improvements. **A revised version of this sheet is provided with this addendum.**

5. **Sheet C-21**: The profile for Pipe #119 (30" secondary clarifier #2 influent line has been updated to maintain this pipe beneath footing and drain field improvements that will need to be installed after Pipe #119 is already installed and operational. **A revised version of this sheet is provided with this addendum.**

6. **Sheets C-47 and C-48**: The tag number for the gate in the bypass control box should be **23-G-3120** rather than 21-G-3120**.**

7. **Sheet C-50**: As discussed above, this sheet has been added to provide details on the one (1) replacement 6-inch plug valve and the one (1) new 6-inch plug that are to be installed on an existing 6-inch DIP line. **A copy of this new sheet is provided with this addendum for reference.**

8. **Sheet PSS-6**: The gate callout in Section 'C' on this sheet should be **23-G-3110** rather than 21-G-3130 – this matches the gate schedule and plan view shown on sheet PSS-2.

9. **Sheets PSM-1, PSM-3, and PSM-5**: The 4-inch secondary clarifier scum line has been rerouted to feed into the drain box (the deepest basin adjacent to the RAS collection boxes) that houses pump 61-P-1300. The discharge for this pump has been modified to include a second discharge option, including two new valves (check and isolation plug valves **61-V-1311 and 61-V-1312** respectively) and an additional 4" DIP/HDPE discharge line that connects to the WAS pump discharge line below grade. These sheets have been modified to show the new route of the 4" scum line and the new discharge line/valves associated with the drain pump. Note that other drawings in the PSM area will be updated to reconcile with this change for the construction set. **Revised versions of these sheets are provided as an attachment to this addendum for reference.**

10. **Sheet AS-2**: For the caisson table on this sheet (and similar tables for the electrical and UV buildings), the "Depths to Bedrock" values indicate the anticipated depth to the top of bedrock from the bottom elevation of the overlying grade beam. These depths are relative to the bottom of the grade beam at each location and not the existing or proposed grade elevations.

11. **Sheets AS-7 and AS-9**: For consistency, the gate called out in the left-most chamber of the secondary clarifier splitter boxes should have tag **33-G-1210** rather than tag 33-G-1120. Also, the tag for the telescoping valve in this chamber should be **33-G-1211** rather than 31-G-1111. Likewise, the tag for the telescoping valve in the center chamber should be **33-G-1111** rather than 31-G-1201. These tags should also be updated on Sections K and J as shown on sheet AS-9. Finally, it should be noted that the left most chamber is associated with secondary clarifier #2 (not clarifier #1) and the center chamber to secondary clarifier #1. This matches the yard piping and other aspects of the design drawings.

12. **Sheet SCS-2 and SCM-2**: The 4-inch scum line associated with secondary clarifier #2 has been rerouted as discussed above for sheet C-13. Accordingly, its position as shown on the structural and mechanical plans for this clarifier are updated to match the revised yard piping layout. This represents rotating the position of the 4-inch scum line roughly 9-degrees counterclockwise to align with the new yard piping. The construction set will be updated to show the new position of the scum line.

13. **Sheet SCH-11**: The following valves are added to the valve schedule:

    Tag: **61-V-3111**; Location: Process Basin Drain Sump; Service: Scum Waste Pump Isolation; Type: Check; Size: 4"; Connection: FLxFL; Actuator: -; Remarks: Valmatic Series 500A Swing Check or Equal.

    Tag: **61-V-3111**; Location: Process Basin Drain Sump; Service: Scum Waste Pump Isolation; Type: Plug; Size: 4"; Connection: FLxFL; Actuator: LV; Remarks: Dezurik Full Port Eccentric Plug Valve or Equal.

    Tag: **62-V-3110**; Location: Gravity Thickener Area; Service: Sludge Transfer Isolation; Type: Plug; Size: 6"; Connection: FLxFL; Actuator: LV; Remarks: Dezurik Full Port Eccentric Plug Valve or Equal.

    Tag: **62-V-3120**; Location: Gravity Thickener Area; Service: Sludge Transfer Isolation; Type: Plug; Size: 6"; Connection: FLxFL; Actuator: LV; Remarks: Dezurik Full Port Eccentric Plug Valve or Equal.

    These valves were added at the District's request (as discussed for Sheet C-50 above) to provide additional sludge transfer options for operators.

14. **Sheet SCH-12**: There have been questions regarding the appropriate specification reference for each pump listed in the schedule. Accordingly, a condensed version of the pump schedule is **provided as an attachment to this addendum** that includes an additional column with the specification section number listed.

Volume 4B

1. **Sheet PI-26:** Sheet has been re-issued to show level transducer on MMWD tank
2. **Sheet LE-02, SE-06:** The SES as shown occupies one section. It is anticipated that the SES will occupy two sections, so twice the size as shown on the drawings. Shift the ATS south along the wall to provide space for the SES.
3. **Sheet LE-02,LE-03, LE-04, LE-10 and LE-14:** Have been re-issued to show more detail on grounding. Grounding of structure and major process equipment is shown. Contractor is still responsible for grounding metal surfaces such as hand rails and roofs to the UFER ground.
4. **Sheet SE-02, SE-06, SE-07:** Sheets have been re-issued to show street lighting and associated ductbanks.
5. **Sheet E-4:** Remove the manual transfer switch and associated Note 4.
6. **Sheet E-12:** Sheet has been re-issued to show the loads for site lighting.
7. **Sheet E-19:** Modified lighting control panel to account for added site lights.
8. **Sheet E-20:** Sheet has been re-issued to show updated instrument schedule per questions and added MMWD tank level transducer (52-LT-1300).
9. **Sheets E-21-E-23:** Sheets have been re-issued to show conduits for site lighting. Conduits added onto E-21 required shifting conduits onto pages E-22 and E-23.
10. **Sheet E-39**: Sheet has been re-issued to show conduits for site lighting.
11. **Sheet E-44,E-45,E-46, E-48, and E-49:** Sheets have been re-issued to show addition to ductbanks for site lighting.

Questions:

The following questions were submitted on 9/06/2018:

1. Drawing SE-03 - Note 4 - What size cabling? Does this need to be in conduit? If so, what type and size conduit? Where is the solar array transformer?
   Answer: Refer to Addendum No. 3

2. Drawing SE-03 - Note 5 - Note 5 is not called out on the plan drawing anywhere. Does it apply to this drawing? If so, where? How many lighting and power circuits need to be reconnected?
   Answer: Refer to Addendum No. 3

3. Drawings SE-03 through SE-07 show an electrical legend symbol for a new light fixture (or relocated existing). We cannot locate this symbol on any of the referenced drawings. Where does this apply?
   Answer: See re-issued site layouts.

4. Drawing SE-07 - Notes 4 & 5 - Please provide list of all conduit and wiring present in these vaults.
   Answer: Contractor will need to verify on site. We have as-builts that do not match current site conditions.

5. Drawing LE-01 - Note 4 - What size is pullbox JB-13?
   Answer: It is anticipated that this would just be a wireway to intercept wiring from the existing conduit beneath the MCC being demolished – the actual size will be dependent on site conditions, but it would be a max length of 4' long 10" deep and 10" tall. Actual site conditions may allow for a smaller wireway.

6. Drawing LE-02 - There is a callout in the upper right hand corner of this drawing for Detail 1010 / GE-09. This detail does not exist.
   Answer: Remove the detail from the drawing.

7. Drawing LE-04 - There is a callout to Note 7 (Typical) to a light fixture in the upper left hand corner of this drawing. Is this is mistake? Also Note 7 calls out Detail 921 on Drawing GE-08. That detail does not exist. Please clarify.
   Answer: The callout should be Note 8 instead of Note 7. Also the referenced detail 921 should be corrected to 901.

8. Regarding the statement - "Conduit development is not all inclusive. Contractor shall provide conduit and wire to provide a fully functional facility. Interconnection of low voltage devices may not be shown ". This is not common and creates a high level of risk for the electrical contractors. It is not possible to accurately assess the costs for conduit

and wiring that is not shown during the bidding phase. We may not bid this project unless the District clarifies that the District will reimburse the contractor for the additional costs for any conduit and wire that is not shown. Please clarify the intent of this note. We would be satisfied with a similar response to what was provided in Addendum 2 of the original bid.
Answer: This approach has been used on similar jobs without issue. The note could be clearer, but is specifically referring to building electrical items such as lighting, lighting control, receptacles, and low voltage HVAC systems which are not included in the conduit development. If there are conduits missing in the design from a power or process control standpoint it is anticipated that these items would be a change order.

9. Drawing GE-06 - Detail 925 - The 2"x2"x.125" Bent Plate description ends with (Typical of 2). Are there a quantity of 2 - 2"x2" bent plates in this cable trench?
Answer: Detail shows Qty of 2 2" x 3" plates and Qty 1 2"x2" plate

10. Please confirm that PVCGRS conduits, as shown on the conduit schedules and on Note 1 of various electrical drawings, supersede specification 26 05 33 - 2.8.A, Note 10 on Drawing GE-01, and specification 26 05 33 - 2.1.A. Otherwise, please change all mentions of PVCCGRS in the conduit schedules to SS.
Answer: Conduit schedule supersedes the mentioned references. PVC Coated GRS is acceptable.

11. Drawing GE-06, Detail 926 - Standard cable tray widths are 6", 9", 12", etc. 8" wide tray is not a standard size. We suggest going with 9" tray. Please confirm that is acceptable. Also, are all 3 cable trays shown the same dimensions? The call out says typical of 2. Please clarify.
Answer: A 9" tray is acceptable and the note should say typical of 3.

12. What material should the cable tray supports shown on Detail 926, Drawing GE-06 be made out of? Are these 316SS? We can't find any direction in the drawings or specifications.
Answer: Mounting hardware and supports should be 316SS

13. Drawing GE-03 shows two different stub-up details - Detail 320 and 321. Detail 320 shows SS conduit, Detail 321 shows PVC Coated conduit. Which detail should be used?
Answer: Detail 321

14. We noticed there are no grounding grid plans provided with the electrical drawings. Drawing E-01, note 7 references a grounding grid, but there are no drawings that depict this work. Please provide grounding plan drawings.
Answer: Grounding grids are shown on the layout drawings. See LE-02 for the grid referenced in E-01. We have re-issued some layout drawings and added more

grounding detail. We show major process equipment and building structural being grounded on the drawings. We still expect that metal surfaces such as fuel tanks, roofs, hand rails, etc. be grounded per the specifications and NFPA 70.

15. Please confirm that the warranties for equipment commissioned and turned over to the owner for beneficial use will begin at the completion of Phase 1. Otherwise, the extended warranties that contractors will need to obtain from equipment suppliers to cover equipment until the end of the project will be very expensive.
    The warranty starts at the end of Phase 1 for equipment that was installed, tested, and commissioned in Phase 1.

16. Will there be another site walk?
    No official site walk is scheduled. Per previous addenda, bidders must coordinate additional site visits with District staff if desired.

The following questions were submitted on 9/07/2018:

1. Reference: Drawings I-19, I-20, I-21, I-22 Typical Panel Layout. Can the engineer provide panel tag numbers that apply for each of drawings listed above.
   Answer: The Layout on I-19 is typical of PLC-AB; the layout on I-20 is typical of PLC-MCC3, PLC-PRP, PLC-PSP; the layout on I-21 is typical of CTC-RWDP and CTC-MMWD; and the layout on I-22 is typical of CTC-AB.

2. Reference: Drawings I-02 PLC MCC3 IO List and NI-01 thru NI-04. How will PLC-MCC3 connect to the network and where is it depict on the network diagrams.
   Answer: Please see re-issued sheet. Also add conduit F015 that will go from existing conduits at the UV awning (LE-13) originating in the electrical room of the Re-use building (LE-12) and run underground to MCC-3 building. (LE-01) Conduit shall be 1.5" and contain two shielded Cat6 cables. Install surge protection at each end of the run.

3. Reference: Drawings I-19 and I-20 and NI-01 thru NI-04. Will any SCADA Hardware equipment be required other than panel mounted PC's and OIT's depicted on I-19 and I-20.
   Answer: The district already has SCADA servers in place so no additional computers or software will need to be provided.

4. Drawing PI-12 shows 61-PI/PSH-1100 and 1200 however these instruments are not on the instrument schedule on drawing E-20. Please confirm if these instruments are required.
   Answer: Yes the instruments are required. Please see updated instrument schedule for details.

5. The instrument schedule lists 33-LT-1111,1211,1311 as being on PI-12. Please confirm these are the LT's shown on PI-09.
   Answer: That is correct. 1311 is not a future piece of equipment. See updated instrument schedule for details.

6. Drawing PI-14 shows 23-LT-1020 Storm Drain Storage Level but this instrument is not listed on the instrument schedule. Please confirm whether the index or the drawing is correct.
   Answer: The drawing is correct and the index has been updated.

7. The instrument schedule lists 23-LSLL-1020 as a low low level switch for the Storm Drain Storage however there is no LSLL shown on PI-14. Please confirm whether PI-14 or the instrument schedule is correct.
   Answer: See updated instrument schedule.

8. The instrument schedule lists 23-LSHH-1020 however PI-14 does not show this float switch. Please confirm whether E-20 or PI-14 is correct.
   Answer: See updated instrument schedule.

9. The instrument schedule lists 81-PIT-1000 however PI-15 does not show this instrument. Please confirm whether E-20 or PI-15 is correct.
   Answer: See updated instrument schedule.

10. The instrument schedule lists 81-FE/FIT-1001 however PI-15 does not show this instrument. Please confirm whether E-20 or PI-15 is correct.
    Answer: See updated instrument schedule.

11. The instrument schedule lists 42-FE/FIT-1120 as being on PI-09. Please confirm that this instrument is actually shown on PI-06. Also, E-20 calls this meter out as an 18" however PI-06 shows this meter as a 16". Please confirm.
    Answer: See updated instrument schedule. Meter is 16".

12. The instrument schedule lists 42-LSH-1120 as being on PI-09 and being part of the Return Meter Vault. This instrument is not shown and appears should be shown on PI-06. Please confirm there is a meter vault that should be shown on PI-06 and that this float is required.
    Answer: See updated instrument schedule.

13. The instrument schedule lists 44-FE/FIT-1920 however PI-26 does not show this instrument. Please confirm this meter is required.
    Answer: See updated instrument schedule.

14. The instrument schedule lists 41-AIT-1002 however PI-16 does not show this instrument. Please confirm if the instrument is needed.
    Answer: See updated instrument schedule.

15. The instrument schedule lists 52-AIT-1200 however drawing PI-26 does not show this instrument. Also, please note that Hach has discontinued the 1720e turbidity analyzer. Please confirm this instrument is required and if so, what a suitable manufacturer/PN is for this analyzer.
    Answer: See updated instrument schedule.

16. PI-26 shows 5 Rotameters and 4 Pressure indicators that are not listed on the instrument schedule. Please confirm whether these items are required and if they are, please provide an updated instrument index with associated tagging.
    Answer: See updated instrument schedule.

17. PI-29 shows the UV building with a vendor supplied box. Is every instrument inside the building supplied by a packaged vendor.
    Answer: Only the instruments shown inside the "vendor package" outline on PI-28 are supplied by the UV packaged vendor.

The following questions were submitted on 9/10/2018:

1. Drawing D-1 indicates the primary, secondary bio-filters and secondary clarifier are to be demolished. Provide details of active pipe within 10' of the structures that may be compromised during the demolition of the structures. Details should include: Pipe material and size, joint types used, pressure of the line, media it carries and depth of bury.
   Drawings D-3 and D-4 indicate other existing lines that are present. The yard piping drawings (sheets C-6 thru C-14) provide drawings and tables indicating the size, service, and pipe type of new and existing lines. Per the demolition drawings, the biofilter structures are relatively shallow.

   For reference (but not necessarily representing a complete list), the following significant pipelines are noted:

   Near the Primary & Secondary Biofilter:
   - **10" digester sludge line – this line runs beneath the secondary biofilter and adjacent to the primary biofilter.**
   - **20" and 24" Primary Clarifier #2 influent/effluent lines – these lines are near (and connect to in some cases) the biofilter pump station which is to be removed. The pipelines in this area are detailed in the PCM (primary clarifier) drawings of Volume 4A.**
   - **24" Bypass line – currently runs around the north/northeast of the secondary biofilter (and beneath this structure at certain points).**
   - **24" Primary Effluent – runs near the south of the biofilters as it flows to the existing secondary clarifier pump station. This line will be replaced in Phase 3 and shouldn't be required once the new process basins are operating at the end of Phase 1.**
   - **Smaller 1"-3" potable and non-potable water lines that must remain in service, temporary shutdown for rerouting as convenient for construction could be coordinated with operators however.**

Near the Primary & Secondary Biofilter - several lines will be in place when the existing secondary clarifier is demolished including but not limited to:

- **30" secondary clarifier #2 influent line**
- **14" secondary clarifier #2 RAS line**
- **4" secondary clarifier #2 scum line**
- **Portions of the 15" storm drain line, depending on the contractors choice to install portions of this line in earlier phases.**
- **16" NMWD distribution line**
- **3-4" non-potable water lines**
- **1-2.5" potable water lines**

2. Section 013130, 1.3, D, 1, b, requires a full time representative with no other duties be present on site during all working hours. In lieu of this requirement, can a working superintendent/foreman/project manager/etc. with other duties be designated as the onsite safety representative with part-time support from a designated safety professional handling multiple projects?
   This proposal is acceptable.

3. Drawing C-5 indicates new Type E Curb (Note 14) along the toe of the hillside. There is existing stackable block wall at this location currently. How does the new curb interact with the block? Provide a detail.
   The block retaining wall should be protected and remain in place during construction. The Type E curbing is no longer required along this portion, refer to the description for sheet C-5 above in the Volume 4A items.

4. Per detail 310/SD-2; there is PVC coated wire rope shown above the top railing. Is this to be provided on all railings, including the stair cases, or is it just included at removable handrail?
   This is required for all guardrail, removeable or not but <u>not</u> on handrail. For staircases, horizontal components must include this, but sloping guardrail along stairs does not require the PVC coated wire.

5. Addendum #1 clarifies there is new Pervious Concrete. There does not appear to be a specification section for this activity. Please provide. There is a Concrete Paving specification 321313, but this is different from Pervious Concrete.
   A detail is provided in the civil details (see sheet CD-2). Specifications have been added to Section 321313 as discussed above in Volume 3B items.

6. The page 34 of the General Conditions, "the District will conduct all negotiations with the utility company and the work will be done at no cost to the Contractor, unless otherwise stipulated in the Agreement". Please confirm that the contractor will carry no costs for the PG&E electrical work. Please also confirm that since the Contractor does

not have a contract with PG&E, that the contactor will not be liable for any costs or delays caused by PG&E.
This is correct, but the contractor is required to coordinate with PG&E, but the District will pay for PG&E electrical work.

7. Redwood Headers appear sporadically throughout the project. Is there a project requirement to provide Redwood Headers on all asphalt edges that are not adjacent to concrete?
Redwood headers are required as specifically shown on sheets C-4 and C-5, typically for asphalt edges that are not adjacent to concrete <u>within the wastewater treatment plant site</u>. Note that these headers are not indicated nor required along the public roadway. The leader callouts indicate the location and key start/end points for redwood headers.

8. During the site visit, several trees were observed near the pond area. Are they to be removed or remain in place? They do not appear to be specifically called out for removal. If removal is required, please provide diameter at breast height for each tree requiring removal and verify that removal permits will not be required. Additionally, is this removal a responsibility of the owner or contractor?
Owner has attempted to remove all trees in the sludge pond area and grind stumps 18" below ground. However, Contractor is expected to remove roots remaining in the ground. See discussion for demolition drawings in Volume 4A items above.

9. DAC Geotech Report classifies the exiting "fill" material as either SC, GP-GM, CL, or GC. Section 31 20 00, 2.1, C, indicates that these materials are unsuitable for use on site. Please confirm the potential uses for the onsite "fill" material.
Excavated site soil materials should be screened and if they are primarily granular and have a plasticity index of 12 or less, they could be used as fill in areas where grading fill is required below structures and roadways. Fill material should be moisture conditioned and compacted to a minimum of 95% relative compaction.

10. DAC Geotech Report contains Appendix D and Appendix E, both of which contain borings labeled BG-1 & BG-2. The two BG-1 and the two BG-2 borings contain differing strata layers and classifications. The site map located on sheet 301 of 650 does not differentiate between borings found in Appendix D and those located in Appendix E. Please confirm the location of each boring.
Appendix E boring logs pertain to the parking lot area and outside the current project area. They were included for development of our bedrock contour diagram. Therefore, borings BG-1 and BG-2 in Appendix E should be ignored

11. Section 32 17 23, Pavement Markings, is included in the bid documents, but not markings are indicated in the construction drawings. Please confirm where pavement markings and traffic signage are required.
There are no longer any pavement markings included with this project.

12. Section 31 20 00, 3.5, references pre-load/surcharge STAGING PLANS in the design drawings, but no such plans were located in the bid documents. Please confirm the applicability of paragraph 3.5.
These requirements are not part of this project.

13. The DAC Geotech Report pages 14 – 16 references the need for lightweight fill. Will lightweight fill be required/recommended/allowed on this project? If so, please provide the proposed lightweight fill locations and material specifications.
Lightweight fill, geofoam, or other materials to mitigate settling will not be required unless observation of the graded road and other areas show continued, excessive settling. Previous projects have indicated that the risk in this area is low and the anticipation is that these materials will not be necessary.

As conditions and continued observation merit, special provisions for light weight fill (etc.) will be discussed between the Geotech, Owner, and Contractor, and necessary changes will be implemented at that time. This would mainly concern the roadway, which will be graded and compacted but not paved until near the end of the project, allowing time for observation and discussion of any changes if needed.

14. The DAC Geotech Report page 12 indicates that 6 to 18 inches of settlement is to be expected on the project site. The contractor is basing the project cut/fill requirements on the survey information provided in the contract documents. From these calculations, the project will require a significant amount of fill material even if no settlement occurs. Should settlement occur, how will the contractor be compensated for the additional fill requirements? Additionally, how will settlement be monitored and quantified?
Page 12 indicates that there could be 6-18" of settlement in areas with at least 5' of fill. There are a few areas under roadways and paving (north, east, and south of the aeration basin structure) that will have 5' or more of fill placed and could be susceptible to 6-18 inches of settlement. Paving will not occur in these areas until Phase 3, but the structure will be backfilled and the grade brought up after the concrete is placed, which will allow at least 8-12 months of loading of the underlying, existing material. The Contractor should assume the areas with 5' of fill or more will settle a maximum of 18" and include that material in their bids. It is anticipated that these areas will see significant use during the construction with vehicles and equipment, and the Contractor is required to maintain access through these areas. Grading and maintaining these areas will be required by the Contractor and as such we do not see how the settlement can be monitored and

quantified, which again points to the approach that the Contractor shall include 18" of settlement for the areas with 5' or more fill.

15. If a surcharge program will not be implemented, will pipeline installations and other improvements be allowed prior/during the two year monitoring program or will these installations need to take place after settlement has occurred? Should settlement occur after installations have been completed, will the contractor be entitled to compensation to repair any resultant damages?
A general surcharge program is not being implemented as part of the work. Pipelines will be installed during all phases of the work. There are a few pipelines being installed in areas receiving 5' of fill or more. If pipelines are damaged due to settlement of undisturbed, subgrade soils then the Contractor would be entitled to compensation to repair these damages. This assumes the Contractor has properly prepared the existing soils prior to backfilling the areas per the geotechnical requirements in the Contract Documents.

16. Section 01 10 00, requires a Project Construction Survey completed by a licensed surveyor. Please confirm that this survey only applies items installed under this contract.
Only improvements to be impacted or installed as part of this project would be expected as part of the survey.

17. Section 01 41 20, 1.3, indicates that the "Owner is not responsible for obtaining any permits." This statement is incredibly open ended and could be interpreted that the contractor is responsible for obtaining permits normally secured by the Engineer on bid-build projects. (DEP, Title 22, Zoning, Easements, Army Corps, etc.) Please confirm what permits are the responsibility of the contractor and what permits will be secured by the owner/engineer.
Owner has obtained Title 22 permits for recycled water, issues regarding other permits was addressed in a previous addendum.

18. After a thorough review of the project plans, we do not feel that the project milestones can be achieved within the Section 01 10 00 defined working hours of 6:30am to 5:00pm M-F. Please provide what steps need to be taken and the costs involved to allow for continuous (24/7) working hours.
A 24/7 operating schedule is acceptable where required to maintain the project on the proposed timeline as long as after-hour construction activity does not impact plant operations or require District staff/operators to be onsite. Special notification and planning must be in place for any tie-ins or other activity that may impact plant operations. In addition, we have not had sufficient time to review all CEQA requirements or other limitations that may impact the free implementation of a 24/7 operation. Furthermore, the Contractor must be sensitive to light and noise pollution that are after normal operating hours and provide provisions to reduce direct light infiltration from the site. Additional information may be provided in a

future addendum as any concerns regarding CEQA or other local limitations are confirmed.

19. After a thorough review of the project plans, we do not feel that the project milestones can be achieved. Please confirm that Liquidated Damages for this project are uncapped. Additionally, please quantify any consequential damages that may be imposed by failing to meet project milestones. Is any project funding specifically tied to a project milestone? This information will assist in determining if the contractor should carry additional overtime costs, liquidated/consequential damages, or a combination of both in their proposal.
Liquidated damages are uncapped. The District will quantify consequential damages such as additional operating cost, cost to supplementing RW with potable water, and etc. at the time when Liquidated Damages are being assessed. For reference, a portion of the project funding is from grant money associated with the expansion of the recycled water facility (i.e. Phase 1).

20. Contract documents indicate that Phase 1 must be completed in 517 calendar days, but also includes a firm date of June 1, 2020, Phase 2 must be completed in 730 calendar days, but also includes a firm date of January 1, 2021, Phase 3 must be completed in 1,060 calendar days, but also includes a firm date of November 10, 2021. Please confirm which of these timelines is applicable as the contractor has no control of the project award, NTP, or certain potential project delays. Are any of these dates tied to a particular funding or penalty deadline?
The firm dates given are based from an assumed Notice to Proceed date of 01/02/2019. **The dates will be adjusted to allow for the calendar days listed if the Notice to Proceed date is different.**

21. Section 01 74 19, Table 2 includes reliability acceptance test parameters for items not associated with this project. Please confirm that RAT testing will only be required for items installed under this contract.
It is assumed that this question references Section 017500 – Commissioning . As discussed above, this table has been updated to remove items no longer associated with the project.

22. Reference Drawing C-13. Secondary Clarifier #2, Primary Pump Station and associated pipelines 122, 119,116,126, and 132B are to be installed prior to the completion of Phase 2. Secondary Clarifier #1 is not to be installed until Phase 3. The outline of Secondary Clarifier #1 indicates the outer wall of the structure, but does not illustrate the 2'-4" footer or the 5' underdrain. The proposed pipelines mentioned above are to be installed, prior, above, or in some cases, through the footer and underdrain. Can these lines be installed outside of the footer/underdrain footprint or is it the intent of the contract to install footers/underdrain under suspended infrastructure? If relocation is allowed, will

the contractor be compensated for the additional pipe length, bends, bedding, installation, etc.?
Piping has been adjusted as is feasible to allow for more space in this area and avoid direct conflicts between piping and the clarifier footing/underdrain. Details are provided above in the items listed under Volume 4A.

23. Please confirm what specific facilities, pipelines, and equipment are associated with Title 22 requirements and provide information on any additional testing may be associated with these facilities. Will the owner be responsible for any required Bioassay's or other regulatory/permitting requirements associated with Title 22 compliance?
Pipelines associated with Title 22 water are already indicated as such in the yard piping schedule (e.g. reference to "recycled water" or "RWTF "pipelines). Pipeline testing is to be performed as outlined in the specifications.

24. As confirmed on previous addendums there is a good faith effort required but there are no minority or DBE goals required for this contract. Per Appendix H, there are 5ea forms to be filled out requiring extensive amount of information for the MBE/WBE firms and 4ea of which are to be submitted with the bid package. These forms include listing every MBE/DBE solicited (Form 1), every MBE/DBE we received quotes from with bid amounts and explanations of why or why not they were selected (Form 2), forms for each minority firm being selected (Form 4) and full list of all subcontractors, suppliers and brokers (Form 5). Since the completion of these forms requires an extensive amount of work and this information has no effect on the bid results as there is no minority requirements or goals; they should be submitted within 3 business days after the bid date. This places a hardship on the bidders to complete this information at bid time. For the previous bid, LGVSD understood this hardship and allowed the bidders to submit this information within 3 business days. We request the LGVSD allow for the same with the rebid of this project.
The proposal to submit this information within 3 business days is acceptable.

25. Drawing SCH-13, Note 2 – Gates 316 SS. Spec states 304 or 316 SS. Please confirm if 304 or 316 SS is required.
The specification is more general from the manufacturer, but the materials required in the schedule are 316 SS only. The gates shall be 316 SS as indicated in the schedule.

26. T-Valves are included in the gate schedule. Do T-Valves need to be included in the slide gate bid per the bid forms.
There is not a dedicated bid item in the primary Bid Schedule (Volume 2) that specifically breaks out gates and/or valves. It is up to the general contractor to coordinate the scope of supply with all of its suppliers. However, telescoping valves would generally be considered valves and need not necessarily be furnished by the gate supplier.

27. Both specifications say nothing about field service (Spec. 400558 Stainless Steel Channel Gates, Spec. 400559 Stainless Steel Weir Gates). Please confirm if field service is required. We recommend the following:
    1 trip 1 day Installation supervision
    3 trips 6 days Installation inspection and operation of operators (Need to consider construction schedule, but this should be close for 41 gates and multiple areas)
    2 trip 6 day Leakage testing and startup
    1 trip 1 day Training (one hour training and could be combined with one of the startup trips)
    Addressed above in the comments for Volume 3B.

28. Spec. 400558 Stainless Steel Channel Gates – 2.1-C-2: "The gate frame shall be made of formed plates or structural members creating the clear opening of the specified dimensions in a rigid one-piece unit."
    Spec. 400559 Stainless Steel Weir Gates – 2.1-C-2: "The gate frame shall be made of formed plates or structural members creating the clear opening of the specified dimensions in a rigid one-piece unit."
    Please confirm "rigid one-piece guide" terminology. Suggest adding a clarifying sentence to both of the above specifications, "Guides bolted together are not acceptable."
    The standard bolt together guide frame will not be able to meet the stress thresholds called out in AWWA C561, thus not in compliance with this standard.
    Some of the gates (Items 9, 14 & 15) will need a wraparound gusset. Bolt together guides cannot host wraparound gussets. Bolt together guides require disassembly of the frame to access the seal – very difficult once installed.
    Addressed above in the comments for Volume 3B.

29. 13-SG-1020 & 1030 – 2ea. 36x60 Gates – Drawings do not call out elevations and there are no views that can be scaled. Please provide elevations
    These gates are replacing existing isolation gates in the grit chambers (reference sheet HWS-1 of Volume 4A). The dimensions (width and height) required for the gate are provided in the gate schedule. Final installation details and elevations will need to be field verified to match existing conditions, but the actual furnished gate should have the dimensions provided in the gate schedule. Gate frames should extend above the opening to place the actuator at a height of 3'-6" above the top of the walkway/access platform.

30. 23-G-3110 from schedule, but drawings PSS-6 calls out a different tag number 21-G-3130. Using tag number from schedule. Please confirm and correct.
    The tag for the gate shown on sheet PSS-6 should be the same as called out on sheet PSS-2, namely 23-G-3110.

31. 23-G-3120 – 1ea. 48x84 – Schedule calls for 3' head, but gate is 4' tall, will quote 4' for the head. Please confirm and correct.
    Based on the hydraulics through this box, the maximum seating head experienced by this gate would be 3.25-feet (i.e. the top of the gate is designed to be above the max water surface to prevent undesired overflow) – hence the max seating head is

less than the height of the gate. However, a design for a max 48" seating head is acceptable.

32. 23-G-3120 from schedule, but drawings C-47 & C-48 call out tag number 21-G-3120. Please confirm and correct.
The correct tag is 23-G-3120.

33. 33-G-1110 & 1120 – Schedule calls out 33-G-1210, but drawing AS-7 & AS-9 calls out 33-G-1120. Used drawing tag number 33-G-1120. Please confirm and correct.
The gate tags should match the schedule as discussed above in the items for Volume 4A.

34. 51-G-1210 – 1ea. 36x36 Gate – Location is Outfall Box. There are no gates in the schedule with this tag number. Drawing C-32 is for the Outfall Box. It shows a gate without a tag number. It shows a slide gate that is existing and statement to preserve and protect existing gate and rotate the electric actuator. The box has a 36" pipe coming to the 60" wide box. The gate is 60" wide. Please confirm if this gate should be deleted from the schedule. If it is included, please confirm gate size. Please confirm and correct.
Reference sheet SCH-13 in Volume 4A, gate 51-G-1210 is provided in the schedule (29th item in the schedule). The existing gate shown on Sheet C-32 is currently in place and should be handled as already outlined on sheets C-32 and C-33.

35. 44-G-1310, 1320, 1330 & 1340 – 4ea. 30x72 Gates – Schedule calls for 7' head, but is only 6' tall in an open channel. We quoted 6' head. Please confirm and correct.
Per the schedule, the gates are 72-inches so 6-feet seating/unseating would be the maximum.

36. 44-G-1310, 1320, 1330 & 1340 – 4ea. 30x72 Gates – If the gate is to have 72" of travel (equal to the height of the gate); the head rails where the electric actuator will be mounted will be 63" above the floor. This is ok but a non-standard height. Please confirm.
The height of the gate is required to provide full isolation at peak hydraulic flows and allow for fully-open channel flow for the UV modules. A configuration with a more accessible height for the electric actuator is ideal, but the described mounting height is acceptable.

37. Reference: Drawings E-01 thru E-07 and LE-01 thru LE-16. Differences in NEMA ratings for electrical equipment are stated on various drawings, can the engineer specify what NEMA ratings and Materials construction will be required for the following electrical equipment.

Answer: See table below.

Equipment:	Drawing	NEMA
SES Service Entrance Section	E-01	3R SS
ATS	E-01	3R SS
100% Rated Breaker	E-01	3R
SWBD-AB1	E-01	1A
Active Harmonic Filter	E-01	1A
XFMR-AB	E-01	1
LP-AB	E-01	1A
VFD-52-P-1013	E-01	1A
VFD-52-P-1014	E-01	1A
MCC-AB1	E-01	1A
MCC-AB4	E-01	1A
MCC-AB2	E-02	1A
MCC-AB3	E-03	1A
DP-RWDP	E-05	3R
VFD-51-P-2100	E-05	3R
VFD-51-P-2200	E-05	3R
VFD-51-P-2300	E-05	3R
VFD-51-P-2400	E-05	3R
LP-RWDP	E-05	3R
DP-AB2	E-06	1A
DP-MCC-3	E-06	1A
XFMR-UV	E-06	3R
LP-UV2	E-06	3R
MCC-3	E-07	1A

The following questions were submitted on 9/12/2018:

1. Specification 432313 Self-Priming Centrifugal Pumps;
   a. This section provides no quantity or where they are used. How many and where are they used?
   In general, the quantity required for each pump should be obtained from the pump schedule (sheet SCH-12 in Volume 4A) – quantities are not typically listed or repeated in individual specification sections. The pump schedule also lists the design-basis make and model for each pump. In this case, this type of pump is no longer used or required for this project. This section may be disregarded

   b. This section refers to a pump schedule which is page 281 but there is no reference to Gorman-Rupp on the schedule. Is this just a generic spec that is not used? **This type of pump is no longer used or required for this project. This section may be disregarded.**

2. Specification 432323 Self Priming Axially-Split Centrifugal Pumps;
   a. This section provides no quantity or where they are used. How many and where are they used? **This references the recycled water distribution pumps as shown in the pump schedule. Refer to the pump schedule with section number cross-referencing.**
   b. This section refers to a pump schedule which is page 281 but there is no reference to this type of pump. Is this just a generic spec that is not used? **This references the recycled water distribution pumps as shown in the pump schedule. Refer to the pump schedule with section number cross-referencing.**
   c. This section provides no manufacturer. If these are to be used please provide basis of design. **These reference the Gould's pumps as cross-referenced in the pump schedule included with this addendum.**

3. Specification 432413 Vertical Turbine Can Pumps;
   a. This section provides no quantity or where they are used. How many and where are they used? **The pump schedule includes multiple vertical turbine pumps, refer to cross-referenced schedule provided with this addendum.**
   b. This section does not refer to any pump schedule. **The pump schedule includes multiple vertical turbine pumps, refer to cross-referenced schedule provided with this addendum.**
   c. We cannot find any can pumps on this job. Is this just a generic spec that is not used? **The pump schedule includes multiple vertical turbine pumps, refer to cross-referenced schedule provided with this addendum.**

4. Page 281 SCHEDULES PUMPS; [In reference to sheet 281 of Volume 4A]
   a. What specification is to be used for pumps 51-P-2100, 2200, 2300,2400? **Reference pump schedule that is included with this addendum.**

b. What specification is to be used for pumps 43-P-2100, 2200? **These are small sampling pumps (Pentair brand) and detailed technical specifications are not available from the manufacturer. Please provide the design basis make/model listed in the pump schedule or something equal in function with similar or superior materials of construction.**
c. What specification is to be used for pumps 41-P-2500, 2511? **See response to item 'b'.**
d. What specification is to be used for pumps 44-P-2100, 51-P-1110? **These are small, sump style pumps to be installed in metering vaults and detailed technical specifications are not available from the manufacturer. Please provide the design basis make/model listed in the pump schedule or something equal in function with similar or superior materials of construction.**

5. Sheet SCH-12 Pump Schedule does not denote which spec section applies to each pump or does each spec section have equipment numbers listed. The descriptions on sheet SCH-12 seem to overlap: submersible vs. submersible centrifugal and centrifugal vs vertical centrifugal. Is it possible to expand the schedules SCH-12 to include applicable spec section]
The spec section for each pump is shown on the modified sheet SCH-12 included with this addendum.

The following questions were submitted on 9/13/2018:

1. The pre-selected purchase agreement states the equipment will be shipped with a non-specified primer per their standards with the intent to only provide minimal protection and Ovivo accepts no responsibility for coatings once they leave their shop.
This is addressed above in detail – the supplier will now furnish a hot-dipped galvanized coating for the mechanisms that will not require a field-applied finish coat by the Contractor.

2. Please provide electrical vault schedule for bidding purposes.
No schedule currently exists however it is anticipated that the vaults will be 4'x4' except where larger ones will be necessary such as the power vaults P-VLT 25, P-VLT 26, and P-VLT 27. It is anticipated that those vaults may need to be 4'x6' or 6'x8'.

3. Drawing SE-06 shows route for DB-1 going from Power Pole to Transformer. Drawing E-44 states DB-1 is going from the Transformer to the SES. Please clarify correct routing for DB-1.
DB-1 as shown on E-44 is correct. Add DB-0 for the ductbank between utility pole and transformer. DB-0 construction and conductors to be per PG&E specifications.

4. Drawing SE-06 shows route for DB-2 going from the Transformer to the SES. Drawing E-44 states DB-2 is going from SES to ATS. Please clarify correct routing for DB-2.

DB-2 as shown on E-44 is correct. It is also anticipated that due to the location of SES and ATS that conduits between the two structures will be acceptable and a ductbank is not necessary.

5. Please confirm the conduit sizes on the conduit schedule supersede the conduit sizes on the ductbank schedule. I.E. Conduits P23-1300A, P23-1400A, & P23-1500A are shown as 1.5"on the conduit schedule, but shown as 1" on the ductbank schedule.
   Conduit schedule supersedes sizing shown on ductbank schedule.

6. Drawing E-44, ductbank 4, calls out conduits P31-3540A & P31-4550A. These conduits do not show up on the conduit schedule. Please provide conduit size and conductors.
   These conduits should be removed from the ductbank.

7. The drawings show a table with depth to top of bedrock "To BR" (SH AS-2). Is this depth assumed from existing grade.
   This has been clarified above in the discussion for sheet AS-2 in the Volume 4A items above.

END OF QUESIOTNS SECTION FOR ADDENDUM #4

LIST OF ATTACHMENTS

Attachment A: Volume 3 Appendix C (original RFP document for Owner Selected Equipment Procurement).

Attachment B: Revised Section 260000 – General Electrical Requirements (Volume 3B).
Attachment C: New Section 312319 – Drilled Concrete Piers (Volume 3B).
Attachment D: Revised Section 409000 – Instrumentation Control for Process Systems (Volume 3B).
Attachment E: Revised Section 409123 – Miscellaneous Properties Process Measurement Devices (Volume 3B).
Attachment F: New Section 432420 – Horizontal Axial Flow Pumps (Volume 3B).
Attachment G: Pump Schedule (from Volume 4A) with Specification Section References.
Attachment H: Revised Bid Schedule Page (from Volume 2).

Attachment I: Revised drawing sheets from Volume 4A, total of eight (8) sheets:

C-5	C-50 (**NEW**)
C-9	PSM-1
C-13	PSM-3
C-19	PSM-5

Attachment J: Revised drawing sheets from Volume 4B, total of twenty-four (24) sheets:

PI-26	E-12
NI-02	E-19
NI-03	E-20
SE-02	E-21
SE-06	E-22
SE-07	E-23
LE-02	E-39
LE-03	E-44
LE-04	E-45
LE-10	E-46
LE-14	E-48
LE-17	E-49

END OF ADDENDUM #4

See following Sheets for Attachments

Attachment A

Volume 3 Appendix C

Original RFP and Specifications for Owner Furnished Equipment

NOTE (September 14, 2018): Items #2, #3, #7, #9, and #10 are not included in the current project

Date: January 13, 2017

Re: Request for Proposals– LAS GALLINAS VALLEY SANITARY DISTRICT SECONDARY TREATMENT AND RECYCLED WATER PLANT UPGRADE

The purpose of this correspondence and enclosed materials is to solicit equipment proposals for the LAS GALLINAS VALLEY SANITARY DISTRICT (OWNER) Secondary Treatment and Recycled Water Plant Upgrade. The following information details the Scope of Work for furnishing equipment in accordance with the enclosed **Request for Proposal - Equipment for the Las Gallinas Valley Sanitary District Secondary Treatment and Recycled Water Plant Upgrade**, General Conditions, and instructions for suppliers.

An original proposal including two (2) hard copies and one (1) digital copy must be received in the Engineering Division at Las Gallinas Valley Sanitary District, 300 Smith Ranch Road, San Rafael, CA 94903 by **2:00 pm local time** on ***February 2, 2017***. Proposals received after that time and date will be considered a late proposal and will be returned unopened to the Sender without receiving any further consideration in the Award. Envelopes must be clearly marked **Proposal - Equipment for LGVSD Secondary Treatment and Recycled Water Plant Upgrade.** Equipment associated with this RFP includes:

- Hybrid fixed film activated sludge treatment process
- Trickling filter distributor mechanism
- Trickling filter media package
- Eductor tube mixers
- Secondary clarifier mechanisms
- Open channel UV disinfection system
- Dissolved air flotation thickener (DAFT) system (multiple options)
- Mechanical sludge thickening equipment
- Odor control equipment package
- Pond return water pre-treatment equipment package (multiple options)

Please contact the design engineer to obtain electronic copies of the RFP packet. All technical questions shall be submitted to the Design Engineer. Any questions asked for which a written response is furnished will be provided to all bidders. Questions submitted less than five (5) days before bid opening may not be addressed.

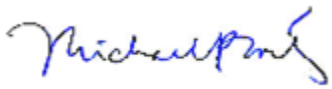
Design Engineer

Justin Logan or Eric Sahm
justinl@aquaeng.com; erics@aquaeng.com
AQUA Engineering, Inc.
801-299-1327
533 W 2600 S
Bountiful, UT 84010

District Engineering Department

Mike Cortez
mcortez@lgvsd.org
OWNER
415-472-1734
300 Smith Ranch Road
San Rafael, CA 94903

District Engineer, Las Gallinas Valley Sanitary District
Sincerely,



Michael Cortez, PE
District Engineer

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LAS GALLINAS VALLEY SANITARY DISTRICT
San Rafael, California

REQUEST FOR PROPOSALS – FURNISH EQUIPMENT

LAS GALLINAS VALLEY SANITARY DISTRICT (OWNER)

REQUEST FOR PROPOSALS – LAS GALLINAS VALLEY SANITARY DISTRICT SECONDARY TREATMENT AND RECYCLED PLANT UPGRADE

INTRODUCTION

LAS GALLINAS VALLEY SANITARY DISTRICT hereby known as "OWNER" solicits interested and qualified firms to submit proposals for **furnishing and delivery of equipment for the Las Gallinas Valley Sanitary District Secondary Treatment and Recycled Water Plant Upgrade.** Furnish all permits, labor, materials, equipment, transportation, tools, supplies, onsite services, and appurtenances for satisfactory completion of all work.

I. GENERAL TERMS AND CONDITIONS

A. Proposal Submission

Proposal submittals that include two (2) hard copies and one (1) electronic copy, marked **Proposal - Equipment for LGVSD Secondary Treatment and RWF Upgrade** will be received no later than 2:00 p.m., February 2, 2017 by:

Hard copies mailed to:	Electronic copies emailed to:
Attn: Mike Cortez, P.E.	**Justin Logan:** justinl@aquaeng.com
LGVSD	**Mike Cortez:** mcortez@lgvsd.org
300 Smith Ranch Road	
San Rafael, CA 94903	

Proposals will not be accepted via Fax machine. Mark outside of envelope with **Proposal - EQUIPMENT FOR LAS GALLINAS VALLEY SANITARY DISTRICT SECONDARY TREATMENT AND RECYCLED WATER PLANT UPGRADE.** Time is of the essence and any proposal or addenda pertaining to the RFP received after the announced time in accordance with the clock(s) on District computers and date for submittal, whether by mail or otherwise, will be rejected. It is the sole responsibility of the Supplier for ensuring that their proposals are stamped by Engineering Staff before the deadline indicated in Section I-A. Proposals and/or any addenda pertaining thereto received after the announced time and date of receipt by mail or otherwise, will be returned. However, nothing in this RFP precludes OWNER from requesting additional information at any time during the procurement process before or after the bid opening date and time.

Nothing herein is intended to exclude any responsible firm or in any way restrain or restrict competition. On the contrary, all responsible firms are encouraged to

submit proposals. OWNER reserves the right to award in part or in whole or to reject any or all proposals.

Any proposal submitted must include the Signature Sheet that has been signed by an individual authorized to bind the supplier. All proposals submitted without such signature may be deemed non-responsive.

B. RFP Process

Suppliers are to submit written proposals, which present the Supplier's qualifications and understanding of the work performed. The Supplier's proposal should be prepared simply and economically and should provide all the information that it considers pertinent to its qualifications for the project and which respond to the Scope of Services and Evaluation Criteria listed herein. Emphasis should be placed on completeness of services offered and clarity of content. Suppliers may furnish proposals for all bid items or any combination of individual bid items so long as they are qualified and able to fulfill the requirements of each bid item for which a proposal is submitted.

Questions or objections to specifications, design criteria or other aspects of the RFP process must be received and acknowledged by OWNER and Engineer at least five (5) business days before the date and time at which proposals are scheduled to be opened. Questions or exceptions furnished after this time may not be addressed or answered.

II. SPECIFIC TERMS AND CONDITIONS

A. Appropriations

The continuation of the terms, conditions, and provisions of this contract beyond the fiscal year is subject to approval and ratification by the OWNER Board of Directors and appropriation by them of the necessary money to fund said project/contract for each succeeding year.

B. Termination of Contract

It shall be the sole right of OWNER to terminate any contract upon written notification to the Supplier.

C. Insurance

The Supplier shall purchase and maintain in force, at their own expense, such insurance as specified in OWNER's Agreement for General Services. The Supplier shall furnish a copy of an original Certificate of Insurance, naming OWNER as an additional insured. The Supplier shall furnish insurance in satisfactory limits, and on forms and of companies, which are acceptable to OWNER and shall require and show evidence of insurance coverages on behalf of any subcontractor (if applicable, before entering into any agreement to sublet any part of the work to be done under this agreement).

NOTE (September 14, 2018): Items #2, #3, #7, #9, and #10 are not included in the current project

III. PROJECT DESCRIPTION

A. Intent of Proposal

The intent of this proposal is to obtain competitive pricing from qualified vendors for furnishing and delivery of the following pieces of equipment:

- **Item #1 -** One (1) hybrid fixed film Activated sludge treatment process
- ~~**Item #2 -** One (1) trickling Filter Distributor Mechanism~~
- ~~**Item #3** - One (1) trickling Filter Media package~~
- **Item #4 -** Eight (8) eductor tube mixers
- **Item #5 -** Two (2) 100-foot diameter Secondary Clarifier Mechanisms with cost adder for optional third unit.
- **Item #6 –** One (1) open channel UV disinfection system.
- ~~**Item #7** - One (1) sludge thickening system~~
  ~~Option 7A - Dissolved air flotation thickener (DAFT) System~~
  ~~Option 7B - Skid mounted micro DAFT System~~
- **Item #8 -** One (1) standby mechanical thickener
- ~~**Item #9** - One (1) odor control equipment package~~
- ~~**Item #10** - One (1) return water pre-treatment system - Algae removal equipment package for storage pond return water~~

B. Estimated Equipment and Volume

"**Exhibit One-Equipment**" is not a commitment to contract, but is intended to provide potential suppliers with the specifications of the desired equipment. Detailed specifications are provided under "Exhibit One-Equipment Specifications" in this document.

IV. SCOPE OF WORK

A. General

The Supplier shall provide to OWNER all listed equipment, services, recommended spare parts, training/startup services, and testing. The Supplier shall assist Engineer during the design process with technical information, dimensions, installation requirements/clearances, and other details to help ensure an adequate and efficient design suitable for the equipment.

B. Loss or Damage to Equipment

During shipment, Supplier shall assume all responsibility for loss or damage. Vendor shall be present during unloading of equipment and installation to ensure no damage is caused during those activities. Touch-up coating required due to installation/handling by the contractor will be provided by the installation contractor.

C. Training

The Supplier will provide, at their expense, all training required for the operation of any equipment. An instructional manual is to be provided for the equipment.

D. Award of Contract and Performance

Purchase of equipment may proceed only after being approved by OWNER and upon the Supplier receiving notice of such approval and written notification to proceed with submittals, production, and delivery.

E. Delivery Timeline

The Supplier shall complete all work under this contract within the following number of calendar days from and after the date of "Notice to Proceed":

The Contract Completion Schedule is and shall be based on commencing on the date the Equipment Supplier is notified in writing of the Notice to Proceed.

The work shall be completed within the number of calendar days listed in the Contract Completion Schedule below commencing on the date of written Notice to Proceed. Time of delivery will be considered in evaluating the Bids, thus, the Bidder may list below an alternate number of calendar days for completion of work. Bidder shall consider and include in the calendar days listed the time necessary for shop drawing review.

V. Contract Completion Schedule

Item of Work	**Calendar Days for Completion** Contract Completion Time	Bidder's Completion Time
1. Receipt by OWNER of complete, approved manufacturer's shop drawings and installation instructions (**includes 15 days for Engineer's review**).	60*	_____
2. Delivery of equipment to the project site:		
a. Complete and Operable Equipment Ready for Delivery	225**	_____

* Commencing on Date of "Notice of Award" issued by OWNER during the design phase of the project. **Supplier must furnish submittal information within 45 days of receiving the Notice of Award – allowing 15 additional days for engineer review (total of 60 days)**.

**Commencing on Date of "Notice to Proceed" issued by the Contractor during the construction phase of the project.

Work shall be completed per the Contract Completion Time, unless Alternate Completion Times, herein references as "Bidder's Completion Time", is proposed by Bidder, as set forth herein, and is approved by Owner.

Equipment Supplier is advised that "Liquidated Damages" of $1,500.00 per calendar day, including Saturdays, Sundays, and Holidays, may be assessed for each calendar day each item or sub-item of work remains incomplete after the Contract Completion Time in accordance with the CONTRACT COMPLETION TIME or the BIDDER'S COMPLETION TIME, whichever is in force. Equipment as delivered shall be complete and operable requiring only installation. Contract is subject to "Liquidated Damages" due to delays in performing remedial work if equipment as determined by OWNER does not perform as specified. Total amount of Liquidated Damages shall not exceed 10% of the Total Contract Amount.

OWNER will transmit a "Notice to Proceed" to Equipment Supplier upon receipt by OWNER of an executed Agreement, including insurance. Thereafter, the Equipment Supplier shall commence ordering equipment and preparation of shop drawings.

1. Contract Manager

The Supplier shall provide one Contract Manager who will be responsible for the performance of the work. The name of this person and an alternate who act for the Supplier when the manager is absent will be designated in writing as part of this Proposal. The Contract Manager or alternate will have full authority to act for the supplier on all contract matters relating to the daily operation of this contract.

2. Equipment

REFERENCE SPECIFICATION DETAILS IN EXHIBIT ONE.

Supplier shall provide “New” equipment as defined as newly assembled for first-time use with new components. It must be eligible for the minimum warranty period required for each item in the technical specifications provided in EXHIBIT TWO.

VI. EVALUATIONS AND SELECTION PROCESS

A. Evaluation Criteria

The following criteria will be utilized in the evaluation of bids:

Operability – This criterion addresses the relative ease of operating and maintaining the system. Analysis is based mainly on the equipment provided in the bid and the operation & maintenance costs associated with the equipment. Equipment operability will be evaluated on the method for operation of the equipment as well as scheduled preventative maintenance. The supplier shall detail equipment operation and routine maintenance in their respective proposal. Key items that will be considered for this criterion are as follows:

- Energy efficiency
- Equipment that can be easily deciphered for operation and has controls and alarms that is easy to navigate and understand.
- Equipment that requires minimal preventative maintenance to maintain system performance.
- Equipment that allows for easy access for plant personnel to perform routine tasks without disrupting plant operation and without placing the personnel in harm's way.
- A lower cost for providing recommended spare parts.
- Sound attenuation/noise levels.

Installed Capital Cost – Compares the actual cost of the equipment as well as basin/building footprint size and other factors that affect the total installation cost associated with the equipment. Each piece of equipment is inherently different, and the Supplier shall provide as much information as possible to assist OWNER in determining final installation cost.

O&M Costs – Compares the estimated annual operating expenses and long-term maintenance/capital outlay expenses such as:

- Power consumption
- Chemical use (if applicable)
- Typical routine maintenance hours (per year)
- Costs for wear/replacement parts annual and over 20-year period.
- Other normal periodic costs such as major overhauls anticipated over 20-year period.

Experience – Used to compare the experience of the vendors on facilities of similar size, complexity, and type of installation.

Lead Time – Lead time to receive submittals and lead time for delivery of equipment upon approval of submittals.

Local Service – Addresses the location of the nearest service center and their ability to assist with questions and potential problems. Detailed information should be provided on the capabilities of this service center and what parts are stocked there.

Warranties – Evaluate the warranty provided and any differences between vendor warranties. Favorable results will be given to suppliers that provide the following:

- Warranties of extended duration.
- Warranties that are not limited by proration.
- Warranties that also include service.
- Warranties that cover all parts and components of a system.

References – OWNER and Engineer will contact the references furnished with the RFPs and consider this input in the evaluation.

Owner's Preference – OWNER will provide input on the system that best fits its needs.

The following table indicates the established, weighted rating system:

Evaluation Criteria	Weighted Value
Operability	3
Installed Capital Cost	4
O&M Costs	5
Experience	3
Lead Time	2
Local Service	1
Warranties	3
References	2
Owner's Preference	5

B. Selection Process

OWNER will evaluate each item proposed using the evaluation criteria. A rating score between 1 and 5 will be assigned for the evaluation criteria for each proposed item. The score will be multiplied against the weighted value for each item to produce a total score. These scores will be totaled and the proposed item with the highest score will be recommended to OWNER for selection. Any information that will assist OWNER and Engineer in evaluating the proposals based on the criteria listed above is encouraged. The technical proposal should address all the above items or the proposal will be considered non-responsive. **Price will be considered but not necessarily the sole determining factor.** OWNER reserves the right to reject any and all bids for the items associated with this RFP.

C. References

Supplier will include a list of a minimum of five references, from similar projects only, who could attest to the firm's knowledge, quality of work, timeliness, diligence, flexibility, and ability to meet budget constraints, include names, contact persons, and phone numbers of all references. References should be submitted individually for each bid item included in the Supplier's proposal.

References may or may not be reviewed or contacted at the discretion of OWNER. Typically, only references of the top ranked shortlist of supplier or suppliers are contacted. OWNER reserves the right to contact references other than, and/or in addition to, those furnished by a supplier.

VII. BASIS FOR AWARD

A. General

Information and/or factors gathered during interviews, negotiations, and any reference checks, in addition to the evaluation criteria stated in the RFP, and any other information or factors deemed relevant by OWNER, shall be utilized in the final award.

B. No Contact Policy

After the date and time established for receipt of proposals by OWNER, any contact initiated by any supplier with any OWNER representative, other than the Purchasing Division representative listed herein, concerning this request for proposals is prohibited. Any such unauthorized contact may be grounds for the disqualification of the supplier from this procurement transaction.

C. Request for Further Information

Questions, which may arise as a result of this RFP, may be directed to the design engineer (AQUA Engineering):

Justin Logan, Principal/PE or Eric Sahm, PE
justinl@aquaeng.com or erics@aquaeng.com
801-299-1327
AQUA Engineering, Inc.
533 W. 2600 S. Suite 275
Bountiful, UT 84010

D. Bid Awards

OWNER may award multiple items to a single bidder or may award each item to separate bidders. Each bid item will be evaluated and awarded separately as described herein. Accordingly, each cost and proposal package must be independent from all other items, meaning costs for travel, submittals, service/training must be separate and independent for each bid item. Additional savings by combining multiple items may be listed in the "Exceptions" section for consideration, but each price provided in the bid forms shall be separate and independent of all other items.

Equipment and items associated with this bid are critical to the phasing, construction, and completions of the project. Accordingly, submittals for these items **will be required within 45-days upon receipt of the Notice of Award** from Owner. Payment for submittals (as indicated in the bid forms) will be provided by Owner upon review and approval of submittals. The remainder of the contract for fabrication, delivery, installation, startup, and training services will be through the installation contractor. The installation contractor is scheduled to be selected and awarded in the second quarter of 2017 at which point the

agreement including costs (except for submittals), scope of supply, and other services will be executed through the installation contractor.

All other items associated with this bid process will be assigned in whole to the installation contractor.

VIII. PROPOSAL FORMAT

1. General

Proposals must include fully completed Exceptions, References, and Signature Sheets as well as Cost Proposal. **Exceptions to any design criteria, specifications or other requirements listed in this RFP must be specifically listed and stated on the "EXCEPTIONS" form provided below.** It is also highly encouraged that any exceptions be discussed with the Engineer prior to bid opening.

Proposal bonds are not required for this procurement.

2. Cost Proposal

All suppliers must utilize the format below to complete the bid forms and complete any other informational forms or tables furnished in the RFP packet. These forms will facilitate Owner and Engineer's review of the proposals.

Suppliers are not required to submit proposals for all items listed in this RFP and are permitted to submit solely for bid items for which they are interested and qualified. Any bid items that are not included in the supplier's proposal package should be listed, and the item's associated bid form crossed out or otherwise clearly marked to indicate that no bid is furnished for said item.

EXHIBIT ONE - EQUIPMENT SPECIFICATIONS

SPECIAL REQUIREMENTS
For EQUIPMENT for
LGVSD SECONDARY EXPANSION AND RWF UPGRADE PROJECT

G-01 THE REQUIREMENT

Equipment Supplier shall furnish and deliver to the project site equipment as awarded and in accordance with this RFP for treatment of wastewater at the Las Gallinas Valley Sanitary District. In addition, shop drawings, technical services during installation, instruction on operation, startup services, operational maintenance manuals, and all other items as hereinafter specified or shown on the Drawings (Figures) shall be provided. The equipment shall be delivered to the site by Vendor (Equipment Supplier) where it will be unloaded, stored, and installed by the Installation Contractor.

G-02 LOCATION OF PROJECT SITE

The Plant's address is 300 Smith Ranch Road, San Rafael, CA 94903.

G-03 DEFINITIONS

‘‘OWNER” or “Owner” shall mean LAS GALLINAS VALLEY SANITARY DISTRICT(LGVSD).

“Vendor” or “Seller” or “Supplier” or "Equipment Supplier" or "Equipment Manufacturer" or "Manufacturer" shall mean the successful Bidder entering into a contract with OWNER for furnishing of material, equipment, and/or services specified herein and in the Agreement.

The phrase "Installation Contractor" shall mean the construction contractor entering into a Contract with OWNER to receive, unload, store, and install the equipment furnished by the Equipment Supplier.

G-04 RESPONSIBILTY OF EQUIPMENT SUPPLIER

Equipment Supplier shall accept risk of loss responsibility until all of the following have been completed: (i) the equipment is delivered to the Project site and examined by Owner, Installation Contractor, and Equipment Supplier's representative; (ii) the equipment is found to be in suitable condition and properly prepared for storage; and (iii) the equipment is formally accepted by OWNER as set forth herein.

The Equipment Supplier shall obtain at his expense all licenses, permits and other approvals necessitated by his operations.

In accordance with generally accepted practices for the type of work to be performed by the Equipment Supplier, the Equipment Supplier will be solely and completely responsible for conditions of the job site for which the Equipment

Supplier is responsible including safety of all persons and property during performance of the work.

Equipment being furnished and delivered, including components, materials, fabrication, and delivered product, shall be subject to rigid inspection by Owner and Installation Contractor. Owner may at Owner's expense visit the manufacturing facility to inspect the equipment during fabrication. Equipment Supplier shall maintain a current monthly schedule of fabrication and be prepared for unannounced inspection by Owner. Equipment Supplier shall cooperate with Owner to readily permit said rigid inspection by Owner.

G-05 GENERAL DESIGN CRITERIA

Equipment shall be designed based on the following criteria and specific performance requirements specified in the Technical Specifications. The Drawings (Figures) show existing and proposed plant facilities, including ultimate facilities.

The following equipment specifications are given to provide a design, sizing, and performance basis for the required equipment. It is the responsibility of the Supplier to guarantee compliance with these specifications and the operation of the equipment for its intended use.

A. SITE CHARACTERISTICS

1. Site Elevation: 10 feet above sea level.
2. Max. Temperature: 98° F
3. Min. Temperature: 30° F
4. Average Annual Max. Temperature: 65.1° F
5. Average Annual Min. Temperature: 51.4° F

B. INFLUENT FLOW CHARACTERISTICS

General: The flow entering the OWNER Treatment Plant can be classified as typical municipal wastewater. The following characteristics shall apply:

Influent Characteristics:

Average Wet Weather Flow Rate:	3.2 MGD
Average Dry Weather Flow Rate:	2.2 MGD
Peak Wet Weather Hourly Flow Rate:	25 MGD
Peak Wet Weather Daily Flow Rate:	18 MGD
BOD – Average Dry Weather Loading:	6,250 lbs BOD/day
BOD – Maximum Day Loading:	10,000 lbs BOD/day
TSS – Average Dry Weather Loading:	5,860 lbs of TSS/day
TKN – Average Dry Weather Loading:	35 mg/l (934 lbs TKN/day)
TKN – Maximum Day Loading:	1,500 lbs TKN/day
Minimum Design Temperature:	15˚C

Design Effluent Characteristics:

For Average Daily Flow of 3.2 MGD and Peak Hourly flow of 18.0 MGD:

BOD: < 2 mg/L
TSS: <5 mg/L
TN: <7.6 mg/L

C. PERFORMANCE SPECIFICATIONS

General

1. Scope: Supplier shall furnish complete equipment packages as described below and in the Cost Proposal with all associated equipment for a complete and functional system.

2. Pre-Approved Suppliers: Pre-approved suppliers (if any) will be listed below under each specific bid item. This should in no way preclude others from bidding. Suppliers not listed as pre-approved are strongly encouraged to contact the engineer well before bid opening to discuss their equipment and alternatives. This will improve the ability of alternate suppliers to provide satisfactory equipment and proposals.

3. Field service: At a minimum, the Supplier shall provide the service of qualified representatives for two **(2) trips with a total of ten (10) days** to inspect the equipment installation, assist in startup/initial operations, and instruct Plant personnel in the proper operation and maintenance of the equipment.

   If more time is anticipated, indicate how many additional trips and additional man-days of field service should be added and provide an adder cost in the "Exceptions" table provided above. Likewise, if less time is recommended the supplier may provide a cost credit and description of the reduced service scope in the "Exceptions" table. **However, all service included in the proposal bid price shall be based on these minimum requirements**.

4. Controls: Unless otherwise indicated in the following equipment specifications, the Supplier shall supply controls, control enclosures, and control logic for the equipment per the technical specifications provided with this document to facilitate incorporation into the sites SCADA system (SCADA integration by others).

5. Installation: Installation of the equipment will be in accordance with the contract drawings, manufacturer's engineering drawings and instructions.

G-06 DRAWINGS (FIGURES)

Relevant preliminary design drawings (Figures) are furnished as part of **EXHIBIT FOUR** to familiarize the BIDDER with the available space and general design intent for the project. Deviations from these dimensions and design drawings are acceptable, but should be discussed with Engineer prior to bid opening.

G-07 WARRANTY/GUARANTEE

The Equipment Supplier shall provide to Owner the warrantees, extended warranties/guarantees, and license agreements as specified in the Technical Specifications. The warranty period shall start at the time of final payment per the payment schedule included in the Bidder's Proposal Documents.

G-08 EQUIPMENT PERFORMANCE GUARANTEE

Equipment Supplier shall guarantee the performance of the equipment as specified in the Equipment Technical Specifications.

If the equipment does not meet the performance requirements, Equipment Supplier shall modify the equipment as necessary to achieve performance requirements per Equipment Technical Specifications. The Supplier shall be responsible for all costs associated with removals, replacement, and modifications required herein.

G-09 PROJECT SCHEDULE

Schedules for submittal of shop drawings and delivery of equipment are specified in the Completion Schedule. It is anticipated that award of a construction contract for project construction and installation of equipment will be made to the Installation Contractor in 2017.

G-10 PERMITS, CERTIFICATES, LAWS, ORDINANCES, FEES, AND ROYALTIES

Equipment Supplier shall, at his own expense, procure all permits, certificates, and licenses required of him by law for the execution of the work. He shall comply with all Federal, State, and local laws, ordinances, or rules and regulations relating to the performance of said work.

Equipment Supplier shall pay all royalty or license fees for use of patented devices or systems and shall protect Owner from patent infringement litigation thereon.

G-11 SUBMITTALS

Equipment Supplier shall provide submittals, including shop drawings, erection instructions, and operation and maintenance manuals as specified during the design phase of the project. **Payment for these submittals will be directly from the OWNER and will be separate from the equipment contract with the installation contractor.**

G-12 SHOP DRAWINGS (SUBMITTALS)

Within **45 calendar days** after issuance of “Notice of Award”, Equipment Supplier shall submit to Owner for approval complete shop drawings and technical information associated with the equipment. Shop drawings and submittals shall include, but not be limited to, the following:

A. Plans and elevations showing details, sizes and dimensions of all equipment, and locations of sole plates, anchor bolts, jacking devices, supports, anchor tie rods, turnbuckles, and all other devices used for supporting and anchoring the equipment and components.

B. Drawings, weights, static and dynamic loads, and all other information necessary for the design of the equipment foundations, structures, and connections for lubricating, cooling, and piping required for equipment furnished.

C. Usage, size, type, manufacturer, and complete description and nameplate data for all electric motors, gear drives, impellers, gates, and mounting details.

D. Wiring diagrams showing required external connections. All wiring terminations shall be identified with terminal numbers. Interconnect diagrams for all devices and equipment and filter controls.

E. Required control signal inputs and outputs.

F. Detailed instructions for unloading, storing, and protecting all equipment during storage.

G. Details, sizes, and locations of all connections for external piping, wiring, and conduit.

H. Materials used for the fabrication of the various components of the equipment to be furnished including thickness and ASTM designation where applicable.

I. Surface finishes and protective coatings.

Additional drawings, instructions, or information which may be requested by Owner for erection, operation, and maintenance of the equipment or to determine compliance with the Agreement shall likewise be submitted for approval.

The drawings shall fully demonstrate that the equipment to be constructed will comply with the provisions of these Specifications and shall furnish a true and complete record of the equipment as manufactured and delivered.

If the drawings contain information which does not pertain to the equipment being furnished, Contractor shall either delete the information which is not applicable or plainly identify the pertinent information.

Shop drawings and data will be incorporated by the Engineer as part of Contract Documents for installation of equipment.

G-13 ERECTION INSTRUCTIONS

As formal submittals are required before selection of the installation contractor, erection instructions shall be submitted as shop drawings as specified herein within 45 calendar days after date of award. Owner will review and Equipment Supplier shall revise and resubmit. Erection instructions will be incorporated by the Owner as part of the Contract Documents for installation of equipment.

Within 60 calendar days prior to the scheduled date of delivery, Equipment Supplier shall submit to Owner four (4) hard copy sets and one (1) electronic set of detailed erection instructions (updated for equipment as fabricated) for installing the equipment.

Erection instructions shall contain all illustrations, detailed drawings, wiring diagrams, and instructions necessary for installing the equipment. The illustrated parts shall be numbered for identification. All information contained therein shall apply specifically to the equipment to be furnished and shall not include inapplicable instructions. Photographs, photocopies, and similar types of reproductions shall not be attached to pages. All such illustrations shall be incorporated within the printing of the page to form a durable and permanent reference book. Erection instructions shall include, but not be limited to, the following information:

A. Information pertinent to the erection of the equipment, including lifting requirements.

B. Sequence of assembly and erection of component parts.

C. Instructions including necessary drawings for unloading, storing, uncrating, and preparing equipment for erection and assembly.

D. Instructions including necessary drawings for the erection, assembly, and alignment of equipment component parts.

E. Torque requirements for all bolts, nuts, and fasteners.

G-14 INFORMATION REQUIRED PRIOR TO DELIVERY OF EQUIPMENT

Equipment Supplier shall furnish Owner and Installation Contractor with the information listed below 60 days prior to scheduled delivery of the equipment:

A. Required unloading and lifting requirements.

B. Complete shop drawings showing all equipment and components including complete wiring diagrams.

C. Specific and detailed sequential operating steps required for startup of the equipment, including alignment and lubrication.

D. Estimated net weights of parts of the equipment as they will be packaged for shipment; location of packages and estimated shipping times. Information shall be complete to permit the Installation Contractor to determine necessary unloading equipment.

E. Operation and maintenance information necessary for installation.

G-15 ENGINEERING SERVICES FURNISHED BY EQUIPMENT SUPPLIER

Owner shall have the right and option at any time up to final completion and acceptance of the Work to require Equipment Supplier to furnish, for the time stipulated in the Proposal and additional time at the daily prices quoted in the

Proposal, a competent service engineer (Equipment Supplier's or Manufacturer's representative) to provide technical direction for the assembly, installation, startup, and testing of the equipment and their components.

The service engineer shall not assume executive charge of such work but shall provide technical direction so that Owner (to the extent that Owner follows the recommendations of the service engineer) will be relieved of claims that failure is due to improper work of installation. Equipment Supplier shall provide adequate written erection instructions from the Equipment Manufacturer for use by Installation Contractor and Owner. Equipment Manufacturer shall provide a Certification of Installation to Owner as specified herein.

Equipment Supplier shall include in the Proposal the cost of said service engineer to be at the Project site the number of man-days listed herein. Costs shall include travel and subsistence. Specific times and number of trips to Project site to perform services are specified in the Technical Specifications and Proposal.

During startup and testing, the service engineer shall provide detailed instructions to Owner's personnel for operation of the equipment. These training services shall include post startup classroom and onsite instruction.

The service engineer shall be knowledgeable of construction safety practices and conduct himself in a safe manner when on the project site.

The service engineer shall be able to speak, write, and understand the English language and shall be completely familiar with the foot-pound-second system of measurement.

G-16 RIGHT TO OPERATE UNSATISFACTORY EQUIPMENT

If the operation of the equipment after installation proves to be unsatisfactory to Owner, Owner shall have the right to operate equipment until it can be taken out of service without injury to Owner for the correction of defects, errors, or omissions, provided the period of such operation pending the correction of defects, errors, or omissions shall not exceed one year without written consent of Owner and Contractor.

G-17 OPERATION AND MAINTENANCE MANUALS

At the time of completion of delivery of all equipment, Equipment Supplier shall submit to Owner **three (3) hard copy** sets (bound) and **one (1) electronic copy** of detailed operation and maintenance manuals for all equipment and components furnished and operation of the equipment. These manuals shall contain all illustrations, detailed drawings, wiring diagrams, and instructions necessary for starting up, operating, and maintaining the equipment. All illustrated parts shall be numbered for identification. All information contained therein shall apply specifically to the equipment and components furnished and shall not include instructions that are not applicable. Photographs, photocopies, and similar types of reproductions shall not be attached to pages. All such illustrations shall be incorporated within the printing of the page to form a durable and permanent reference book.

Owner will inform Equipment Supplier in writing within 60 calendar days after receipt that the manuals are approved as submitted or that revisions are required. If revisions are required, one set will be returned to Equipment Supplier with the required revisions indicated. The required revisions shall be promptly incorporated in the manuals. When approved, a total of four complete, identical sets of such revised manual shall be furnished to Owner. One manual will be provided to the Installation Contractor for his use. After startup and test, all revisions needed to make the manuals conform to the equipment as finally completed shall be made by the Equipment Supplier and sent to Owner for insertion into the four manuals to provide four complete manuals to Owner for final distribution.

Manuals shall include start-up, operation, shut down, trouble shooting, and other operating information for operator training and maintenance.

G-18 EQUIPMENT SUPPLIER'S REPRESENTATIVE

Equipment Supplier shall designate an Equipment Supplier's representative who shall be available both by phone and in person to provide technical information relative to the installation of the specific equipment being furnished. This representative shall aid Owner during preparation of the installation drawings and aid those who will be bidding the installation of the equipment.

G-19 LOCATION OF EQUIPMENT AND ENVIRONMENTAL CONDITIONS

The equipment will be installed out of doors at the Project site. The equipment shall be designed and constructed to prevent damage which could be caused by cold and hot weather, weather exposure, and dust. Specific site conditions are furnished above. Wherever possible, equipment shall be specifically designed to function satisfactorily under said conditions. Equipment Supplier's Shop Drawings shall include specific details on portions of the equipment that are sensitive to temperature or dust.

G-20 SHIPPING, DELIVERY, AND STORAGE

Equipment shall be fabricated, shipped, and delivered by Equipment Supplier to the Project site where unloading and storage will be performed by the Installation Contractor. Equipment Supplier shall be responsible to notify Owner and Installation Contractor at least 10 working days prior to delivery and again 24 hours prior to arrival of equipment or components thereof to the Project site. The 24-hour notification shall include exact components being delivered and hour and date of arrival. Equipment Supplier shall coordinate all details of delivery with the Installation Contractor. Installation Contractor shall be responsible for unloading, handling, and storing the equipment per the guidelines and recommendations provided by thy Supplier. Equipment Supplier's representative shall be present at time of unloading major equipment components to ensure that unloading is properly performed, components delivered are complete, and components are properly stored. Equipment Supplier shall provide complete written storage requirements, including any required maintenance during storage.

Shipments for equipment items which require forklifts or cranes for unloading shall be completed within five (5) working days commencing on a Monday through Friday. Since equipment will require a crane or forklift for unloading, ample notice to Installation Contractor is required. Unloading shall be performed between 7:00 AM and 4:00 PM. Equipment Supplier shall include, in his Bid for furnishing and

delivery of equipment, standby costs for shippers to permit unloading as specified herein.

All shipments shall be properly boxed, crated, packed, or otherwise protected to prevent damage in transit and storage. All parts shall be prepared for shipment so that slings for handling can be readily attached while the parts are on the truck. Where it is unsafe to attach slings to boxes, boxed parts shall be packaged with slings attached to the parts so that attachments can be readily made.

Before shipment, all painted surfaces shall be suitably wrapped or otherwise protected from damage. All pipe flanges shall be protected by flange protectors bolted on, metal plugs shall be screwed into all tapped holes, and all other openings shall be adequately protected to prevent entrance of dirt and moisture during shipment.

Shipments involving sea transportation shall be crated with dry materials, shall be packed with a desiccant, shall be sprayed or treated with a fungicide or given equivalent treatment, and shall be otherwise protected to ensure delivery with no fungus growth, rust, or other damage due to such transportation.

Equipment Supplier shall obtain all necessary permits required to transport the equipment to the delivery point and shall provide a representative to supervise the unloading and storage of the equipment on the Project site. Equipment Supplier shall repair or replace any equipment components or equipment damaged during shipment.

Each package shall be plainly marked with the following:

A. An identifying number, which also shall appear on the bill of lading and other documents relating to shipment.

B. Name and address of Owner and Equipment Supplier.

C. Sufficient information to identify the contents and, when possible, the name of the machine or equipment of which the contents form a part.

D. Shipping weight.

Each package shall contain a detailed packing list containing package numbers and a description of the contents including quantities, part or unit identification, and part numbers if applicable.

Spare parts shall not be packaged with other material.

All equipment delivered by truck shall be capable of being unloaded from the truck bed with a forklift loader or from above with an overhead crane.

Copies of the packing lists and bills of lading shall be sent to Owner on or before the packages are shipped.

G-21 INVENTORY AND STORAGE

After equipment has been delivered and ready for storage, Equipment Supplier's representative shall perform an inventory inspection, with Owner and Installation Contractor present, of equipment delivered to the site to confirm that delivery is, in fact, complete. The Equipment Supplier's representative shall also check storage and certify in writing that equipment is stored properly. Once complete, the Equipment Supplier shall provide Owner with written notice that the equipment has been delivered, is complete, and is stored properly. The responsibility for the equipment thereafter becomes the Installation Contractor's, except for defective or missing equipment discovered during installation and startup.

G-22 INSTALLATION CERTIFICATION

Prior to startup, the Equipment Supplier's service engineer shall certify in writing to the Owner that the equipment has been installed in- accordance with the Equipment Supplier's recommendations and inspected by an Equipment Supplier's authorized representative, and serviced with the proper lubricants, that applicable safety equipment has been properly installed, that the proper electrical and mechanical connections have been made, and that the equipment is ready for startup and initial operation.

G-23 SAFETY REQUIREMENT

The equipment shall comply with the applicable requirements of the Safety Orders of the Division of Industrial Safety of the State of California. Copies of the Safety Orders are available at the Printing Division, Documents Section, State of California, Sacramento, California 95814.

G-24 EARTHQUAKE (LATERAL) DESIGN

All equipment, its major components (including electrical motors/drives), anchorage parts, and bolts shall withstand stresses caused by ground movement (seismic forces) in accordance with 2016 California Building Code (CBC) and ASCE 7-5 Seismic Parameters for Site Class D, essential facilities in any horizontal direction and vertical direction. Safety factor for overturning shall be 1.5:1.

The following factors shall be utilized as defined by said CBC:

Site Class D

S_s	-	1.50 g
S_1	-	0.60 g
F_a	-	1.00 g
F_v	-	1.50 g
S_{MS}	-	1.50 g
S_{M1}	-	0.90 g
S_{DS}		1.00 g
S_{D1}		0.60 g

Calculations and anchorage details shall be prepared by a State of California licensed engineer (civil or structural) and submitted in accordance with the "Contractor's Submittals Technical Specifications" for all anchorage systems.

G-25 LUBRICATION

Adequate provision shall be made for lubrication of bearing surfaces of all moving parts.

Before shipment, Equipment Supplier shall properly lubricate all moving parts of the equipment to ensure protection against corrosion during shipment, storage, and installation. Lubricants furnished shall conform to the Equipment Supplier's printed recommendations. Safeguards shall be provided where necessary to prevent operation of the equipment without proper lubrication.

All locations on the equipment which require grease lubrication shall be provided with Alemite lubrication fittings. All lubrication fittings shall be readily accessible. The grease passages and ports shall be designed so that grease is forced into the normally loaded sides of the bearings.

Equipment Supplier's engineering representative shall check all lubrication prior to start up. Equipment Supplier shall furnish lubricants for initial lubrication for protection of wearing surfaces during shipment and storage.

Equipment Supplier shall provide list of all lubricants necessary for operation to the Installation Contractor.

G-26 FOUNDATION

All equipment to be furnished under these Specifications shall be furnished with all necessary embedment items, anchor bolts, nuts, washers, soleplates, structural steel supports, anchor tie rods, turnbuckles, jacking pads, leveling jacks, and other material necessary for anchoring the equipment to the foundations. Supplier shall furnish loading and anticipated reactions for equipment to allow Engineer to properly design foundation and support structures. Anchor bolt patterns or other mounting requirements shall also be furnished to the engineer to facilitate design and ensure adequate accommodations for installation are furnished. The installation contractor will furnish anchors to meet the design requirements of the supplier and Engineer.

G-27 NOISE

The equipment furnished under these Specifications shall operate as quietly as practical and as the design considerations permit. The design and construction shall be such as to reduce the noise to a minimum. Noise levels and sound attenuation will be considered as part of the “Operability” and “Owner’s Preference” evaluation criteria listed in Section VI of EXHIBIT ONE.

EXHIBIT TWO - EQUIPMENT SPECIFIC TECHNICAL SPECIFICATIONS

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NOTE (September 14, 2018): Items #2, #3, #7, #9, and #10 are not included in the current project

BID ITEM #1 – HYBRID FIXED FILM ACTIVATED SLUDGE TREATMENT PROCESS

Provide a complete hybrid fixed film activated sludge treatment (rotary IFAS) system that will provide mixing and air entrainment for wastewater following primary treatment. Manufacturer shall confirm the placement, configuration, number of basins, and number/size of units necessary for each basin as summarized in the design criteria below and preliminary design drawings in **EXHIBIT FOUR**. The rotary IFAS treatment system will be preceded by headworks (screens and grit removal), primary clarifiers, and anoxic basins. The supplier shall provide all process sizing calculations as well as process and sizing recommendations for the preceding anoxic basins. The process sizing calculations shall be prepared and stamped by a State of California Registered Professional Engineer regularly engaged in the design of rotating IFAS treatment systems. As evidence of the proper experience, the proposal shall include a summary of treatment systems designed by the Supplier that are currently operating and are providing an effluent total nitrogen less than 8 mg/L. The supplier shall provide all information for the internal recycle (aerobic to anoxic basin) requirements. The supplier shall not supply any internal recycle pumps or anoxic basin mixers (to be furnished by others). Specifications for rotary IFAS system are provided in this section. Any proposed alternate equipment must be modified to meet the requirements as set forth in the equipment specifications. The system shall be designed per the design criteria listed in paragraph A.

A. DESIGN CRITERIA:

Loading from the primary clarifiers feeding into the basins associated with this process are summarized as follows:

1. Total Design Average Day: 3.2 MGD
2. Total Design Peak Day: 18 MGD
3. Influent BOD:
   - Average Day: 141 mg/L, 3,781 lbs/day
   - Peak Load @ 3.2 MGD: 227 mg/L, 6,048 lbs/day
   - Peak Load @ 18 MGD: 54 mg/L, 8,038 lbs/day (max loading)
4. Influent TSS
   - Average Day: 94 mg/L, 2,517 lbs/day
   - Peak Load @ 3.2 MGD: 161 mg/L, 4,085 lbs/day
   - Peak Load @ 18 MGD: 42 mg/L, 6,235 lbs/day (max loading)
5. Influent TKN
   - Average Day: 33.8 mg/L, 902 lbs/day
   - Peak Load @ 3.2 MGD: 56.2 mg/L, 1,500 lbs/day

Peak Load @ 18 MGD:	10 mg/L 1,500 lbs.day (max loading)

6. Effluent BOD, Average Day: <2 mg/L*
   Effluent BOD, Peak Day: <2 mg/L*
7. Effluent TSS, Average Day: <5 mg/L*
   Effluent TSS, Peak Day: <5 mg/L*
8. Effluent TIN, Average Day: <6 mg/L
   Effluent TIN, Peak Day <8 mg/L

* Includes aeration basin *after* passing through secondary clarifiers.

Aeration Basin Sizes:

a.	Number of Basins (Trains)	4*(minimum)
b.	Basin Length	96'-0"*
c.	Basin Width	27'-0"
d.	Basin Water Depth	18'-0" (max)
e.	Aerobic Hydraulic Retention Time	8 hours min (@ Average Day)

Anoxic Basin Size

a.	No. of Basins	4
b.	Total Volume, gallons	719,000

* Please refer to **EXHIBIT FOUR** (Drawings) for preliminary process basin layout. The basin dimensions may be adjusted from the numbers shown here if recommended by the manufacturer. Any changes to these dimensions or configuration shall be discussed with and approved by the Engineer no less than five (5) days prior to the bid opening date. The Engineer must be notified of these changes as the available area to construct the process basins is very limited.

B. PRE-APPROVED SUPPLIERS:

1. WesTech Engineering: STM Aerotor™; Salt Lake City, UT (Design Basis)
2. Or equal

C. PERFORMANCE REQUIREMENTS

1. There shall be furnished and installed equipment to handle the design criteria provided in this section. The equipment shall include drive units, drive chains, rotating IFAS Aerotors, mounting bearing assemblies, anchor bolts, and all other appurtenances required for a complete and functional operating system.

2. The Rotary IFAS equipment shall be capable of operating at the specified liquid levels of mixed liquor in the basin so that oxygenation and power draw will vary as desired to respond to load variations seen by the plant. The equipment shall be capable of providing adequate mixing within the basin.

D. QUALITY ASSURANCE

1. The proposed Supplier/Licensor shall have a minimum of 15 years experience in the design, application, and supply of Rotary IFAS equipment in wastewater treatment plants, and shall submit a list of no less than 25 operating installations in the United States as evidence of meeting the experience requirement. The manufacturer shall certify to not less than five (5) successful operating installations in the United States using the same or larger size equipment as specified herein as evidence of meeting the experience requirement. Additionally, supplier shall certify the proposed equipment has been applied using said equipment in operating installations producing effluent total inorganic nitrogen levels below 8 mg/L.

2. The equipment supplier shall submit a process guarantee with their proposal. Said guarantee shall be valid for a period of 12 months from the date of plant start-up. A single manufacturer shall supply and be responsible for the performance of the activated sludge/fixed film system.

3. Supplier shall provide laser alignment for all Rotary IFAS components during installation to assure proper operation of the Rotary IFAS equipment.

4. Suppliers that cannot provide information from a minimum of five (5) operating rotating IFAS treatment plants with similar or larger treatment units that treat to an effluent total inorganic nitrogen of 8 mg/L using separate anoxic zones will not be considered.

E. WARRANTY

Warranty: A written supplier's warranty shall be provided for the equipment specified in this section. The warranty shall be for a minimum period of five (5) years from start-up. Such warranty shall cover all defects or failures of materials or workmanship, which occur as the result of normal operation and service except for normal wear parts.

F. GENERAL DESIGN

1. Description: The equipment shall be designed to biologically treat wastewater using a combination of the activated sludge and fixed film processes. It shall consist of a number of cylindrical polypropylene media assemblies mounted to a structural steel framework around a rotating steel shaft. Rotation shall be accomplished by a variable speed drive through a steel chain and sprocket assembly. The rotating unit shall run 75 to 85 percent submerged in the wastewater.

2. Air shall be entrapped in the media chambers as they enter the wastewater, and shall be continuously released into the wastewater as coarse bubbles as the mechanism rotates, thus providing aeration for the activated sludge process. In addition, the media shall be designed with sufficient surface area for fixed film growth to provide an optimum combined biological process in the basin.

3. Materials: All steel shall conform to the requirements of ASTM A36. Steel pipe used for the shaft shall conform to ASTM A53. Steel members in contact with liquids, either continuously or intermittently, shall have a minimum thickness of 3/16" unless otherwise noted. Stainless steel shall be minimum Type 304. Plastic media shall be polypropylene. Main support bearings shall be fabricated steel with a machined low friction thermoplastic bushing.

4. Fabrication: Shop fabrication and welding of structural members shall be in accordance with the latest edition of the "Structural Welding Code", AWS D1.1, of the American Welding Society. All welded connections shall develop the full strength of the connected elements and all joined or lapped surfaces shall be completely seal welded with a minimum 3/16 inch fillet weld. Intermittent welding shall not be allowed.

5. Edge Grinding: Sharp projections of cut or sheared edges of ferrous metals shall be ground to a radius by multiple passes of a power grinder as required to ensure satisfactory coating adherence.

6. Structural Design: All structural members and connections shall be designed so that the unit stresses will not exceed AISC allowable stresses by more than one-third when subject to either the torque load under startup or the dynamic loading of the equipment operating under full load. All steel design shall be in accordance with the AISC Manual of Steel Construction, latest edition, and the International Building Code (IBC), latest edition. The supplier shall provide calculations for all required anchors. The calculations shall be stamped by a Professional Engineer licensed in the State of California.

G. DRIVE SYSTEM

1. The drive unit shall be designed to turn the mechanism within the listed speed range. The drive unit and chain shall be capable of producing and withstanding the required peak torque to start the mechanism. The drive and controls shall be designed to accommodate momentary power outages without damage to the equipment. All gearing shall be designed to the latest AGMA standard for strength and surface durability, based on a life of 100,000 hours. To ensure safety and ease of maintenance, all components of the drive shall be direct coupled. Each drive unit shall consist of an electric motor with electric brake, a speed-reducing unit, and an adjustable support base to be mounted on the tank wall. All speed reducers shall be fully enclosed and running in oil or grease. Lubrication fittings shall be readily accessible.

2. MOTOR: Each IFAS Aerotor shall be driven by an inverter duty, TEFC, Class F insulation, constant torque motor, wired for 460V, 60 cycle, 3-phase current. The nominal motor speed shall be 1800 rpm. The motor shall be a heavy-duty unit of ample power for starting and operating the mechanism without overload. The motor shall be capable of being driven by a variable frequency drive. The motor shall include a normally closed thermal protection device and an electrically controlled brake to prevent the unit from back-driving. The motor brake shall be designed to operate on 120 VAC. The brake is designed to release upon delivery of 120 VAC from the controls. The brake shall also have the means of manual release. The Motor shall comply with the requirements of Section 220513 –

Common Motor Requirements for Equipment and other relevant technical specifications provided in **EXHIBIT THREE**.

3. GEAR REDUCER: The speed-reducing unit shall consist of cycloidal, helical, or planetary speed reducers directly connected to the motor without the use of chains or v-belts. Speed reducer helical or planetary gearing shall be manufactured to AGMA standards and shall provide at least 90% power transmission efficiency per stage. The speed reducer shall have a minimum service factor of 1.25. The reducers shall be fitted with radial and thrust bearings of proper size for all mechanism loads.

4. CHAIN & SPROCKET: The drive sprocket shall be fabricated of 4041 steel and a minimum 13 teeth. The driven sprockets shall be fabricated of A36 steel. Both sprockets shall be designed to withstand all normal operating and startup loads of the mechanism. The sprocket reduction ratio shall be designed in conjunction with the drive unit and VFD to produce the required rotational speed range. Chain shall be a steel roller chain, or equal.

H. SHAFT AND SUPPORT FRAME

The IFAS Aerotor shall be supported by a fabricated structural steel framework attached to a steel pipe center shaft. The structure shall be designed for all normal mechanism operating loads including cyclical fatigue loadings. Shaft ends shall be removable using a bolted/indexed connection and shall include solid 304 stainless steel bearing ends, with collars or shoulders to prevent lateral movement of the shaft.

I. MEDIA

A series of cylindrical plastic media assemblies of the quantity listed shall be attached to the steel framework and mounted concentrically around the center shaft. The media assemblies shall consist of individual specially molded corrugated polypropylene plates assembled adjacent to each other at a spacing of approximately 20 mm. The individual plates shall be designed to fit securely together to form a cylindrical assembly, which is held together and attached firmly to the steel frame with a steel pipe through the center of the assembly. The cylindrical media assemblies shall be oriented such that the openings into each assembled cylinder are directly below the respective axis of the cylinder at the nominal water level, thus allowing each media cylinder to trap the maximum volume of air and carry it downward into the liquid. The media shall be shipped to the site in pre-assembled sections.

J. MIXING PADDLES

Mixing paddles in the quantity shown on the drawings and/or as required by the manufacturer shall be attached to the outer periphery of each IFAS Aerotor assembly to promote gentle mixing of the tank contents.

K. AUXILIARY MEDIA CYLINDERS

If required, additional media cylinder assemblies of the type described above shall be attached to the outer periphery of each IFAS Aerotor as recommended by the manufacturer, in order to provide extra aeration and mixing capacity and fixed film surface area for optimum process performance.

L. SUPPORT BEARINGS

Each IFAS Aerotor assembly shall be supported by two specially designed bearings to be mounted to the tank walls. Bearings and anchors shall be designed to accommodate all normal operating and startup loads. Bearing housings shall be fabricated steel, and shall be lined with machined low friction thermoplastic bushings. Bushings shall be designed for a minimum ten-year wear life. No exterior lubrication shall be required. Mechanisms shall not be rotated unless the bearings are submerged. Following the installation and leveling, the support bearing housing shall be grouted into place using Chalk Fast Epoxy Grout.

M. ANCHORAGE AND FASTENERS

1. Fasteners: All fasteners shall be a minimum of 3/8-inch diameter and made of 304 stainless steel and include nylock nuts. The equipment supplier shall furnish all fasteners required for the assembly of the equipment.

2. Mounting Plate: Each IFAS Aerotor shall be equipped with a rigid, structural steel mounting plate. The mounting plate shall be sufficiently thick and be designed to minimize vibration.

N. COATING

Gear reducers and motors shall be furnished with the manufacturer's standard paint system. The STM center shaft shall be prepared in accordance with SSPC-SP10 and coated with two (2) coats of coaltar epoxy. All other steel components shall be prepared in accordance with SSPC-SP8 and hot-dipped galvanized.

O. SPARE PARTS

1. One (1) chain
2. One (1) complete set of sprockets.
3. Four (4) plastic bearings.
4. One (1) VFD for wheel drive motors.
5. One (1) VFD fan.
6. One (1) drive motor.
7. One (1) gear reduction drive.
8. List all other recommended spare parts, including costs, and provide with the proposal.

P. CONTROLS

1. Controls will be provided by the Owner. The Seller shall coordinate with the owner's integrator to ensure successful installation.

BID ITEM #4 – EDUCTOR TUBE MIXERS

A. GENERAL REQUIREMENTS

The supplier shall furnish eductor tube mixers sufficient to provide proper mixing and maintain solids in suspension while minimizing air entrainment to maintain anoxic conditions for each of four (4) anoxic basins. Manufacturer shall confirm the placement location, configuration, quantify and size of the mixers necessary for each basin. Preliminary basin drawings are furnished in **EXHIBIT FOUR** for reference.

These basins will receive flow from the primary lift station (mixed flow pumps) that is preceded by primary clarifiers, grit removal and step screens. Eductor tube mixer design shall be such that the intermittent bubble produces an induced flow of anoxic basin mixed liquid which is essentially continuous through the entire length of the barrel.

B. DESIGN CRITERIA

Design criteria are based on preliminary design information and are for reference only. The dimensions are anticipated as:

Basin Length (each):	44’ – 6”
Basin Width (each):	27’ – 0”
Design Water Depth:	20’ – 0’
Total Basin Volume (each):	180,000 gallons
Total Volume (4 basins)	720,000 gallons
Maximum Flow per Basin:	7.2 MGD
Mixing Period:	20-30 minutes (assumes 2 eductors per basin)

In addition to the general information required in the bid forms and for the proposal, please complete the information table furnished for eductor tube mixers provided at the end of this section.

C. APPROVED SUPPLIERS

1. JDV
2. WesTech
3. Or equal

D. PRODUCT REQUIREMENTS & MATERIALS OF CONSTRUCTION

1. Eductor tube shall be furnished with threaded (for connections less than 2-inch) or flanged (for connections 2-inches and larger) air connection points to connect to piping from blowers furnished by others.

2. The eductor shall be fabricated from 1/8” thick 316 stainless steel plate. All welds shall be continuous. Facing surfaces of bolted joints shall be shop primed if not fabricated from stainless steel. Facing surfaces of field welded components shall be beveled and match marked.

3. Eductor tube shall be fabricated from AISI 316 stainless steel. Stainless steel components shall be furnished unpainted.

4. Edge Grinding - Sharp corners of all cut and sheared edges shall be made smooth by a power grinder.

5. Fasteners. All bolts, nuts, washers, and other fasteners shall be 316 stainless steel.

Eductor Tube Information Table	
Parameter	**Value**
Eductor Tube Diameter (inches)	
Total Eductor Tube Height (inches)	
Minimum Required Submergence from top of unit (ft)	
Maximum Allowed Submergence from top of unit (ft)	
Anticipated required air flow *range* per educator unit (SCFM)	
Maximum required air flow per eductor unit (SCFM)	
Required air inlet pressure at educator connection (psig)*	
Air connection pipe size (inches)	
Number of units required per basin	

*Assume total water depth in basin to be 20’-0”.

BID ITEM #5 – SECONDARY CLARIFIERS MECHANISMS

A. GENERAL REQUIREMENTS

The supplier shall furnish two (2) secondary clarifier mechanism units **with optional pricing for a third unit**, each suitable for installation in the concrete basins with dimensions as shown in the drawings (see **EXHIBIT FOUR**). Each unit shall be a center column supported, center feed unit with peripheral effluent collection. A center drive mechanism shall be provided for rotation of the two (2) rake arms with spiral type rake blades. The clarifiers will receive effluent flow (combined with RAS) from a hybrid fixed film, activated sludge secondary biological process.

The equipment shall be designed to effectively settle mixed liquor suspended solids and scrape the settled solids from the basin floor to the sludge withdrawal drum as shown on the drawings. The clarified effluent shall be collected uniformly by the peripheral launder. Surface scum shall be collected by the scum skimming equipment and discharged through the scum withdrawal pipe.

The equipment furnished for each clarifier mechanism shall include but not be limited to: walkway with handrails, center drive assembly, center drive platform, center support column with inlet openings, flocculating feedwell, inner dispersion inlet well (EDI), center cage, sludge collection arms with spiral rake blades, rotating sludge collection drum, surface scum skimming equipment, effluent weir plates and scum baffle, peripheral density wall baffles, anchor bolts and assembly fasteners.

B. PROCESS REQUIREMENTS

1.	Total Average Day Flow:	3.2 MG (total net effluent)
2.	Total Peak Day Flow:	18.0 MGD (total net effluent)
3.	Average Daily Flow (per unit):	2.13 MGD (including RAS)
4.	Design Peak Day Flow (per unit):	10.8 MGD (including RAS)
5.	Peak Hourly Flow Effluent (per unit):	9.0 MGD-one unit offline @ 18MGD
	Recycle (RAS) Rate:	0.5 – 1.0 Q
6.	Maximum Recycled (RAS) Rate:	3.2 MGD (total and per unit)
7.	Drive – Continuous Torque:	29,000 ft-lb
8.	Drive – 100% Design Torque:	70,000 ft-lb
9.	Drive – Momentary Peak Torque:	120,000 ft-lb
10.	Mechanism rotation:	Clockwise
11.	Rake Arm Tip Speed:	8 – 12 ft/min

C. BASIN DESIGN CRITERIA*****

Basin Diameter:	100-feet
Side Water Depth:	14-feet
Tank Freeboard:	16 – 18 inches
Floor Slope:	1:12
Center Column Diameter:	28-inches*
Feedwell Diameter:	24-feet*
Feedwell Submerged Depth:	5’ – 6”*
Energy Dissipating Inlet (EDI) Diameter:	10-feet*

EDI Submerged Depth:	3-feet*
Number of EDI Openings:	8*
Minimum Cage Size:	4-feet (square)*
Rake Arm Minimum Size:	4-feet (square)*
Sludge Drum Diameter:	5’ – 10” *
Sludge Drum Height:	26-inches*
Scum trough width	full clarification radius
Scum box width	4'-0"*

***** *Dimensions and parameters are preliminary. Deviations are acceptable but must be discussed with the Engineer prior to bid opening.*

D. APPROVED MANUFACTURES AND QUALITY ASSURANCE

Manufacturers regularly engaged in the manufacture of the clarifier equipment as specified herein and who can demonstrate equipment of this specified design, in actual service for a period of not less than 5 years will be considered as acceptable manufacturers.

1. Ovivo
2. Westech
3. Or equal

E. GENERAL DESIGN REQUIREMENTS

Except where specifically indicated otherwise, all plates and structural members designated for submerged service shall have a minimum thickness of 1/4 inch. All structural steel will conform to ASTM A-36 requirements and steel plate will conform to ASTM A283C requirements. All anchor bolts used to secure the mechanism to the tank shall be 316 stainless steel. All fasteners shall be high strength steel. Handrail, skimmer, and rake blade squeegee fasteners shall be 316 stainless steel.

Each clarifier mechanism shall be of the center-drive type, supported on a stationary influent column, with the flow entering at the bottom of the influent column and flowing upward to the inlet openings and dispersed into the tank through the EDI and flocculating feedwell. The clarifier shall be designed to remove sludge uniformly from the bottom of the tank

F. AMERICAN SOCIETY OF TESTING MATERIALS (ASTM):

1. A-36 Structural Steel Specifications
2. 304 Bolt Specifications
3. A-123 Hot-Dip Galvanized Coatings
4. A-153 Hot-Dip Galvanized Bolts
5. A-48 Cast Iron Specifications
6. A-536 Ductile Iron Specifications
7. A-283C Steel Plate Specifications

G. ADDITIONAL STANDARDS AND SPECIFICATIONS

1. American Iron and Steel Institute (AISI), Heat Treated Steel Specifications
2. American Gear Manufacturers' Association (AGMA), Gear Ratings
3. American Welding Society (AWS), Current Standards
4. Anti-friction Bearing Manufacturers' Association (AFBMA), Bearing Life Specifications
5. National Electrical Manufacturer's Association (NEMA), Motor Design Standards and Standards for Control Enclosures

H. CENTER DRIVE ASSEMBLY

The center drive assembly shall consist of an integral motor and primary speed reducer coupled through roller chain and sprockets to a secondary worm/worm gear reducer driving the main gear through a pinion and shall have an integral overload protection system.

All gears and bearings shall be oil bath lubricated with the main bearing totally submerged in oil and the teeth of the main spur gear submerged at least 70 per cent in the oil bath. Oil pumps for lubrication or grease lubricated bearings are not considered appropriate for this application and will not be allowed. The oil reservoir for the main bearing and gear shall have a section of minimum depth 5 inches below the main bearing to positively prevent contamination of the main bearing and gears with condensate or other contaminants. Gear and bearing housings must also be fitted with oil level sight glasses and condensate drains. Condensate must be allowed to drain from a low point of the housing. Condensate and contaminants will not be allowed to drain through the lower pinion bearing. In lieu of the oil reservoir depth requirement a continuous oil conditioner unit installed at each drive assembly and as specified herein will be considered equal. The conditioner shall consist of an electrical continuous pre-pump filter and 150-micron stainless steel oil filter. All conditioner mounting hardware, electrical wiring/controls and necessary piping shall be provided by the clarifier manufacturer.

Drive components will be located via a machined, registered fit to preserve the alignment of key drive components under all load conditions. Inspection of the completed drive unit shall be accomplished at the clarifier manufacturer's shop, with reports of all tests and certifications of material hardness being made available for review at the Engineer's request prior to shipment to the job site.

Major drive components, main gears and bearings must be designed to allow for separate and individual replacement by plant personnel to facilitate quick and economical repairs.

The complete center drive assembly, including the overload protection device, shall be a regularly manufactured in-house product of the clarifier manufacturer. The center drive assembly is a key element in a successful clarifier installation, therefore drive assemblies purchased from third party vendors will not be accepted.

1. The drive motor shall be minimum 3/4 horsepower and shall be totally enclosed, fan cooled, with a 1.15 service factor, and have bearings with a minimum B10 rating of

50,000 hours. Operating voltage will be 460 volts, 3 phase, and 60 hertz. The Motor shall comply with the requirements of Section 220513 – Motor Requirements for Equipment as provided with these technical specifications.

2. The gearmotor primary speed reducer shall drive a secondary worm gear reducer through a #60 roller chain and steel sprockets enclosed in a galvanized 22-gauge steel guard. A constant speed motor shall drive the speed reducer. Sprockets and chain shall be designed for the connected horsepower of the drive with a minimum service factor of 4.0. Provision shall be made for adjustment of chain tension.
3. The main drive unit shall consist of a worm gear secondary reduction unit, pinion, and main spur gear assembly. The secondary reducer shall be a worm/worm gear reducer specifically designed for this application. The worm gear shall be centrifugally cast high strength manganese bronze. The worm shall be hardened alloy steel. A single piece pinion shall be keyed to the worm gear to transmit power from the worm gear to the spur gear. In order to maintain proper alignment between the pinion and the spur gear, the pinion will be supported by bearings both above and below the spur gear. The bearings shall be fitted into precision machined bearing pilots to positively insure bearing and gear alignment.
4. The main spur gear material shall be high strength ductile iron per ASTM A536 grade 100-70-03 or equal. The gear shall have a nominal pitch diameter of 40 inches with a 6.0-inch face width or the equivalent nominal spur gear surface area of 754 square inches. Spur gear surface area is defined as the spur gear pitch diameter multiplied by the spur gear face width multiplied by 3.14.
5. The main gear shall rotate and be supported on a ball bearing assembly provided with four replaceable liner strips fitted into the main gear and turntable base. Liner strips shall be special vacuum degassed carbon corrected alloy steel hardened to a Rockwell hardness of at least 43 to 46 RC. The turntable base shall be a minimum 1 inch thick to insure adequate structural rigidity to properly support the drive bearing and gear.
6. The main gear and bearing shall be completely enclosed in an ASTM A-48 Class 40A cast iron housing provided with neoprene dust seals. In order to ensure the maximum possible base rigidity and vibration dampening, the gear housing shall be of full sidewall construction, integral with the base. Prior to assembly, the base shall be thoroughly inspected for seep holes or inclusions and given a hydrostatic test to insure no leaks are in the oil containment area. Shop inspection reports must be made available for review.
7. The drive unit shall be equipped with an electro-mechanical overload control device actuated by thrust from the worm shaft. The pointer shall provide a visual reading of the relative main gear output torque on a 0 to 100 percent graduated scale. The 100 percent reading shall equal the 100 percent drive rating as specified in section 1.03. The control device shall also activate an alarm switch for warning of impending overload, a motor cutout switch for overload protection and a back-up safety motor cutout switch for backup overload protection. In lieu of a back-up safety motor cutout switch a slip clutch assembly will be acceptable upon review by the Engineer. The respective switches in the overload control device shall be factory calibrated and set to the following settings.
    a. Alarm - 40% of scale
    b. Motor cutout – 85% of scale
    c. Back-up motor cutout or slip clutch – 100% of scale
8. All drive control components shall be mounted in a weatherproof enclosure of either epoxy coated aluminum construction or stainless steel with a gasket-sealed,

removable cover. The pointer shall be covered with a clear plastic enclosure and shall be above the walkway surface for visibility from the walkway. Amperage sensing devices are not acceptable for torque overload protection due to their inability to react quickly enough to prevent damage to the drive. Overload devices with exposed linkage connections will not be accepted due to possible corrosion problems. Devices which react to rotational movement of the secondary reduction unit will not be allowed due to possible misalignment of gearing created by the movement of the reduction unit.

9. The center drive unit shall be designed for the continuous torque rating as specified in section 1.03. The continuous torque shall be defined as the minimum torque at which the drive mechanism may operate continuously 24 hours per day, 365 days per year, for 20 years, at the specified sludge collector arm speed. Main gear and pinion calculations shall be based upon ANSI/AGMA 2001-C95 standards for rating the pitting resistance and bending strength of involute spur and helical gear teeth. Calculations shall clearly present the values used for the following design parameters:

    1. Number of pinions
    2. Actual face width
    3. Tooth geometry (I and J factors)
    4. Load distribution factor
    5. Allowable contact stress
    6. Allowable bending stress
    7. Pinion pitch diameter
    8. Hardness ratio factor
    9. Elastic coefficient
    10. Life factor

10. The load distribution factor shall be determined by the empirical method. For parameters which are material dependent, such as allowable contact stress, the calculations shall include a complete description of material and heat treatment used.
11. Worm gearing shall be designed and rated to equal or exceed the specified continuous torque and life. The basis for rating shall be ANSI/AGMA 6034-B92 standards for durability rating and design of worm gear reducers.
12. The continuous torque rating for the drive unit shall be the lowest value determined for the gearing.

I. WALKWAY ACCESS BRIDGE

1. The clarifier shall be provided with a 36-inch clear open width walkway extending from the tank wall to the center drive platform. The walkway shall be supported at the center by the drive unit and supported on the opposite end by the tank wall. As a minimum, the walkway shall be designed to safely withstand all dead loads plus a live load of 50 pounds per square foot with a maximum deflection of l/360, over the entire span. The walkway shall consist of beams or a structural steel truss, with either sufficiently braced to resist the specified design loads. The walkway decking shall be 1-1/4-inch aluminum I-Bar grating.
2. A center drive operations platform shall be provided. It shall be a minimum of 8 feet square to provide clearance around the center assembly and drive control for maintenance and service. The drive platform shall be decked with 1/4-inch aluminum checkered floor plate and have sufficient structural steel supports to meet the specified design load conditions.
3. Provide handrails with toe plate along both sides of the walkway and around the center drive platform. The hand railing shall be in conformance with the handrail specifications, found within this set of bid documents, and shall be as shown on the drawings.

4. Structural steel associated with the walkway shall be coated in the same manner as all other non-submerged steel members as specified below. Anchors, bolts, and other associated hardware shall be 316 stainless steel.

J. CENTER CAGE AND RAKE ARMS

1. The center cage shall be of steel box truss construction, with connections for the two (2) sludge removal arms, rotating sludge collection drum and feedwell supports. The top of the cage shall be bolted to the main gear which shall rotate the cage with the attached arms and feedwell. The minimum angle size used for construction of the cage and rake arms shall be 2 inch x 2 inch x 1/4 inch members.
2. The clarifier mechanism shall include two (2) sludge removal arms of steel truss construction, with steel spiral rake blades and adjustable 20 gauge 304 stainless steel squeegees. The rake blades shall provide complete raking of the basin floor twice per revolution.
3. The rake blades shall consist of a minimum 3/16-inch thick steel plate. The blades shall be constructed to a logarithmic spiral curve with a constant 30-degree angle of attack. Blade depth shall vary as noted in Article 1.04. Each rake truss support arm shall be provided with the necessary outrigger bracing and other blade support structures, to ensure that the complete blade can be properly located and adjusted in the field.
4. The rake blades shall terminate in the center to within 1 inch of the rotating sludge collection drum. The 1 inch space shall be sealed with a neoprene seal.
5. The structural calculations for the rake arm shall include an analysis of the torsional loads from the spiral curve blade.
6. The cage and rake arms shall be designed such that calculated stresses do not exceed the AISC allowable stress at twice the drive 100% rating.

K. ROTATING SLUDGE COLLECTION DRUM

1. A rotating sludge collection drum shall be provided to collect settled solids raked to the center by the rotating spiral blades. The collected sludge shall be discharged from the tank by way of the RAS sludge pipe as shown on the contract drawings.
2. The sludge collection drum shall rotate with the center cage and shall be provided with sludge collection ports located directly in front of each rotating spiral rake blade. The ports shall be sized to collect thickened sludge from the bottom most dense sludge layer to maximize underflow solids concentration.
3. The rotating sludge drum shall be constructed of ¼ inch steel plate. A neoprene seal shall be provided to seal against the center column. A stainless steel seal shall be provided to seal against the tank floor.

L. CENTER COLUMN

1. A stationary center column shall be provided which shall serve as the influent pipe. One end shall have a 1-1/4-inch support flange for bolting to the foundation with a minimum of eight (8) 1-1/4-inch diameter anchor bolts as shown on the plans. A similar flange shall be provided at the top of the column for supporting and securing the center drive assembly. Minimum center column thickness shall be 1/4".
2. Influent openings shall be provided in the upper portion of the column to allow unrestricted passage of the flow into the energy dissipating feedwell. Influent velocity

shall be reduced by providing a total inlet port area a minimum of 135 percent of the center column cross sectional area.

M. ENERGY DISSIPATING INLET (EDI)

1. The clarifier shall be equipped with an energy dispersion well located inside the rotating flocculation feedwell. The dispersion well shall be designed to dissipate the energy of the incoming flow by way of multiple baffled inlet ports equally spaced around the dispersion well.
2. The center dispersion well shall include a bottom plate to fit within one inch of the center column. The well shall be constructed of 3/16-inch plate. EDI outlet ports equally spaced around the periphery shall be provided for energy dissipation. The outlet ports shall impart a tangential flow into the outer flocculating feedwell and shall have bottom plates to prevent short circuiting.
3. The bottom plate of the EDI shall be provided with properly sized drain holes.

N. FLOCCULATING FEEDWELL

The flocculating feedwell shall be supported by structural members attached to the rotating center cage. The feedwell shall be fabricated out of 3/16-inch steel plate with upper and lower reinforcing rim angles and stiffeners as required. Properly sized scum ports shall be equally spaced around the feedwell periphery to allow scum to exit from the feedwell at water level.

O. SURFACE SCUM SKIMMING EQUIPMENT

1. Surface scum skimming equipment shall be furnished with the clarifier mechanism. It shall be arranged to have the surface scum swept along an angled skimmer blade to the skimmer assembly, attached at the end of the blade, for discharge to the scum box as shown on the plans. The surface of the clarifier shall be swept once per revolution.
2. The skimmer blade shall be tangential to the rotating feedwell and be supported by vertical supports from the rake arm. The skimmer assembly shall be a pivoting aluminum skimmer device equipped with manual out-of-service lock out. The skimmer shall have replaceable neoprene rubber wipers on all three sides to form a pocket to trap the scum and discharge the scum into the scum box.
3. The scum box shall be supported from the tank wall and connected to a six (6) inch scum line, as shown on the contract drawings.
4. The clarifier equipment manufacturer shall furnish a flush valve assembly for automatic flushing of the scum box and scum pipe. The flush valve assembly shall be adjustable to allow 0 to 20 gallons of clarified effluent to enter the scum box as the skimmer assembly passes over the scum box. The assembly shall consist of a stainless steel lever, UHMW seal plate and neoprene diaphragm mounted to the scum box. The diaphragm shall be opened and closed by an easily adjustable, submerged actuation arm mounted to the rotating skimmer blade. The flush volume adjustment mechanism shall be above the water level and shall include at least three settings.

P. EFFLUENT WEIR AND SCUM BAFFLE

Effluent weir plates shall consist of 9-inch deep x ¼-inch thick FRP sections with 2-1/2-inch deep 90 degree V-notches at 6 inch intervals. The weir sections shall be fastened to the tank wall using 316 stainless steel cinch anchor bolts hex nuts and 5-inch diameter FRP washers, allowing for vertical adjustment. To prevent leakage all surfaces between the launder walls and weir plates shall be given a seal coat of suitable mastic by the erection contractor. The scum baffle plates shall consist of 12-inch deep x ¼-inch thick FRP sections supported from the tank wall by FRP angle brackets secured with 316 stainless steel cinch anchor bolts and hex nuts, allowing for vertical and radial adjustment.

Q. SURFACE PREPARATION AND PAINTING

1. All non-submerged steel shall be sandblasted to SSPC-SP-6 specifications and given one coat of manufacturer's epoxy primer 2-3 MDFT. All submerged steel shall be sandblasted to SSPC-SP-10 specifications and given one coat of manufacturer's epoxy primer 2-3 MDFT.
2. Prior to assembly of the drive unit, the castings shall have been sandblasted and thoroughly cleaned to remove any foreign particles in the drive base. After assembly, the drive mechanism shall be solvent cleaned and power wire brushed as needed prior to application of manufacturer's standard primer.
3. Gear motors shall be furnished with manufacturer's standard enamel.

R. SPARE PARTS

The following spare parts shall be provided:

1. One (1) sight glass or dip stick for each main drive housing containing oil.
2. One (1) set of neoprene skimmer wipers for each mechanism.
3. One (1) drive motor.
4. One (1) gear reduction drive.
5. Additional spare parts as recommended by the supplier.

S. CONTROLS

Motor controller, disconnect and clarifier controls will be provided by others. Any safety interlocks, torque control, torque switches, …etc., will be provided with the clarifier drive by the manufacturer.

BID ITEM #6 – OPEN CHANNEL UV DISINFECTION SYSTEM

A. GENERAL DESCRIPTION

The supplier shall provide one (1) complete open channel ultraviolet (UV) disinfection system to treat minimum, average, and peak day effluent flows to the discharge standards outlined below. The manufacturer shall furnish all equipment, power distribution panels, control panels, cleaning apparatuses, cleaning/chemical tanks (if required), fasteners, supports, and all other items necessary to provide an open channel, gravity flow, low pressure high intensity UV disinfection system to be installed in concrete channel(s). Vertical or horizontal modules are acceptable for this project; it should be noted that space is very limited at the site and thus vertical systems may better accommodate this limitation. The UV equipment shall be installed indoors in a ventilated building (building by others).

The UV system shall disinfect effluent from secondary clarifiers that follow a hybrid fixed film activated sludge treatment process. The activated sludge process is preceded by anoxic basins, primary clarifiers, grit removal and ¼" influent step screens.

B. DESIGN CRITERIA

1. Average Wet Weather Daily Flow:	3.2 MGD
2. Average Dry Weather Daily Flow:	2.2 MGD
3. Peak Daily Flow:	18.0 MGD (continuous for 24 hours)*
4. Transmittance:	55% (@ 254 nm)
5. Influent TSS:	< 10 mg/L
6. Required Effluent MPN/100mL Enterococci:	< 35 MPN/100 mL (30-day geometric mean)
7. Number of Channels:	2
8. End of Life Lamp Factor:	90%**
9. Max Jacket Fouling Factor:	95%**
10. Capacity per Channel:	9.0 MGD w/ 1 bank offline*
11. Number of Standby Units per Channel:	1 (for redundancy)*
12. Required minimum dose @ Max Flow:	45,000 µJ/cm^{2}s**

* Each channel must treat 9.0 MGD with one UV bank offline in each channel.

** While lower doses or higher fouling/end of life factors may be adequate, OWNER prefers to be more conservative to help ensure proper performance during peak events.

C. QUALITY ASSURANCE AND APPROVED MANUFACTURERS

1. Subject to compliance with the specifications and performance criteria, approved suppliers include:

    a. ITT Wedeco
    b. SUEZ – Ozonia

c. Trojan Technologies
d. Or equal

2. Supplier shall provide guaranteed operation hours (e.g. 12,000 or 16,000 hours) for lamp life where output will be no less than the output utilized for end of life dose calculations (refer to limits in the design criteria). This lamp life will be utilized in conjunction with other information provided in the UV information table to help establish annual costs and 20-year net present values to operate the disinfection system. Lamp life shall be warrantied for the stated duration of lamp life. Pro-rated warranties against actual lamp life is acceptable.

3. Supplier shall have a minimum 10 years experience in manufacturing and installing open channel UV disinfection systems and must furnish five (5) references with installations as similar as possible to this application (see reference form provided above).

D. GENERAL SCOPE & REQUIREMENTS

The UV system shall consist of the following major equipment, in addition to any other items, equipment, and other appurtenances that are standard or necessary to furnish a complete UV disinfection equipment package. Scope includes but is not limited to:

1. UV disinfection modules.
2. Power Center Enclosure (PCE) and interconnecting power and data cables to modules.
3. Main PLC Enclosure (MPE) housing the A/B PLC Controller and interconnecting data cables to PCE.
4. UV intensity monitoring system.
5. UV eye shields.
6. Personal safety equipment.
7. Automatic dose/flow pacing energy conservation system (power center by power center) and Variable UV Lamp Output or ability to adjust power draw and/or number of active lamps to optimize power efficiency with flow rate and real-time conditions.
8. Automatic effluent level control device (finger weir or similar effluent troughs).
9. Spare parts.
10. Start-up, testing, and personnel training.
11. Module lifting frame or integral design to allow for removal of modules and/or individual lamps or rack of lamps for maintenance, repairs, cleaning, etc.
12. Automatic cleaning (Mechanical Wipers) system.
13. Integrated flow dispersion baffles.
14. Chemical tank or holding rack to facilitate manual chemical cleaning of quartz sleeves (crane by others).
15. Spare parts, including but not limited to:
    a. UV lamps (specify number recommended)
    b. Quartz sleeves (specify number recommended)
    c. Mechanical wipers for cleaning system (specify number recommended)
    d. Lamp controllers (if recommended)
    e. UV intensity sensors (if recommended)

16. Other appurtenances that are standard and required in order for the supplier to furnish a complete and operable UV system.

E. GENERAL REQUIREMENTS

1. The UV system shall be fully functional including furnishing, testing, and putting into operation the open channel UV disinfection system. The number of units required to meet the design parameters may vary.

2. The supplier shall specify the required channel properties for their system including: length, width, depth, spacing between UV units and any other required structures such as cleaning tanks, hoist cranes, etc. The supplier is responsible for ensuring that the recommended UV channel design avoids dead spots and other flow anomalies that adversely impact flow, reliability, and performance of the UV system.

3. The supplier shall specify all controls, lamp cleaning mechanisms, and all other auxiliary equipment required for a complete and functional UV disinfection system.

4. The UV manufacturer shall provide a test protocol for the UV system to be followed after initial start-up and following a minimum of 10 days of continuous plant operation. The installing contractor shall notify the Owner and UV manufacturer in writing, that he is prepared to begin the acceptance test. The Owner shall then provide written notification to the Contractor to proceed with the acceptance testing. Results of the test done by the contractor will be supplied for review to the UV manufacturer.

5. The system shall allow for continuous operation while replacing lamps or performing other maintenance on the system.

6. The manufacturer shall provide a lifetime performance guarantee that their proposed UV equipment package will meet or exceed the permit requirements regarding total coliform limits as specified in Paragraph D. This guarantee shall be provided and specifically stated as part of the proposal package.

7. In addition, the manufacturer shall provide 3rd party validation, for average flow requirements, per NWRI guidelines to support the calculated dose provided in the UV tables. Note that the dosage calculation should be computed at the end of lamp life and account for fouling. Also, as noted in the UV table below, 3rd party validation for the end of lamp life and fouling factors provided must also be provided with the proposal.

8. All module metal components in contact with effluent shall consist of type 316 stainless steel. All materials exposed to UV light shall be type 316 stainless steel, type 214 quarts, Teflon, or other suitably UV resistant material. Lamp bases shall be of a durable construction resistant to UV.

9. A completed UV information table (that follows this section) must be submitted with the proposal.

10. The UV system shall be provided with a self-maintained cleaning system which will automatically and sufficiently clean all lamps to ensure UV dispersion and contact with the effluent water.

11. The system shall be configured such that modules and rows of lamps can be turned on/off and/or dimmed to adjust power with the flow rate and other real-time conditions. Adjustability and power consumption are key considerations of the review process for this equipment.

F. CONTROLS

1. Automatic controls shall be provided in type 4X NEMA rated stainless steel enclosures and meet the requirements outlined in the general technical specifications provided in **EXHIBIT THREE**.
2. System and power control panels shall allow for redundancy. The UV system as a whole shall be capable of continued operation with one module offline, including the offline module's associated control panel.
3. The Vendor shall provide to the Owner a preliminary version of the PLC and Touch Screen source code for their PLC programs at the time of equipment delivery. A final version of the source code shall be provided within fifteen (15) days of startup.
4. The minimum automatic controls to be included in the local control panel and to be integrated into the SCADA are as follows:
    a) System/ module Hand-Off-Auto selector
    b) Wiper and/or clean in place system Hand-Off-Auto selector
    c) Reset selector
    d) Emergency stop
    e) Over current and starter overload alarms
    f) Relays
    g) Timer
    h) Run and alarm auxiliary contacts

5. The minimum automatic controls to be included in the SCADA programming include:
    a) Emergency stop
    b) Intensity indicators
    c) Run IMD

6. If additional controls, relays, etc. are required for High Efficiency UV control (i.e. for flow pacing and power adjustment), the proposal shall indicate the additional controls and instruments that are to be furnished.
7. The UV power and control system shall meet the requirements of sections 220513 Motor Requirements for Equipment, 409433 Human Machine Interfaces, 409443 Programmable Logic Controllers and 409513 Process Control Panels and Hardware as provided with these technical specifications.

LGVSD UV DISINFECTION INFORMATION TABLE	
Total Number of Modules or Banks (Duty & Standby) per channel	
Total Active Modules Required for Average Daily Wet Flow (3.2 MGD)*	
Total Active Modules Required for Average Daily Dry Flow (2.2 MGD)*	
Total Active Modules Required for Peak Day Flow (18 MGD)	
Lamps per Unit or Bank	
Lamp Power Draw (ea. - watts)	
Lamp Power Output (ea. - watts)	
Total Number of Active Lamps for Average Daily Wet Flow (3.2 MGD)	
Total Number of Active Lamps for Average Daily Dry Flow (2.2 MGD)	
Total Number of Active Lamps for Peak Day Flow (18 MGD)	
Required Channel Width (inches)	
Required Channel Length (feet)	
Minimum Required Water Depth (inches)	
Maximum Allowable Water Depth (inches)	
Maximum headloss through channel (at peak flow 9.0 MGD per channel) in inches	
Required Effluent Control (Finger Weir) Length (ft)	
Design Dose ($\mu Ws/cm^2$) - **Refer to limits in design criteria**	
Lamp Aging Factor (**Refer to limits in design criteria**)	
Lamp Fouling Factor (**Refer to limits in design criteria**)	
Total Power Consumption @ Average Daily Wet Flow (kW)	
Total Power Consumption @ Average Daily Dry Flow (kW)	
Total Power Consumption @ Peak Day Flow (kW)	
Annual Power Cost (assume $0.10/kWh and overall annual average **flow at 2.7 MGD**)	
Guaranteed Lamp Life (operating hours)	
Replacement Lamp Cost (ea.)	
Annual Lamp Replacement Cost (at 2.7 MGD ADF)	
Annual Quartz Sleeve Replacement Cost (@ 2.7 MGD ADF)	
Annual Cost for other Replacement Parts (@ 2.7 MGD ADF) – List items associated with this cost	
Estimated Annual Labor Cost (@ 2.7 MGD ADF)	

* At these flows we anticipate only one active channel rather than splitting flow between two channels. However, suppliers input is expected to achieve most reliable and efficient operation at average flow rates.

BID ITEM #8 – STANDBY MECHANICAL THICKENER

A. DESCRIPTION

1. The supplier shall provide a mechanical thickener unit to thicken combined waste activated sludge (WAS) and primary sludge. The thickener(s) shall be complete with all components for proper operation including but not limited to instrumentation and a polymer feed system.

2. This unit will be installed to serve as backup for a DAFT thickening process. The OWNER has requested a cost adder to add a second mechanical thickening unit (refer to the Bid Form). The second mechanical thickener would replace the DAFT, resulting in a duty/standby installation for the mechanical thickeners.

3. Special consideration will be given to mechanical thickener equipment that has a small footprint and minimizes polymer usage.

4. The thickener(s) shall be suitable for outside installation; however, the Owner can provide an awning to cover the thickener, if necessary.

5. Proposals shall include the completed **Information Table** for this bid item as provided at the end of this section.

B. DESIGN CRITERIA

1. WAS + Primary Sludge Flow Criteria

a. Average Daily Design Flow:	45,000 gpd / 31 gpm
Peak Flow	61,600 gpd / 43 gpm
b. Design Loading:	6,438 lbs/day WAS+Primary
WAS @ 1%:	2,268 lbs/day
Primary Sludge @2.5%	4,170 lbs/day
Peak Loading	7,500 lbs/day
c. Net Influent Concentration:	1.5 – 1.6%

2. Thickened WAS Requirements

a. Thickened WAS Concentration:	≥ 6% dry solids
b. Solids Capture:	≥ 95% capture

C. ACCEPTABLE MANUFACTURERS

a. Huber Technology, Inc.
b. Centrisys
c. Or Equal

D. GENERAL REQUIREMENTS

1. The supplier shall provide the number of unit(s) required to thicken the sludge as outlined in the design criteria.

2. Each thickener shall be equipped with a dedicated polymer mixing and feed unit. The polymer units shall be sufficiently sized for the thickener that it serves. The polymer unit shall include the polymer mixing, dosing, and injection ring and all other equipment necessary for a complete and functional system. The manufacturer shall provide a recommended layout for all equipment associated with the sludge thickening equipment.

3. The supplier shall clearly **identify where the materials of construction are not stainless steel** and indicate materials of construction (and proposed protective coatings if applicable) for all components. The proposal shall also include details regarding a complete thickening unit including wash water pumps, drive motors, gear reducers, support legs, anchor bolts, flocculation reactor, piping and wiring, controls, and all accessories and appurtenances specified or otherwise required for a complete and properly operating installation. Supplier shall also provide all other information suitable for a reasonable comparison of equipment quality and components.

4. The supplier shall include all flow and pressure requirements for each piece of equipment.

5. The thickener shall be completely enclosed to prevent odor emission and furnished with a flanged connection to facilitate connecting the enclosed thickener to an odor control system.

6. The manufacturer shall supply detailed process information including:

    a. Maximum hydraulics loading capacity
    b. Maximum solids loading capacity
    c. Minimum solids capture rate
    d. Minimum thickness achievable, as well as the chemical dosing requirements to meet the thickness

7. The supplier shall include cut sheets, with all relevant dimensional data, to show the coordination and placement of each piece of equipment. The supplier shall also include design calculations, including anchoring calculations and bolt requirements.

8. The supplier shall include a list of recommended spare parts and include the cost separately as Bid Item B in the Bid Sheet.

E. MOTORS

1. Motors shall be rated as severe duty and shall be 3 phase, 60Hz and 460VAC. Motors shall be TEFC with type F insulation.

2. The Motor shall comply with the requirements of Section 220513 – Motor Requirements for Equipment and other requirements provided in **EXHIBIT THREE**.

F. CONTROLS

Controls shall meet the requirements outlined in the general technical specifications provided in **EXHIBIT THREE** as well as the specific requirements outlined below:

1. Each thickener shall be equipped with a UL labeled, wall mounted or free standing, stainless steel, NEMA 4X control panel. The control panel as a minimum shall have the following:

    a. NEMA 4X Main disconnect with door operator. The door operator shall be defeatable with a screw-driver. The panel shall accept 3 phase power at 480VAC.
    b. Provide a power distribution block.
    c. Provide a fused 120VAC control power transformer that is suitably sized for all 120VAC loads.
    d. The Control Panel and its components and construction shall meet the requirements of the attached specification section 409513.

2. Motor starters and VFD's shall meet the requirements of the attached specification sections 262913 and 262923 respectively. Motor starters and VFD's shall be fed by a circuit breaker and shall be NEMA rated.

3. Each Control Panel shall be equipped with an Allen-Bradley PLC. The PLC shall be a CompactLogix. The PLC shall be equipped with an Ethernet Port. The control panel shall be equipped with an Industrial Ethernet Switch with a minimum of 5 copper ports. The Control Panel will be connected to and monitored by the plant SCADA system. The manufacturer shall coordinate with the integrator for the project by coordinating IP addressing and tagging/addressing. The PLC shall comply with the requirements of 409443 Programmable Logic Controllers as provided with these technical specifications.

4. Each Control Panel shall be equipped with an Allen-Bradley Panelview Plus 6 operator interface that communicates with the PLC over Ethernet/IP. The operator interface shall allow the operator to adjust control settings for the filter and to monitor the system. The operator interface shall comply with the requirements of 409433 Human Machine Interfaces as provided with these technical specifications.

5. Each thickener shall be supplied with a magnetic flow meter for measuring the sludge flow into the thickener. Each flow meter shall send a 4-20mA signal for flow rate and a pulse output for totalization to the PLC. Any additional instrumentation or control valves as needed for a complete and operational system shall be supplied. All instrumentation and electrical field devices shall be rated NEMA 4X. Electrical junction boxes located at the thickeners shall be 316 stainless steel and shall be NEMA 4X. Any factory installed conduit shall be PVC coated GRS.

6. The Vendor shall provide to the Owner a preliminary version of the PLC and Touch Screen source code for their PLC programs at the time of equipment delivery. A final version of the source code shall be provided within fifteen (15) days of startup. Final programs shall be owned by the Owner.

7. Controls: Supplier shall include details regarding all instrumentation that will be provided as part of the package along with details on the proposed control system. The supplier will supply a control description of their equipment.

Mechanical Thickener – Information Table	
Parameter	**Value**
Design solids loading (lbs/hour)	
Maximum solids loading (lbs/hour)	
Maximum hydraulic loading (gpm)	
Design Feed Solids Content (min to max) in %	**-**
Manufacturer of Polymer Mixing/Injection Equipment	
Anticipated polymer usage at design solids loading (lbs/hour)	
Annual cost of polymer (assume 365 days at design loading)	
Required dilution water at design solids loading (gpm)	
Anticipated thickened solids content at design loading (% solids)	

EXHIBIT THREE - ADDITIONAL GENERAL TECHNICAL SPECIFICATIONS

Section 220513	Motor Requirements for Equipment
Section 262913	Motor Controllers
Section 262923	Variable Frequency Motor Controllers (VFDs)
Section 409433	Human Machine Interfaces
Section 409443	Programmable Logic Controllers
Section 409513	Process Control Panels & Hardware

SECTION 220513 – COMMON MOTOR REQUIREMENTS FOR EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This Section includes AC induction electric motors to be provided with associated driven equipment. Motor voltage, speed and enclosures are specified in the equipment specifications. Unless otherwise specified, motors shall be provided by the manufacturer of the driven equipment under the provisions of the individual equipment specification.

1.2 MOTOR RATING

A. Motor horsepower ratings as shown on the drawings and noted on the specifications are estimates only and it is the responsibility of the CONTRACTOR and/or VENDOR to furnish motors, electric circuits, power feeds and other equipment whose ratings meet the requirements for the submitted horsepower and amperage.

B. This section applies to electric motors rated 480 V and below.

1.3 CODE AND STANDARDS

A. Electrical Code Compliance: Comply with applicable local electrical code requirements of the authority having jurisdiction and NEC Articles 220, 250, and 430, as applicable to installation, and construction of motor controllers.

B. AFBMA Compliance: Comply with applicable requirements of AFBMA 9 & 11, "Load Rating and Fatigue Life for Ball and Roller Bearings."

C. UL Compliance: Comply with applicable requirements of UL 674, “Electric Motors and Generators, for Use in Division 1 Hazardous (Classified) Locations” and UL 1004, “Electric Motors”.

D. IEEE Compliance: Comply with recommended practices contained in IEEE Standard 112, "Standard Test Procedures for Polyphase Induction Motors and Generators," and IEEE Standard 841, “Standard for Petroleum and Chemical Industry – Totally Enclosed Fan Cooled (TEFC) Squirrel Cage Induction Motors – Up to and Including 500 HP”.

E. NEMA Compliance: Comply with applicable requirements of NEMA Standard ICS 2, "Industrial Control Devices, Controllers and Assemblies", NEMA Standard ICS 6, “Enclosures for Industrial Controls and Systems, ”Pub No. 250, "Enclosures for Electrical Equipment (1000 Volts Maximum)" and NEMA MG 1, “Motors and Generators”.

1.4 MAINTENANCE DATA

A. Submit maintenance data and parts list for each motor and auxiliary component; including troubleshooting maintenance guide. Also, provide product data and shop drawings in a maintenance manual, in accordance with requirements of the Contract Documents.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's data and installation instructions for each motor in accordance with the individual equipment specification. As a minimum, the following information shall be provided:

1. Manufacturer name, type and model number
2. Motor outline, dimensions and weight
3. Manufacturer's general descriptive information relative to motor features
4. Type of bearing and method of lubrication
5. Rated size of motor and service factor
6. Temperature rise and insulation rating
7. Full-load rotative speed
8. Efficiency at full, ¾ and ½ load
9. Full load current
10. Locked-rotor current
11. Space heater wattage and voltage, if applicable
12. If a winding overtemperature device is required, provide a response curve for the temperature device, wiring diagram and specifications
13. If a moisture detection system is required, provide a typical wiring diagram and a moisture detection relay to be installed by the CONTRACTOR or VENDOR in the associated motor controller.

B. Shop Drawings: Submit shop drawings of electric motors showing accurately scaled equipment locations and spatial relationships to associated drive equipment.

C. Wiring Diagrams: Submit power and control wiring diagrams for electric motors showing connections to electrical power panels, feeders, and equipment.

D. Operations and Maintenance Data: Submit operation and maintenance information.

PART 2 - PRODUCTS

2.1 GENERAL

A. Except as otherwise indicated, provide electric motors and ancillary components that comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for a complete installation.

2.2 SERVICE CONDITIONS

A. Unless specified otherwise, motors shall be suitable for continuous operation at an elevation of 0 to 3000 feet above mean sea level.

B. Unless specified otherwise, motors located outdoors shall be suitable for continuous operation from -25 to 50°C; motors located indoors shall be suitable for continuous operation from 0 to 50°C.

C. All motors shall be able to operate under power supply variations in accordance with NEMA MG 1 – 14.30.

2.3 NAMEPLATES

A. Motor nameplates shall be engraved or stamped stainless steel. Information shall include those items as enumerated in NEMA Standard MG 1, as applicable. Nameplates shall be permanently fastened to the motor frame and shall be visibly positioned for inspection.

2.4 CONSTRUCTION

A. All motors provided under this specification shall have the following features of construction:

1. Frames shall be steel for motors smaller than ½ horsepower and cast iron for motors ½ horsepower and larger.
2. Cast metal shrouds and covers for non-sparking fan blades.
3. Non-hygroscopic motor leads.
4. NEMA Design-B as standard design. Other designs if required must be submitted and approved in writing by the ENGINEER.
5. Motor Service Factor of 1.15 for Sine-Wave and 1.0 for Inverter Duty.
6. Grounding terminal
7. Windings shall be copper
8. Rotor cages shall be die cast aluminum or fabricated copper
9. Shafts shall be made from carbon steel.

2.5 MOTORS LESS THAN ½ HORSEPOWER

A. General:

1. Unless specified otherwise, motors less than ½ horsepower shall be squirrel cage, single phase, capacitor start, induction run type.
2. Single phase motors shall have class B insulation as a minimum.
3. Motors for fans less than 1/8 horsepower may be split-phase or shaded pole type.
4. Winding shall be copper.

B. Rating:

1. Unless specified otherwise, motors less than ½ horsepower shall be rated for operation at 115 volts, single phase, 60 Hz, and shall be continuous-time rated in conformance with NEMA Standard MG 1 – 10.35.

2. Dual voltage (115/230) rated motors are acceptable if all leads are brought out to the conduit box.
3. Motors shall be non-overloading at all points of the equipment operation.

2.6 MOTORS ½ HORSEPOWER AND LARGER

A. General:

1. Unless specified otherwise, motors ½ horsepower and larger shall be 3 phase, squirrel cage, full voltage start induction type.
2. Unless otherwise specified, motors shall have a NEMA MG 1-1.16 design letter B or C torque characteristic as required by the driven equipment's starting torque requirement.
3. Winding shall be copper.
4. Motors shall be equipped with a set of thermal overload switches with dry contacts available at the motor terminal box:

B. Rating:

1. Unless specified otherwise, motors ½ horsepower and larger shall be rated for operation at 460 volts, 3 phase, 60 Hz, and shall be continuous-time rated in conformance with NEMA Standard MG 1 – 10.35.
2. Dual voltage (230/460) rated motors are acceptable if all leads are brought out to the conduit box.
3. Motors for variable frequency systems shall not be required to deliver more than 80% of the motor's service factor rating by any load imposed by the driven machine at any specified operating condition or any condition imposed by the driven machine's performance curve at maximum operating speed.

C. Enclosures and Insulation:

1. Motors shall be classified as Type 1 (Process) or Type 2 (Explosion proof) based upon the location of the motor and the associated area classification.
2. Temperature rise for all motors shall not exceed that permitted by Note II, Paragraph 12.42 of NEMA MG 1.
3. Motor Insulation shall be non-hygroscopic.
4. Type 1 motors (Process):

    a. Type 1 motors shall be premium energy-efficient motors, totally enclosed, fan cooled (TEFC)
    b. All motors shall have Class F insulation with Class B temperature rise.
    c. All internal surfaces shall be coated with an epoxy paint.
    d. Motors shall be rated for corrosive atmosphere duty.

5. Type 2 Motors (Explosion Proof):

    a. Explosion proof motors shall be UL listed in accordance with UL 674 for Class I, Group D hazardous atmospheres.
    b. The motor shall have Class F insulation.

c. A UL-approved Type 316 stainless steel breather/drain device shall be provided in the motor drain hole.

d. The motor shall be provided with a frame temperature thermostat which meets the UL frame temperature limit code T2A (280°C). The thermostat shall contain an automatically reset, normally closed contact rated 2 amperes at 230 VAC.

2.7 MOTORS FOR VARIABLE FREQUENCY DRIVES

A. Motors intended for use with variable frequency drives shall be compatible with the characteristics of the intended variable frequency inverter.

B. Motors shall be Type 1 or Type 2 as specified in 2.06C.

C. Motors shall withstand a pulse voltage of at least 1750 volts with a rate of rise up to 750V per microsecond.

D. Motors shall be certified by the manufacturer as suitable for inverter duty and shall have as a minimum a 10:1 turndown ratio (6-60Hz).

E. Motors shall be capable of running above the rated RPM up to 70 Hz (116.67% of rated RPM) so long as the load current does not exceed the full load amps of the motor.

2.8 MOTOR EFFICIENCIES

A. Type 1 and Type 2 motors in accordance with NEMA MG 1 Table 12-11 and 12-12 and Type 2 in accordance with IEEE 841 Table 2 motor minimum nameplate efficiency for 900, 1200 and 1800 rpm motors, when operating on a sinusoidal power source shall conform to the following (in accordance with IEEE 112B testing procedures):

Motor Horsepower	Guaranteed Minimum Efficiency (%)		
	900 RPM	1200 RPM	1800 RPM
1	70.0%	78.5%	81.5%
1.5	72.0%	81.5%	82.5%
2	80.0%	81.5%	82.5%
3	81.5%	86.5%	84.0%
5	82.5%	86.5%	84.0%
7.5	82.5%	88.5%	88.5%
10	86.5%	88.5%	88.5%
15	86.5%	89.5%	89.5%
20	87.5%	90.2%	91.7%
25	87.5%	91.0%	91.7%
30	89.5%	91.0%	91.7%
40	89.5%	92.4%	92.4%
50	90.2%	92.4%	92.4%

60	90.2%	93.0%	93.0%
75	91.7%	93.0%	93.6%
100	91.7%	93.6%	94.1%
125	92.4%	93.6%	94.1%
150	92.4%	94.5%	94.5%
200	92.4%	94.5%	94.5%
250	93.6%	94.1%	94.1%

2.9 CONDUIT BOXES

A. Conduit boxes shall be sized based on the conduit number and conduit size indicated on the drawings. Provide over-sized boxes with the number of openings as required to accommodate the conduits required.

B. Conduit boxes shall be split construction with threaded hubs and shall conform to IEEE 841 for Type 1 and Type 2 motors. Motors shall be furnished with petroleum-resistant gaskets at the base of the conduit box and between the halves of the conduit box.

C. Conduit boxes shall be designed to rotate in order to permit installation in any of four positions 90 degrees apart.

2.10 BEARINGS

A. Bearings may be oil or grease lubricated ball or angle contact roller bearing rated for a minimum L-10 life of 100,000 hours in accordance with ABMA 9 or 100 at the ambient temperature specified. Motor designs employing cartridge type bearings will not be accepted. Bearings shall be fitted with lubricant fill and drain or relief fittings. Belt loads shall not exceed forces calculated from NEMA MG 1 Table 14-1.

2.11 LIFTING EYES

A. Motors weighing more than 50 pounds shall be fitted with at least one lifting eye and motors weighing over 150 pounds shall be fitted with two lifting eyes.

2.12 SPACE HEATERS

A. Motors that are located outdoors shall be equipped with Space Heaters to prevent condensation inside the motor enclosure after motor shutdown and maintain the temperature of the windings at not less than 5°C above outside ambient temperature.

B. Heaters shall be flexible wraparound type rated 120 volts, single phase, 60 Hz unless otherwise noted. The space heater rating in watts and volts shall be noted on the motor nameplate or on a second nameplate. Space heater leads H1 and H2 shall be brought to a separate terminal block or pigtails in the motor conduit box or separate conduit box with a threaded conduit opening.

PART 3 - EXECUTION

A. Install electric in accordance with equipment manufacturer's written instructions, and with recognized industry practices. Comply with applicable requirements of NEC, UL, and NEMA standards, to insure that products fulfill requirements.

B. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque values for equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A and B, and the National Electrical Code.

C. Ensure that the motor is properly grounded from the incoming motor leads and that the frame is bonded to the grounding electrode system.

D. Verify breather/drain fittings have been installed as specified.

E. Prior to energizing, check circuitry for electrical continuity, and for short-circuits. Winding insulation resistance for motors shall not be less than 10-megohms measured with a 1000-VAC megohmeter at 1-minute at or corrected to 40°C.

F. Check rotation of each motor for proper direction.

G. Upon completion of installation of motor controller equipment and electrical circuitry, energize controller circuitry and demonstrate functioning of equipment in accordance with requirements.

END OF SECTION 220513

SECTION 262913 – MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. A motor controller is any device or group of devices normally used to start and stop a motor by making and breaking the motor circuit current. The motor controller and devices that make up the motor controller shall be governed by items indicated on the Plans, or elsewhere within these specifications.

B. Types of motor controllers specified in this section include the following:

1. Combination.
2. Fractional HP manual.
3. Solid-state reduced voltage.
4. Autotransformer reduced voltage.

C. This section applies to motor controllers rated 480 V and below.

1.2 CODE AND STANDARDS

A. Electrical Code Compliance: Comply with applicable local electrical code requirements of the authority having jurisdiction and NEC Articles 220, 250, and 430, as applicable to installation, and construction of motor controllers.

B. NFPA Compliance: Comply with applicable requirements of NFPA 70E, "Standard for Electrical Safety requirements for Employee Workplaces."

C. UL Compliance: Comply with applicable requirements of UL 486A and B, and UL 508, pertaining to installation of motor controllers. Provide controllers and components which are UL-listed and labeled.

D. IEEE Compliance: Comply with recommended practices contained in IEEE Standard 241, "Recommended Practice for Electrical Power Systems in Commercial Buildings," pertaining to motor controllers.

E. NEMA Compliance: Comply with applicable requirements of NEMA Standard ICS 2, "Industrial Control Devices, Controllers and Assemblies," and Pub No. 250, "Enclosures for Electrical Equipment (1000 Volts Maximum)," pertaining to motor controllers and enclosures.

1.3 MAINTENANCE DATA

A. Submit maintenance data and parts list for each motor controller and component; including troubleshooting maintenance guide. Also, provide product data and shop drawings in a maintenance manual.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's data and installation instructions on motor controllers.

B. Shop Drawings: Submit shop drawings of motor controllers showing accurately scaled equipment locations and spatial relationships to associated motors and equipment.

C. Wiring Diagrams: Submit power and control wiring diagrams for motor controllers showing connections to electrical power panels, feeders, and equipment.

PART 2 - PRODUCTS

2.1 GENERAL

A. Except as otherwise indicated, provide motor controllers and ancillary components that comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for a complete installation.

2.2 COMBINATION CONTROLLERS

A. Provide full-voltage alternating-current combination controllers, consisting of controller and circuit breaker disconnect switch mounted in a common enclosure, of types, sizes, rating, and NEMA sizes indicated on the Plans. Equip controllers with overload relays, control relays, and auxiliary contacts as required on the plans. Provide lockable operating handle for disconnect switch mechanisms, mechanically interlocked with enclosure door. Provide NEMA rated enclosure type as shown on the Plans.

B. Circuit breaker disconnect shall be molded case, motor circuit protector type (MCP), sized per NEC.

C. Provide control power transformer sized properly to accommodate device loads. The control power transformer shall have two (2) primary, and one (1) secondary fuse sized according to NEC.

D. Multi-speed and reversing starters shall have mechanical and electrical interlock.

E. Furnish controller with control and indicating devices as indicated on the plans. Auxiliary contacts, and field connections shall be connected to terminal strips for field connection.

F. Controllers shall be as manufactured Allen-Bradley, General Electric, Square D, Cutler-Hammer, or equal.

2.3 OVERLOAD PROTECTION

A. Overload Protection shall be provided with the motor starters. The unit shall detect overcurrent, phase current imbalance, phase loss.

B. The overload relay shall be Class 10, 600 Volt rated, and shall have a trip indicator. The unit shall have a manual reset feature, and a normally closed contact for control.

C. Each module shall provide individual trip indication and reset for each trip condition, visible without opening the motor control center compartment door. Provide a normally open auxiliary contact for remote trip indication.

E. Overloads shall be as manufactured by Allen-Bradley, Square D, Cutler-Hammer, General Electric, or equal.

2.4 MAGNETIC MOTOR STARTERS

A. Starters, Size 2 and larger, shall have arc quenchers on all load breaking contacts. All starters shall be NEMA rated for the horsepower ratings specified. The Contractor shall verify the motor ratings, and coordinate the starter and overload trip ratings with the actual horsepower ratings of the motors installed. Extended overload reset buttons shall be mounted so as to be accessible for operation without opening the door of the enclosure.

B. Magnetic contactors shall be factory adjusted and shall be chatter free.

C. Starters shall be furnished complete with a 120-volt control power transformer. Control circuit fuses shall be furnished both on the primary and secondary of the control circuit transformer. Control power shall be disconnected with the motor circuit protector.

D. Starters shall be designed to operate in ambient temperatures up to 40º C.

E. The minimum size starter shall be NEMA Size 1.

F. Magnetic Motor Starters shall be manufactured by Allen-Bradley, Square D, Cutler-Hammer, General Electric, or equal.

2.5 MOTOR PHASE FAILURE RELAY

A. The relay shall detect voltage values below an adjustable value, loss of phase, and phase reversal. The unit shall automatically de-energize the control circuits of the motors to be protected, when one or all three phase voltages drop below the set point. The unit shall have a nominal trip delay time of two seconds and a reset time of two seconds. The relay shall automatically reset upon restoration of the line voltage. Relays shall be MotorSaver, Time Mark Corporation, or equal. Relays shall be installed if indicated on the drawings.

2.6 MOTOR PROTECTION RELAY

A. The motor protection relay, where shown on drawings, shall be capable of the following as a minimum:

1. Phase loss
2. Low voltage (adjustable)
3. Phase reversal
4. Phase unbalance

B. The motor protection relay shall be equipped with the following as a minimum:

1. Adjustable trip delay (2 to 20 seconds)

2. Automatic reset
3. Transient protection (2500 volts for 10 ms)

C. Motor protection relays shall be set during the project startup according to the individual motor characteristics and application parameters. The motor protection relays for the motors with variable frequency drives shall be set as to prevent low voltage tripping.

D. The motor protection relays shall be MotorSaver Model 777, Time Mark Model 264, or equal.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install motor controllers in accordance with equipment manufacturer's written instructions, and with recognized industry practices. Comply with applicable requirements of NEC, UL, and NEMA standards, to insure that products fulfill requirements.

B. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque values for equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A and B, and the National Electrical Code.

C. Install fuses, of sizes indicated, in each fusible disconnect switch, if any. Install overload heaters sized to approximately 115% of motor full load current as shown on each, individual motor nameplate.

D. Prior to energizing motor controller equipment, check with ground resistance tester, phase-to phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled.

E. Prior to energizing, check circuitry for electrical continuity, and for short-circuits.

F. Check rotation of each motor for proper direction.

G. Upon completion of installation of motor controller equipment and electrical circuitry, energize controller circuitry and demonstrate functioning of equipment in accordance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and retest to demonstrate compliance.

END OF SECTION 262913

SECTION 262923 - VARIABLE-FREQUENCY DRIVES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes separately enclosed, pre-assembled, combination VFDs, rated 600 V and less, for speed control of three-phase, squirrel-cage induction motors.

1.2 DEFINITIONS

A. CE: Conformite Europeene (European Compliance).
B. CPT: Control power transformer.
C. EMI: Electromagnetic interference.
D. IGBT: Insulated-gate bipolar transistor.
E. LAN: Local area network.
F. LED: Light-emitting diode.
G. MCP: Motor-circuit protector.
H. NC: Normally closed.
I. NO: Normally open.
J. OCPD: Overcurrent protective device.
K. PCC: Point of Common Coupling
L. PID: Control action, proportional plus integral plus derivative.
M. PWM: Pulse-width modulated.
N. P&ID: Process & Instrumentation Diagram
O. RFI: Radio-frequency interference.
P. SCADA: Supervisory control and data acquisition.
Q. TDD: Total Demand Distortion
R. THD: Total Harmonic Distortion
S. VFD: Variable-frequency drive.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: VFDs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.4 ACTION SUBMITTALS

A. Product Data: For each type and rating of VFD indicated.

B. System Harmonics Analysis: For each VFD and for the distribution system as a whole.

C. Shop Drawings: For each VFD indicated. Include dimensioned plans, elevations, and sections; and conduit entry locations and sizes, mounting arrangements, and details, including required clearances and service space around equipment.

1. Show tabulations of installed devices, equipment features, and ratings.
2. Schematic and Connection Wiring Diagrams: For power, signal, communications, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans, drawn to scale, showing dimensioned layout, required working clearances, and required area above and around VFDs. Show VFD layout and relationships between electrical components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate field measurements.

B. Seismic Qualification Certificates: For VFDs, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based, and their installation requirements.

C. Product certificates.

D. Source quality-control reports.

E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.

D. IEEE Compliance: Fabricate and test VFD according to IEEE 344 to withstand seismic forces.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Rockwell Automation, Inc.; Allen-Bradley Brand.
2. Square D; a brand of Schneider Electric.
3. Toshiba International Corporation.

B. General Requirements for VFDs: Comply with NEMA ICS 7, NEMA ICS 61800-2, and UL 508C.

C. Application: Constant torque and variable torque.

D. VFD Description: Variable-frequency power converter (rectifier, dc bus, and IGBT, PWM inverter) factory packaged in an enclosure, with integral disconnecting means and overcurrent and overload protection; listed and labeled by an NRTL as a complete unit; arranged to provide self-protection, protection, and variable-speed control of one or more three-phase induction motors by adjusting output voltage and frequency.

1. Units suitable for operation of NEMA MG 1, Design A and Design B motors as defined by NEMA MG 1, Section IV, Part 30, "Application Considerations for Constant Speed Motors Used on a Sinusoidal Bus with Harmonic Content and General Purpose Motors Used with Adjustable-Voltage or Adjustable-Frequency Controls or Both."
2. Units suitable for operation of inverter-duty motors as defined by NEMA MG 1, Section IV, Part 31, "Definite-Purpose Inverter-Fed Polyphase Motors."
3. Listed and labeled for integrated short-circuit current (withstand) rating by an NRTL acceptable to authorities having jurisdiction.

E. Design and Rating: Match load type, such as fans, blowers, and pumps; and type of connection used between motor and load such as direct or through a power-transmission connection.

F. Output Rating: Three-phase; 10 to 200 (60 as programmed default) Hz, programmable as voltage proportional to frequency throughout voltage range or with sensorless vector control; maximum voltage equals input voltage.

G. Unit Operating Requirements:

1. Input AC Voltage Tolerance: Plus 10 and minus 15 percent of VFD input voltage rating.
2. Input AC Voltage Unbalance: Not exceeding 5 percent.
3. Input Frequency Tolerance: Plus or minus 3 percent of VFD frequency rating.
4. Minimum Efficiency: 97 percent at 60 Hz, full load.
5. Minimum Displacement Primary-Side Power Factor: 98 percent under any load or speed condition.
6. Minimum Short-Circuit Current (Withstand) Rating: Equal to the rating of the gear feeding the drive. If not listed, 65 kA.

7. Ambient Temperature Rating: Not less than 14 deg F (minus 10 deg C) and not exceeding 122 deg F (50 deg C).
8. Ambient Storage Temperature Rating: Not less than minus 4 deg F (minus 20 deg C) and not exceeding 158 deg F (70 deg C)
9. Humidity Rating: Less than 95 percent (noncondensing).
10. Altitude Rating: Not exceeding 3300 feet without de-rating. Up to 9850 feet with de-rating.
11. Vibration Withstand: Comply with IEC 60068-2-6.
12. Overload Capability: VFD system shall be rated for continuous operation at a minimum of 110% of motor load full load amps (FLA) times the motor service factor. Variable torque inverters shall be capable of delivering 110% of continuous rating for a minimum of 60 seconds. Constant torque inverters shall be capable of delivering 150% of continuous rating for a minimum of 120 seconds.
13. Starting Torque: Minimum 100 percent of rated torque from 3 to 60 Hz.
14. Speed Regulation: Plus or minus 0.6 Hz.
15. Output Carrier Frequency: Selectable; 0.5 to 15 kHz.
16. Stop Modes: Programmable; includes fast, free-wheel, and dc injection braking.

H. Inverter Logic: Microprocessor based, VFD isolated from all power circuits.

I. Isolated Control Interface: Allows VFDs to follow remote-control electrical signal over a minimum 100:1 speed range.

J. Internal Adjustability Capabilities:

1. Minimum Speed: 5 to 25 percent of maximum rpm.
2. Maximum Speed: 80 to 100 percent of maximum rpm.
3. Acceleration: 0.1 to 999.9 seconds.
4. Deceleration: 0.1 to 999.9 seconds.
5. Current Limit: 30 to minimum of 150 percent of maximum rating.

K. Self-Protection and Reliability Features:

1. Input transient protection by means of surge suppressors to provide three-phase protection against damage from supply voltage surges 10 percent or more above nominal line voltage.
2. Loss of Input Signal Protection: Selectable response strategy, including speed default to a percent of the most recent speed, a preset speed, or stop; with alarm.
3. Under- and overvoltage trips.
4. Inverter overcurrent trips.
5. VFD and Motor Overload/Overtemperature Protection: Microprocessor-based thermal protection system for monitoring VFDs and motor thermal characteristics, and for providing VFD overtemperature and motor overload alarm and trip; settings selectable via the keypad; NRTL approved.
6. Critical frequency rejection, with three selectable, adjustable deadbands.
7. Instantaneous line-to-line and line-to-ground overcurrent trips.
8. Loss-of-phase protection.
9. Reverse-phase protection.
10. Short-circuit protection.
11. Motor overtemperature fault.

L. Automatic Reset/Restart: Attempt three restarts after drive fault or on return of power after an interruption and before shutting down for manual reset or fault correction; adjustable delay time between restart attempts.

M. Power-Interruption Protection: To prevent motor from re-energizing after a power interruption until motor has stopped, unless "Bidirectional Autospeed Search" feature is available and engaged.

N. Bidirectional Autospeed Search: Capable of starting VFD into rotating loads spinning in either direction and returning motor to set speed in proper direction, without causing damage to drive, motor, or load.

O. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.

P. Motor Temperature Compensation at Slow Speeds: Adjustable current fall-back based on output frequency for temperature protection of self-cooled, fan-ventilated motors at slow speeds.

Q. Integral Input Disconnecting Means and OCPD: NEMA AB 1, thermal-magnetic circuit breaker with pad-lockable, door-mounted handle mechanism.

1. Disconnect Rating: Not less than 115 percent of VFD input current rating.
2. Disconnect Rating: Not less than 115 percent of NFPA 70 motor full-load current rating or VFD input current rating, whichever is larger.

2.2 CONTROLS AND INDICATION

A. Status Lights: Door-mounted LED indicators displaying the following conditions:

1. Power on.
2. Run.
3. VFD Fault.
4. All other lights as shown on the design drawings

B. Panel-Mounted Operator Station: Manufacturer's standard front-accessible, sealed keypad and plain-English language digital display; allows complete programming, program copying, operating, monitoring, and diagnostic capability.

C. Historical Logging Information and Displays:

1. Running log of total power versus time.
2. Total run time.
3. Fault log, maintaining last four faults with time and date stamp for each.

D. Indicating Devices: Digital display mounted flush in VFD door and connected to display VFD parameters including, but not limited to:

1. Output frequency (Hz).

2. Motor speed (rpm).
3. Motor status (running, stop, fault).
4. Motor current (amperes).
5. Motor torque (percent).
6. Fault or alarming status (code).
7. PID feedback signal (percent).
8. DC-link voltage (V dc).
9. Set point frequency (Hz).
10. Motor output voltage (V ac).

E. Control Signal Interfaces:

1. Electric Input Signal Interface:

a. Speed Reference: The VFD drive shall be capable of being controlled locally by a speed potentiometer or remotely by a 4- to 20-mA dc signal. The 4- to 20-mA signal shall be galvanically isolated and input resistance shall not exceed 250 ohms.

b. A minimum of two programmable analog inputs shall be provided and would be typically used for PID process variable and set point. These signals shall be setup to accept a 4- to 20-mA dc signal. The 4- to 20-mA signal shall be galvanically isolated and input resistance shall not exceed 250 ohms.

c. A minimum of six multifunction programmable digital inputs. The drive shall be expandable to handle additional digital inputs if required. The digital inputs shall be programmable to perform functions including, but not limited to:

1) VFD Start/Stop Control (2 or 3 wire)
2) Forward/Reverse/Stop Control
3) Local/Remote. The VFD shall be programmable so that "Local" control may either be the keypad or by hard-wired start/stop and potentiometer. The VFD shall be programmable so that "Remote" control may either be hard-wired start/stop and 4- to 20mA speed control or via the communications network.
4) VFD Interlock/Enable. This input when de-energized will not allow the VFD to run the motor under any circumstance.
5) VFD External Fault. This input will trip the VFD and require a reset before allow the motor to run again.
6) Preset Frequencies. The VFD shall be programmable to run at pre-programmed frequencies with up to 6 different steps.

2. Output Signal Interface:

a. A minimum of two programmable analog output signals 4- to 20-mA dc, which can be configured for any of the following:

1) Output frequency (Hz).
2) Output current (load).
3) DC-link voltage (V dc).

4) Motor torque (percent).
5) Motor speed (rpm).
6) Set point frequency (Hz).
7) Motor power (kW)

b. A minimum of two programmable dry-circuit relay outputs (120-V ac, 1 A) for remote indication of the following (the drive shall be expandable to handle additional digital outputs if required):

1) Motor running.
2) VFD ready.
3) Set point speed reached.
4) Fault and warning indication (overtemperature or overcurrent).
5) PID high- or low-speed limits reached.

F. PID Control Interface: Provides closed-loop set point, differential feedback control in response to dual feedback signals. Allows for closed-loop control of fans and pumps for pressure, flow, or temperature regulation.

1. Number of Loops: One.

G. SCADA Interface: Factory-installed hardware and software to enable the SCADA to monitor, control, and display VFD status and alarms and energy usage. Allows VFD to be used with an external system within a multidrop LAN configuration; settings retained within VFD's nonvolatile memory.

1. Network Communications Ports: Ethernet.
2. Embedded SCADA Protocols for Network Communications: Ethernet/IP; protocols accessible via the communications ports.

2.3 LINE CONDITIONING AND FILTERING

A. Input Line Conditioning: All new power distribution systems supplied shall be required to meet the requirements of IEEE 519-1992. Specifically, the system shall adhere to the TDD requirements of Table 10-3 of IEEE 519-1992. If the power distribution system is equipped with an Active Harmonic System, each VFD shall be equipped with a line reactor whose impedance is as recommended by the Active Harmonic System manufacturer (typically 3%). If no Active Harmonic System is part of the power distribution system, the following rules as a minimum shall define the input line conditioning for each VFD (unless further conditioning is required to meet the IEEE 519-1992 limits). With the Engineer's approval, the contractor may decide to supply an Active Harmonic System even if not shown on the drawings, with corresponding reactors and chokes (this would typically occur if it is more cost effective to meet IEEE 519 with a single system then multiple harmonic filters).

1. All VFD's sized for motors 50HP or larger shall be equipped with DC-link chokes.
2. All VFD's sized for motors 40HP and less shall be equipped with 5% line reactors unless specifically called out as otherwise on the drawings.
3. All VFD's sized for 50HP to 200HP motors shall be equipped with passive harmonic filters with DC Link Chokes.

4. All VFD's greater than 200HP shall have be setup to have less than 5% THD for both voltage and current. This would typically require that the drive is setup with an 18-pulse front end or with an active harmonic filter. The VFD assembly shall accept a single 3-phase input and shall contain all of the harmonic mitigation equipment as part of the assembly.

B. EMI/RFI Filtering: VFD's shall be CE marked and certify compliance with IEC 61800-3 for Category C2.

2.4 LOAD CONDITIONING

A. Load Conditioning: For VFD driven loads with conductor lengths between 200 and 1,000 feet, output dV/dt filters shall be provided as part of the VFD assembly. It is strongly recommended that VFD motor leads not be longer than 500 feet and alternative VFD locations should be considered. If absolutely necessary, loads with conductor lengths greater than 1,000 feet shall have output sine wave filters shall be provided as part of the VFD assembly. Voltage drop considerations shall be taken into account when selecting the motor's nameplate voltage.

2.5 LINE AND LOAD CONDITIONING EQUIPMENT

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. MTE Corporation.
2. Transcoil International (TCI).
3. Or approved equal.

B. Line Reactors: Reactors shall be part of the VFD assembly. They shall be sized based upon the VFD input power requirements. They shall be properly installed with appropriate spacing and ventilation for ambient temperatures up to 104°F. The reactor shall meet the following criteria:

1. The reactor shall be UL 508 listed.
2. Continuous current rating: 100% RMS.
3. Intermittent current ratings: 150% for 60 seconds; 200% for 10 seconds.
4. Altitude Rating: Not exceeding 3300 feet without de-rating. Up to 9850 feet with de-rating.
5. All wiring shall be copper.

C. Passive Harmonic Filters: Filters shall be part of the VFD assembly. They shall be sized based upon the VFD input power requirements. They shall be properly installed with appropriate spacing and ventilation for ambient temperatures up to 104°F. The filter shall meet the following criteria:

1. The filter shall be UL 508 listed.
2. The filter shall filter harmonics generated by the nonlinear VFD to satisfy the requirements of IEEE 519-1992 for individual and total harmonic voltage and current distortion at the input terminals of the filter.

3. The TDD of the current at the input terminals of the filter shall not exceed the limits defined in Table 10-3 of IEEE 519-1992.
4. Full load efficiency: 97% or greater
5. The filter shall not resonate with the power distribution system nor attract harmonics from other sources.
6. The harmonic filter shall be a passive series connected low pass filter consisting of an inductor capacitor network. Active electronic components shall not be used.
7. The harmonic filter shall be equipped with a contactor that will connect the capacitor(s) only when the motor is running, avoiding nuisance VFD over-voltage tripping.
8. All wiring shall be copper.

D. dV/dt Filters: Filters shall be part of the VFD assembly. They shall be sized based upon motor horsepower and required full-load current (including service factor). They shall be properly installed with appropriate spacing and ventilation for ambient temperatures up to 104°F. The filter shall meet the following criteria:

1. The filter shall be UL 508 listed.
2. Maximum peak motor terminal voltage with 500 feet of cable: 15% of bus voltage.
3. Maximum dV/dt: 200 Volts per microsecond.
4. The dV/dt Filter shall reduce common mode voltages by a minimum of 40%.
5. Continuous current rating: 100% RMS.
6. Intermittent current ratings: 150% for 60 seconds; 200% for 10 seconds.
7. Allowed inverter switching frequencies: 1kHz to 8 kHz.
8. Nominal inverter operating frequency: 60Hz; Minimum – 6 Hz; Maximum with de-rating: 120Hz.
9. Altitude Rating: Not exceeding 3300 feet without de-rating. Up to 9850 feet with de-rating.
10. Insertion loss: 3% of rated voltage maximum.
11. All wiring shall be copper.

E. Sine Wave Filters: Filters shall be part of the VFD assembly. They shall be sized based upon motor horsepower and required full-load current (including service factor). They shall be properly installed with appropriate spacing and ventilation for ambient temperatures up to 104°F. The filter shall meet the following criteria:

1. The filter shall be UL 508 listed.
2. Harmonic Voltage Distortion: 10% maximum
3. Continuous current rating: 100% RMS.
4. Intermittent current rating: 150% for 60 seconds.
5. Allowed inverter switching frequencies: 2kHz to 8 kHz.
6. Nominal inverter operating frequency: 60Hz; Minimum – 0 Hz; Maximum with de-rating: 90Hz.
7. The Sine Wave Filter shall reduce common mode voltages by a minimum of 40%.
8. Altitude Rating: Not exceeding 3300 feet without de-rating. Up to 9850 feet with de-rating.
9. Insertion loss: 6% of rated voltage maximum.
10. All wiring shall be copper.

2.6 BYPASS SYSTEMS

A. Provide Bypass Systems only if indicated on the drawings.

B. Bypass Operation: Safely transfers motor between power converter output and bypass circuit, manually, automatically, or both. Selector switches set modes and indicator lights indicate mode selected. Unit is capable of stable operation (starting, stopping, and running) with motor completely disconnected from power converter.

C. Bypass Mode: Field-selectable automatic or manual, allows local and remote transfer between power converter and bypass contactor and retransfer, either via manual operator interface or automatic control system feedback.

D. Bypass Controller: Two-contactor-style bypass allows motor operation via the power converter or the bypass controller; with input isolating switch and barrier arranged to isolate the power converter and permit safe troubleshooting and testing, both energized and de-energized, while motor is operating in bypass mode.

1. Bypass Contactor: Load-break, NEMA-rated contactor.
2. Output Isolating Contactor: Non-load-break, NEMA-rated contactor.
3. Isolating Switch: Non-load-break switch arranged to isolate power converter and permit safe troubleshooting and testing of the power converter, both energized and de-energized, while motor is operating in bypass mode; pad-lockable, door-mounted handle mechanism.

E. Bypass Contactor Configuration: Full-voltage (across-the-line) or reduced voltage soft-starter as shown on the drawings.

1. NORMAL/BYPASS selector switch.
2. HAND/OFF/AUTO selector switch.
3. NORMAL/TEST Selector Switch: Allows testing and adjusting of VFD while the motor is running in the bypass mode.
4. Contactor Coils: Pressure-encapsulated type with coil transient suppressors.

    a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.
    b. Power Contacts: Totally enclosed, double break, and silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.

5. Control Circuits: 120-V ac; obtained from integral CPT, with primary and secondary fuses, with CPT of sufficient capacity to operate all integral devices and remotely located pilot, indicating, and control devices.

    a. CPT Spare Capacity: 100 VA.

6. Overload Relays: NEMA ICS 2.

2.7 ENCLOSURES

A. VFD Enclosures: NEMA 250, to comply with environmental conditions at installed location.

1. Dry, Clean and Non-corrosive Indoor Locations: Type 1.
2. Outdoor or Corrosive Locations: Type 4X, stainless steel.
3. Wash-Down Areas: Type 4X, stainless steel.
4. Other Wet or Damp Indoor Locations: Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: Type 12.

B. Plenum Rating: UL 1995; NRTL certification label on enclosure, clearly identifying VFD as "Plenum Rated."

2.8 ACCESSORIES

A. General Requirements for Control-Circuit and Pilot Devices: NEMA ICS 5; factory installed in VFD enclosure cover unless otherwise indicated.

1. Push Buttons, Pilot Lights, and Selector Switches: Heavy-duty, oiltight type.

a. Push Buttons: Maintained and/or momentary as required.
b. Pilot Lights: LED types; colors as shown on P&ID's; push to test.
c. Selector Switches: Rotary type.

B. Bypass contactor auxiliary contact(s) as required.

C. Control Relays: Auxiliary and adjustable solid-state time-delay relays.

D. Phase-Failure, Phase-Reversal, and Undervoltage and Overvoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connections. Provide adjustable undervoltage, overvoltage, and time-delay settings.

1. Current Transformers: Continuous current rating, basic impulse insulating level (BIL) rating, burden, and accuracy class suitable for connected circuitry. Comply with IEEE C57.13.

E. Supplemental Analog Meters:

1. Elapsed time meter.

F. Breather and drain assemblies, to maintain interior pressure and release condensation in NEMA 250, Type 4, 4X, and 12 enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.

G. Space heaters, with NC auxiliary contacts, to mitigate condensation in NEMA 250, Type 4, 4X, 12 enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.

H. Cooling Fan and Exhaust System: For NEMA 250, maintaining enclosure NEMA rating; UL 508 component recognized: Supply fan, with non-corrosive intake and exhaust grills and filters; 120-V ac; obtained from integral CPT.

I. Air Conditioning System: For NEMA 250, maintaining enclosure NEMA rating; UL 508 component recognized; sized to maintain internal temperatures at or below 100°F.

2.9 SOURCE QUALITY CONTROL

A. Testing: Test and inspect VFDs according to requirements in NEMA ICS 61800-2.

1. Test each VFD while connected to its specified motor.
2. Verification of Performance: Rate VFDs according to operation of functions and features specified.

B. VFDs will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Wall-Mounting Controllers: Install VFDs on walls with tops at uniform height and with disconnect operating handles not higher than 79 inches above finished floor unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in each fusible-switch VFD.

D. Install fuses in control circuits if not factory installed.

E. Install heaters in thermal-overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.

F. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.

G. Comply with NECA 1.

3.2 IDENTIFICATION

A. Identify VFDs, components, and control wiring.

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each VFD with engraved nameplate.
3. Label each enclosure-mounted control and pilot device.

3.3 CONTROL WIRING INSTALLATION

A. Install wiring between VFDs and remote devices and facility's central-control system.

B. Bundle, train, and support wiring in enclosures.

C. Connect selector switches and other automatic control devices where applicable.

1. Connect selector switches to bypass only those manual- and automatic control devices that have no safety functions when switches are in manual-control position.
2. Connect selector switches with control circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Acceptance Testing Preparation:

1. Test insulation resistance for each VFD element, bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

D. Tests and Inspections:

1. Inspect VFD, wiring, components, connections, and equipment installation.
2. Test insulation resistance for each VFD element, component, connecting motor supply, feeder, and control circuits.
3. Test continuity of each circuit.
4. Verify that voltages at VFD locations are within 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Engineer before starting the motor(s).
5. Test each motor for proper phase rotation.
6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
8. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

9. Perform voltage and current harmonic test with each VFD running at minimum and maximum speed. Submit test results for each VFD. Testing shall be witnessed by the Owner and the Engineer.

E. VFDs will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports, including a certified report that identifies the VFD and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

3.5 ADJUSTING

A. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.

B. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

C. Adjust the trip settings of MCPs and thermal-magnetic circuit breakers with adjustable, instantaneous trip elements. Initially adjust to six times the motor nameplate full-load amperes and attempt to start motors several times, allowing for motor cool-down between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Engineer before increasing settings.

D. Set field-adjustable circuit-breaker trip ranges

3.6 SPARE PARTS

A. The following spare parts shall be supplied with each type, or frame size, of VFD:
   1. 3 sets of all replaceable fuses
   2. 3 spare air conditioner or fan filters

END OF SECTION 262923

SECTION 409433 – HUMAN-MACHINE INTERFACES

PART 1 - GENERAL

1.1 SUMMARY

A. This section covers the human-machine interfaces (HMI) used for control and monitoring as indicated on the Contract Documents. HMI's include the following:
   1. Operator Interface Terminals (OIT) or touch screens.
   2. Personal Computers or Servers used as HMI's to the SCADA System.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. Hardware to be furnished under this section shall be the product of firms regularly engaged in the design and manufacturing of this type of equipment. Manufacturer shall assume responsibility for, and guarantee performance of equipment furnished. However, this shall not be construed as relieving the Contractor from responsibility for the proper installation and functionality of the work.

B. Examine the Contract Documents and verify that HMI equipment and software being provided is compatible with the requirements. Provide all necessary accessories to the HMI equipment for a complete and operable system.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver the HMI hardware as a complete system.

PART 2 - PRODUCTS

2.1 OPERATOR INTERFACE TERMINALS

A. OITs shall be furnished with hardware to monitor and control equipment being supplied.

B. OITs shall be 10" color touch screens unless otherwise indicated on the Contract Drawings. Each OIT shall have the following features:
   1. Has serial and Ethernet ports with built-in communications protocols drivers as required by the project.
   2. Has associated software for programming the OIT and its screens, database, alarms, etc.
   3. Has a 640 x 480 minimum resolution with TFT color screen.
   4. Has at least 64MB of memory.

5. Has no limitations on the number of screens or tags that may be used as long as within the memory limitations of the OIT.

C. OIT's Software – Provide a single licensed copy of the touch screen programming software. The software shall never expire and shall be licensed in the name of the Owner.

D. Acceptable Manufacturers
   1. Allen Bradley Panelview Plus 6

PART 3 - EXECUTION

3.1 INSTALLATION

A. OIT's shall be installed on the doors of control panels. The control panel assembly and installation shall be as required by Section 409513.

B. OIT's shall be installed in accordance with the manufacturer's installation guidelines and instructions.

3.2 TRAINING

A. Provide training for the OIT hardware supplied for the project.

END OF SECTION 409433

SECTION 409443 – PROGRAMMABLE LOGIC CONTROLLERS

PART 1 - GENERAL

1.1 SUMMARY

A. This section covers the programmable logic controllers (PLC) used for control and monitoring as indicated on the Contract Documents.

B. Provide one full version of PLC programming software that is applicable to the PLC hardware being supplied for the project. Include auxiliary software (such as communications software, drivers, networking configuration software, etc.) that may be required for a complete and operable system.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Wiring diagrams showing connections to all devices; input and output (I/O), analog and discrete. The wiring diagrams shall indicate the I/O address point to be used in the PLC programs.

C. Submit calculations that show the following:
   1. PLC Power Supply Budget
   2. Calculated number of I/O quantities required
   3. Estimated PLC memory usage

1.3 QUALITY ASSURANCE

A. Hardware and software to be furnished under this section shall be the product of firms regularly engaged in the design and manufacturing of this type of equipment. Manufacturer shall assume responsibility for, and guarantee performance of equipment furnished. However, this shall not be construed as relieving the Contractor from responsibility for the proper installation and functionality of the work.

B. Examine the Contract Documents and verify that PLC equipment and software being provided is compatible with the requirements. Provide all necessary accessories to the PLC equipment for a complete and operable system.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver the PLC hardware and software as a complete system in accordance with Section 409000.

PART 2 - PRODUCTS

2.1 GENERAL

A. PLCs shall be furnished with hardware and software necessary to monitor and control equipment, as listed in the specifications, and shown on the Plans.

B. Each field input and output shown as an I/O Point shall be connected as per the manufacturers' recommendations.

C. The Contractor shall provide the hardware, software, and installation necessary for connecting additional future equipment as indicated on the Plans. In addition to allocating for future I/O, each PLC shall be supplied with a minimum of 20% spare I/O of each type. In other words, the total I/O for each type shall be (current I/O + future I/O) * 120%. Provide enough panel space to install up to 200% of future I/O modules and/or PLC racks/bases.

D. The type of field input and output shall be defined as follows unless specified otherwise on the plans:
   1. Analog inputs and outputs: 4-20mA DC.
   2. Discrete inputs: I/O device shall be a dry contact, inputs shall be powered by the PLC at 24VDC (preferred) or 120VAC.
   3. Discrete outputs: Isolated dry contact outputs.

E. All PLC I/O shall have I/O modules that are installed and wired at a UL508 Panel Shop. All I/O points shall be wired down to terminal blocks. In no way should field wiring go to any part of the PLC assembly.

F. The PLC shall be capable of handling online program modifications without taking the system offline or requiring a download.

G. Acceptable Manufacturers
   1. Allen Bradley CompactLogix
   2. Allen Bradley ControlLogix

2.2 PROCESSORS

A. The PLC processor shall be a microprocessor based industrial controller with a temperature rating of 0 to 60 degrees C, and a humidity rating of 5 to 85% non-condensing, minimum.

B. The processor's memory shall be sized according to the number of I/O points and amount of logic required for the application. As a minimum, the memory shall be at least 1 megabyte.

C. The processor shall retain its memory and programming when power is removed.

D. The processor shall have tag-based memory.

2.3 PLC POWER SUPPLY

A. The power supply shall provide power for the processor, and I/O modules. The power supply shall have built-in over voltage and under voltage detection circuitry, protection against overcurrent conditions, and automatic power-up sequence that enables outputs only when proper operating tolerances are reached. Power requirements shall be 24 VDC unless shown as otherwise on the Contract Documents.

2.4 COMMUNICATIONS NETWORKS

A. Each PLC shall be equipped with network ports (and corresponding network modules if necessary). Each PLC shall be equipped with an Ethernet port for connection to the Plant SCADA System. Additional ports shall be provided for distributed I/O if distributed I/O is utilized. Distributed I/O shall not be on the Plant SCADA network.

B. Ethernet ports shall be setup to communicate with the Allen-Bradley Ethernet/IP protocol.

C. The PLC shall be programmable through the Ethernet port or through a USB port.

2.5 INPUT/OUTPUT MODULES

A. Only I/O modules that have typical wiring diagrams shown in the Contract Drawings shall be allowed for each PLC.

B. Analog I/O modules shall have a minimum of 12 bits of resolution and shall be setup as 4 to 20 mA signals unless indicated otherwise on the Contract Drawings. Analog inputs shall be setup to be connected to loop powered (2-wire) or self-powered (4-wire) signals. All analog inputs and outputs shall be protected by a fuse. 4 to 20 mA signals shall be protected by a 32mA fuse.

C. Each discrete I/O module shall be fused (fuse body shall be equipped with a blown fuse indicator). Each discrete output module and shall have interposing relays for each point with form C relay contacts. Indicator lights shall also be provided on each I/O point to indicate status of each signal. Each individual input or output point shall be optically isolated to protect the controller I/O circuitry from high voltage transients.

2.6 SPARE PARTS

A. In addition to the spare parts requirements of Section 409000, provide the following:
   1. One spare processor for each type of PLC processor supplied for the project.
   2. One spare I/O card for every type of I/O card supplied for the project.
   3. One spare PLC power supply for every type supplied for the project.
   4. One spare network adapter for each type of network adapter supplied for the project.
   5. One spare base for rack style PLC’s.

PART 3 - EXECUTION

3.1 FACTORY ACCEPTANCE TESTING

A. All PLC assemblies shall be built up in control panels and shall be part of a Factory Acceptance Test. The supplier shall give the Owner and Engineer the opportunity to attend the testing. Provide a minimum of two weeks' notice of the testing.

3.2 INSTALLATION

A. The PLC assemblies shall be installed in control panels made specifically for the PLC. The control panel assembly and installation shall be as required by Section 409513.

B. The PLC assemblies shall be installed in accordance with the manufacturer's installation guidelines and instructions.

3.3 TRAINING

A. Provide training for the PLC hardware supplied for the project.

END OF SECTION 409443

SECTION 409513 – PROCESS CONTROL PANELS AND HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the requirements for all control panels and associated hardware for the project. This includes, but is not limited to, vendor control panels, PLC panels, local control panels and instrumentation panels.

1.2 ACTION SUBMITTALS

A. Provide a comprehensive submittal that includes all control panels supplied by the equipment supplier. The submittal should show that the panels are in conformance with the requirements of this section. Divide the submittal into the following:

1. Table of Contents/Index.
2. Panel Bill of Materials and Design Data.
3. Panel Shop Drawings.
4. Panel Hardware Cut Sheets.

B. The Panel Bill of Materials and Design Data shall include the following:

1. Each panel will have its own Bill of Materials and Design Data information presented in association with the panel drawings. The Bill of Materials shall include all hardware inside or on the enclosure. The design data will include UPS and/or battery load calculations to show that the UPS is sized appropriately for load and for backup time. The design data will show panel weight, materials and finishes. HVAC design data shall be shown. Seismic criteria shall be shown if required by the Contract Documents.

C. Panel Shop Drawings:

1. Show every internal wire and connection diagrammatically. Show all interfaces between the control panel and external equipment to be connected for power, controls, signal, communications, etc.
2. All shop drawings shall include a title block with the name of the firm designing the control panels. The title block shall also include project information, Owner information and/or logo, drawing number and description, revision fields and date.
3. All shop drawings shall be developed utilizing AutoCAD version 2008 or later. All shop drawings should be submitted in PDF and AutoCAD formats.
4. Panel layout drawing(s):
   a. Each control panel shall have shop drawing(s) which depict the front, back, sides and top/bottom of the panel. This includes showing any hardware mounted on the inside or outside of the panel.
   b. Layout drawings should include subpanel and swing-out panel layouts.
   c. Layout drawings should show locations of panel penetrations for cutouts, conduit entry and/or access plates.

d. Layout drawings should show all of the components and provide a reference to the bill of materials.
e. Show the elevations of door devices from the finished floor.

5. AC and/or DC power distribution diagrams:
   a. Each panel shall show power distribution schematics that show how the panel receives power and feeds all of its internal loads as well as associated external loads.
6. Communications and/or Network diagrams:
   a. For panels that utilize any means of communications both internally and externally, provide a diagram depicting each communication connection.
7. Input/Output and/or Internal wiring diagrams
8. Terminal block diagrams

D. Provide panel hardware cut sheets for each make and model of equipment being supplied for the project. The cut sheets should have enough information to verify that the equipment conforms to the Contract Drawings and Specifications.

1.3 CLOSEOUT SUBMITTALS

A. Submit the operation and maintenance data, including record control panel drawings for all control panels.

1.4 QUALITY ASSURANCE

A. Referenced Standards:

1. National Electric Code (NEC).
2. American Society for Testing and Materials (ASTM).
3. Joint Industrial Council (JIC).
4. National Electrical Manufacturers Association (NEMA):
   a. ICS 4, Terminal Blocks for Industrial Use.
   b. ICS 6, Enclosures for Industrial Controls and Systems.
   c. 250, Enclosures for Electrical Equipment (1000 V Maximum).
5. Underwriters Laboratories Inc. (UL):
   a. 50, Enclosures for Electrical Equipment.
   b. 508, Industrial Control Equipment.
   c. 508A, Standard for Industrial Control Panels.

B. Hardware to be furnished under this section shall be the product of firms regularly engaged in the design and manufacturing of this type of equipment. Manufacturer shall assume responsibility for, and guarantee performance of equipment furnished. All panels shall be assembled in and labeled by a listed UL 508A panel shop. However, this shall not be construed as relieving the Supplier from responsibility for the proper installation and functionality of the work.

C. Provide all necessary accessories to the control panels for a complete and operable system.

D. Provide information for the Contractor for conduit entry locations. By default the Supplier should assume that conduits will enter the panel primarily from the bottom. Once approved,

conduits shall be placed strategically to best suit the layout of the control panel. Power entry and separation of power, controls and signal shall be considered.

E. All painted control panels shall have matching paint colors and tones.

PART 2 - PRODUCTS

2.1 GENERAL

A. All control panels shall have an overall NEMA rating suitable for withstanding the mechanical, electrical, thermal stresses, humidity and corrosion that the panel will be subjected to in its installed location.

B. The following rules shall be followed when determining the NEMA rating requirement for each control panel:

1. NEMA 1, 3 & 3R shall not be allowed for control panels.
2. NEMA 4 shall be utilized for outdoor or wet locations in non-corrosive, unclassified areas. NEMA 4 control panels shall be painted steel.
3. NEMA 4X shall be utilized in corrosive, unclassified areas. NEMA 4X enclosures shall be 316SS except for the following exceptions with which the enclosure shall be polycarbonate or fiberglass reinforced polyester (FRP):
   a. Chemical areas or rooms.
   b. Locations where stainless steel is incompatible.
   c. Where specifically noted on the Contract Drawings.
4. NEMA 7 shall be utilized for classified areas as required by NEC. NEMA 7 enclosures shall be constructed of cast aluminum.
5. NEMA 12 shall be utilized in dry, non-corrosive, unclassified areas. NEMA 12 control panels shall be painted steel.

C. Each source of foreign voltage shall be isolated by providing disconnecting or pull-apart terminal blocks or a disconnect operable from the control panel front. Each control panel shall be provided with identified terminal strips for the connection of external conductors. The SUPPLIER shall provide sufficient terminal blocks to connect 30 percent additional conductors for future use.

D. PLC Discrete outputs from the control panel shall be provided by electrically-isolated contacts rated for 10 amps at 120 VAC. Analog inputs and outputs shall be isolated 4 to 20 mA, 2 wire signals with power supply.

E. Control panel mounted devices shall be mounted a minimum of 3-feet above finished floor elevation. Touchscreens shall be mounted at a height of 66” from the finished floor to the center of the touchscreen. All control panels will be situated on housekeeping pads, this is not considered the finished floor elevation.

2.2 ENCLOSURES

A. Enclosures shall be either freestanding, pedestal-mounted or equipment skid-mounted, as indicated. Internal control components shall be mounted on an internal back-panel or side-panel as required.

B. Enclosure dimensions indicated on the Contract Drawings are based upon non-certified information and shall be considered the minimum panel size. It is the responsibility of the Contractor to design the size of all control panels. When sizing the control panels, adhere to the following criteria:
   1. Maximum panel depth is 24". If there are special reasons for a deeper enclosure, approval must first be obtained from the Engineer.
   2. The panel size shall provide space for all equipment, wire-ducts, wire, terminations, and space for future expansion.
   3. If the panel size needs to be enlarged, coordinate with the installing Contractor that there is adequate space for the larger size. If there is not space, coordinate with the Engineer to come up with a solution.

C. Materials
   1. Steel panel section faces shall be 12-gauge minimum thickness for free standing panels and 14-gauge minimum thickness for wall-mounted or pedestal-mounted panels. Materials shall be selected for levelness and smoothness.
   2. Structural shapes and strap steel shall comply with ASTM A 283 - Low and Intermediate Tensile Strength Carbon Steel Plates, Grade C.
   3. Bolting Material: For outdoor, wet or corrosive areas, all bolting materials shall be 316SS. In dry, non-corrosive locations, carbon stell may be used. Commercial quality bolts, nuts, and washers shall be 1/2-inch diameter with UNC threads. Carriage bolts shall be used for attaching end plates. Other bolts shall be hex end machine bolts. Nuts shall be hot pressed hex, American Standard, heavy. Standard wrought washers shall be used for foundation bolts and attachments to building structures. Other bolted joints shall have SAE standard lock washers.
   4. Control panels shall be structurally designed such that the completed and installed control panels shall safely withstand seismic requirements for the project. All equipment mounted within the panel shall be properly braced to prevent damage during a seismic event.

D. Acceptable Manufacturers
   1. Hoffman.
   2. Saginaw.
   3. Or Approved Equal.

2.3 CONTROL PANEL ASSEMBLY

A. General

   1. The following requirements must be met when mounting to the back panels or side panels of the control panel:
      a. Holes shall be drilled and tapped with less than 50% diminishment in thread.
      b. Backpan shall be cleaned front and back after any drilling and tapping.
      c. Tek Screws are not acceptable.

d. Any component mounted to a back panel or side panel shall be mounted at an exact square to the vertical and horizontal planes.
e. Any duct running between back panels and side panels shall align horizontally with no overlaps.
f. All DIN rail mounted to the panels shall have ½" stand-offs allowing for wires and other equipment to be routed beneath the rail if necessary.

2. Enclosure doors shall be flush fitting, gasketed, and be of the hinged lift-off type with lockable door handles. A common key shall be provided for the doors on each panel assembly. Removable access panels shall be provided with dished handle fasteners. Screw driver 1/4 turn or Dzus type fasteners are not acceptable.
   a. The flanged edges of panels shall be straight and smooth. Corners shall be welded and ground smooth.
   b. The face of the panel shall be true and level after flanging.
   c. Panel cutouts and holes may be cut or drilled by any standard method that does not cause deformation. Burrs shall be ground smooth.
   d. Adjacent panels shall assemble with faces flush. Gaps or cracks shall not be visible from the front of the assembled instrument board.
   e. Panels shall be self-supporting.
3. Control panels that are supplied with three phase power and/or are powering motor loads shall be supplied with a main feeder disconnect that is door operated. The door operator for the disconnect shall be defeat-able with a screwdriver. If the upstream overcurrent protection device feeding the control panel is not in the same room as the control panel, provide a main circuit breaker as part of the main disconnect assembly. Fused disconnects shall not be used unless specifically shown on the Contract Drawings.

B. Preparation of Bare Metal Panel Surfaces

1. Grind high spots, burrs, and rough spots.
2. Sand or sandblast to a smooth, clean, bright finish.
3. Every trace of oil shall be removed with a solvent.
4. Apply the first coat of primer immediately.

C. Panel Finishing

1. Repair damaged primer on inside surfaces.
2. Apply primer to the entire panel surface.
3. Apply 2 coats of satin finish lacquer enamel over the entire surface.
4. Colors shall match original paint color.

D. Instrument Finishing: The final coat applied to painted surfaces of instrument cases, doors, or bezels which are visible from the front of panels shall be manufacturer's standard unless otherwise indicated. Black japan or "crinkle" finishes on instrument cases are not acceptable.

E. Mounting of Instruments

1. The panel shop shall provide cutouts and shall mount instrument items indicated to be panel mounted, including any instruments indicated to be furnished by other vendors but installed in the panel.
2. The panel shop shall also mount behind the panels other instrument accessory items as required.

3. Equipment mounted at the rear of panel shall be installed to allow for commissioning adjustments, servicing requirements, and cover removal
4. Spare space shall be kept clear of wiring, etc., to give maximum space for future additions.
5. All equipment mounted with fasteners shall be mounted with grade 5 or greater Phillips head fasteners.

F. Electrical Requirements
1. Each panel shall be serialized with its own UL serial number and label.
2. Each terminal block shall have a printed label as shown on the panel drawings. Hand written labels in any location of the panel will not be accepted. Wiring shall be identified with printed tubular wire end markers.
3. Back panels and side panels shall have visible machine printed adhesive labels that detail the following items:
   a. Terminal block torque ratings for field connections.
   b. Terminal block sections as detailed in the panel drawings.
   c. All equipment within the panel including, but not limited to, PLCs, switches, circuit breakers, UPS, Power Supplies, and any other piece of equipment.
4. Screw torque shall not exceed 0.4 N*M (4.4 Lb*In) (7 Lb-In).
5. Wire duct for AC signals and wiring shall be light grey. All duct for DC signals shall be white. Wiring for AC circuits and DC circuits must be kept within their respective ducts.
6. Freestanding panels shall be provided with switched lighting as indicated in the panel drawings.
7. Freestanding panels shall be provided with a 15 amp, 120 volt, service outlet circuit within the back-of-panel area as shown in the panel drawings.
8. Wall-mounted or pedestal-mounted panels shall be sized to adequately dissipate heat generated by equipment mounted in or on the panel.
9. Outdoor panels shall be provided with thermostatically-controlled heaters to maintain inside temperatures between above 40°F.
10. Any panel with heat producing equipment such as a PLC, UPS or VFD shall have cooling capabilities to maintain the inside temperature below 104°F.
11. All outdoor panels equipped with heating and/or cooling shall be insulated with a minimum R value of 2.0.
12. Provide a laminated fuse list matrix detailing fuse numbers and sizes mounted on the inside of the enclosure door. The fuse list matrix must be easily visible and at minimum size 14 font. Hand written fuse matrices will not be accepted. See panel drawings approximate locations.
13. Provide a pocket mount on the inside of each panel door large enough to hold type 8.5 x 11 size paper. See panel drawings for approximate locations. Pockets must be accessible with no equipment obstructing the entrance of the pocket for at least ten inches above the pocket. The pocket mount shall be fastened. No adhesive type pockets allowed.
14. Where required crimped fork or ring terminals will be properly installed on the conductors for connection integrity.
15. Signal and Control Circuit Wiring
   a. Wire type and sizes: Conductors shall be flexible stranded tin machine tool wire, UL 1015 listed Type MTW, and shall be rated 600 volts. Wires for instrument signal circuits and alarm input circuits shall be 14 AWG. Other wires, including shielded cables, shall be 16 AWG minimum.
   b. Wire Insulation Colors: Conductors supplying 120 VAC power on the line side of a disconnecting switch shall have a black insulation for the ungrounded conductor.

Grounded circuit conductors shall have white insulation. Insulation for ungrounded 120 VAC control circuit conductors shall be red. Wires energized by a voltage source external to the control panel shall have yellow insulation. Insulation for DC conductors shall be blue.

c. Wire Marking: Wire numbers shall be marked using white numbered wire markers made from plastic-coated cloth, Brady Type B 500 or equal, or shall be heat shrink plastic. Wire labels must be machine printed. All conductors within the control panel are to be permanently marked with wire labels at each end. Wire labels are to correspond to the labels on the approved shop drawings.

d. For case grounding, panels shall be provided with a ground lug complete with solderless connector for one no. 1 AWG bare stranded copper cable.

e. Panel doors shall be connected to panel ground.

f. Wire Fastening: Provision shall be made utilizing cable tie bases such as type CTM1 or equivalent, fastened inside the wire duct to allow for the fastening of the shop wire harnesses upon final installation.

16. Power Supply Wiring

a. Unless otherwise indicated, control power shall be 120 VAC. Where the electrical power supply to the control panel is something other than 120 VAC, the control panel shall be provided with a control panel transformer. Control conductors shall be provided in accordance with the indicated requirements.

b. At a location near the top of the panel (or bottom), the panel fabricator shall provide terminal box connections for the main power supply entry.

17. Signal Wiring

a. Signal wire shall be shielded twisted pair or triads. Cable shall be 18 AWG copper signal wires.

b. Color code for instrument signal wiring shall be as follows:

1) Positive (+) – Red or Clear

2) Negative (-) – Black

c. Multiconductor cables where indicated shall consist of no. 16 AWG copper signal wires twisted in pairs with 90-C, 600 V fault insulation. A copper drain wire shall be provided for the bundle with a wrap of aluminum polyester shield. The overall bundle jacket shall be PVC.

d. RTD cabling shall be Belden 8770 cabling or equal.

e. Multi-conductor cables, wireways, and conduit shall be sized to allow for 25 percent spare signal wire.

18. Wiring run to control devices on the front panels shall be tied together at short intervals with nylon wire ties and be secured to the inside face of the panel using adhesive mounts.

19. Wiring to rear terminals on panel-mount instruments shall be in plastic wireways secured to horizontal brackets above or below the instruments in about the same plane as the rear of the instruments.

G. Labor and Workmanship: Panels shall be fabricated, piped, and wired by fully qualified workmen who are properly trained, experienced, and supervised.

2.4 CONTROL PANEL COMPONENTS

A. Nameplates and labels

1. All control components within the control panel shall be labeled with adhesive labels that have a thermal transfer type ink system on a UL-508A approved label. Labels shall be

provided for marking wire ducts, terminal block sections, PLC modules, networking modules, signal isolators, intrinsic barriers, relays, breakers, power supplies, surge suppressors and all other pertinent components within the control panel.

2. All components on the exterior of the control panel shall have nameplates fabricated from black-letter, white-face laminated plastic engraving stock, Rowmark Ultramatte or equal. Engraved characters shall be block style with no characters smaller than 1/8 inch. Adhesive shall be high strength, low profile double strength, double sided as produced by Bron or Tessa or approved equal. Stainless steel fasteners shall be used in addition to the adhesive on all equipment where the fasteners do not derate the NEMA rating of the enclosure.

B. Pilot Devices

1. Provide pilot devices from a single manufacturer.
2. Pilot devices shall have NEMA ratings that match the overall control panel rating. They shall be 30mm in diameter and heavy duty.
3. All pilot devices shall have an associated nameplate that clearly describes the function of the device.
4. Pilot lights shall be LED and shall have colors as follows:
   a. The Contract Drawings shall take precedence for light colors. Refer to the P&ID's and schematics.
   b. On/Running/Opened: Green.
   c. Off/Stopped/Closed: Red.
   d. Power: White.
   e. Alarm/Fail: Red.
5. Acceptable Manufacturers
   a. Square D Types K (for NEMA 4 or 12) or Types SK (NEMA 4X).
   b. Allen-Bradley Types 800T (NEMA 4/12) or Types 800H (NEMA 4X, 7).
   c. Or Approved Equal.

C. Door Mounted Meters

1. Digital Process Meters
   a. Provide digital process meters to display a numeric process value as required by the Contract Drawings.
   b. The meter shall accept and re-transmit an analog input signal which is in proportion with the process value. The meter shall be capable of receiving the following signals:
      1) 0 or 4 to 20 mA current.
      2) 0 to 5 or 10 DC volts.
      3) RTD and Thermocouple type inputs.
   c. The meter shall be programmable to scale the numeric display to process engineering units. It shall be capable of showing up to three decimal points.
   d. The meter shall be capable of powering the input and re-transmitted signal.
   e. Acceptable Manufacturers:
      1) Precision Digital Trident Series.
      2) Red Lion PAX Series.
      3) Or Approved Equal.
2. Elapsed Time Meters (ETM)
   a. Provide ETM's for each motor and/or machine provided for the project. Each ETM shall accumulate hours in tenths of an hour.

b. The ETM enclosure shall be panel mount, polycarbonate, shock resistant and totally sealed.
c. Acceptable Manufacturers:
   1) Hobbs 20000 Series.
   2) Or Approved Equal.

D. Terminal Blocks

1. Terminal blocks shall mount on standard DIN rail, and be of the size required for conductors therein. A minimum of 25 percent spares shall be provided in each terminal box. No more than 2 conductors shall be allowed per termination. Jumper bar assemblies shall be installed for interconnecting terminal blocks, distributing power and signal commons. Terminal blocks shall be U.L. rated for 600 Volts, and 30 Amps, minimum.
2. Grounding terminal blocks shall be provided for instrumentation cable shields. The terminal blocks shall have distinctive 2-color bodies yellow and green, and shall be mounted to the DIN rail with metal screw down type clamps, providing a positive ground connection. One grounding terminal block shall be installed for every 2 instrument cables terminated. Grounding terminal blocks shall be U.L. rated for 600 Volts, and 20 Amps, minimum.
3. Terminal blocks shall be available in a variety of colors, including red, green, blue, gray, black, yellow, and orange.
4. DIN mount fuse holders shall have blown fuse indicators for DC and AC circuits. Fuse holders shall be of the compression clamp type. Fuse holders shall be U.L. listed, and rated for 600 Volts. Fuse sizes shall not exceed the U.L. current rating for the fuse holders.
5. Terminal blocks for 4 to 20 milliamp signals shall have knife disconnect switches, and accessible test points for testing and measurement of current loop signals, without the need for removing wire terminations.
6. Approved Manufacturers
   a. Phoenix Contact UT Series.
   b. Allen-Bradley 1492 Series.
   c. Or Approved Equal.

E. DIN Rail

1. DIN rail shall be prepunched, RoHS compliant, treated with galvanic zinc plating and passivation. Symmetrical DIN rail shall be 35 mm X 15 mm.
2. Acceptable Manufacturers
   a. Iboco Omega 3AF.
   b. Or Approved Equal.

F. Wire Ducts

1. Wire ducts shall have narrow slots (approximately every ½") to accommodate high-density terminal blocks and other hardware.
2. Wire ducts shall be made of lead-free PVC, shall be UL rated for continuous use up to 122°F, and shall be flame retardant.
3. Wire duct colors shall be as follows:
   a. Light grey for all wiring 120V and higher.
   b. White for all wiring 48V and lower.

c. Blue for all intrinsically safe wiring.

4. Acceptable Manufacturers
   a. Panduit Type F Series.
   b. Or Approved Equal.

G. Surge Protection Devices

1. Provide a Surge Protection Device (SPD) for power feeds which feed power to the control panel.
2. Each SPD shall have a short circuit current rating that exceeds the rating of the power feed that it is protecting.
3. All SPD's shall be properly grounded to the ground grid per NEC and per the SPD manufacturer's recommendations.
4. Three phase power feeds and single phase power feeds for non-sensitive loads.
   a. Provide a parallel, DIN rail mountable, SPD whose location is immediately downstream of the main panel disconnect or circuit breaker.
   b. Capable of handling a 10kA surge current.
   c. Acceptable Manufacturers
      1) Transtector 12R Series.
      2) Or Approved Equal.
5. Single phase power feeds for control panels with sensitive electronics
   a. Provide an inline, DIN rail mountable, SPD that also provides EMI filtering.
   b. The SPD shall be capable of handling a 10kA surge current.
   c. The inline SPD shall have a set of dry contacts that indicate when the unit is healthy and operating correctly.
   d. Acceptable Manufacturers
      1) Phoenix Contact SFP Series.
      2) Or Approved Equal.
6. Low Voltage Signals
   a. Provide surge protection for low-voltage signals where shown on the Contract Drawings.
   b. Acceptable Manufacturers
      1) Phoenix Contact Termitrab.
      2) Or Approved Equal.
7. Coaxial Transmission Lines
   a. For radio type systems, provide surge/lightning protection for all coaxial lines leaving the control panel.
   b. Surge/lightning protectors shall be rated for the frequency at which signals are to be transmitted on the cabling.
   c. Acceptable manufacturers
      1) Polyphaser.
      2) Or Approved Equal.

H. Circuit Breakers

1. Circuit breakers shall meet the requirements of Section 262816.
2. Provide a main circuit breaker with panel disconnect if required as described in 2.3.A.
3. All control panels fed by 120VAC shall have a main DIN rail mounted circuit breaker.
4. The following types of loads shall be individually fed by circuit breakers:
   a. Panel mounted receptacles.
   b. UPS equipment.

c. DC Power Supplies.

5. Circuit breakers shall be sized according to the loads they are powering.
6. Acceptable Manufacturers
   a. Square D.
   b. Cutler Hammer.
   c. Or Approved Equal.

I. Motor Controllers

1. All motor controllers shall meet the requirements of Division 26.

J. Uninterruptible Power Supplies (UPS)

1. All UPS equipment shall meet the requirements of Section 263353.
2. UPS equipment intended to be installed in control panels shall meet the following criteria:
   a. The UPS shall be UL listed and shall maintain the UL listing of the control apnel.
   b. The UPS shall be properly mounted to withstand vibration and seismic requirements for the project.
   c. The UPS shall be sized for 200% of the calculated panel load.
   d. The UPS shall have a minimum backup time of 30 minutes unless specifically stated as otherwise on the Contract Drawings.
   e. For PLC panels, the UPS shall be equipped with dry contacts for monitoring the UPS for any alarm conditions and low battery.
3. Where specifically shown on the Contract Drawings, an industrial DC UPS may be used as backup power for the control panel. This will typically be the case where all critical loads are at 24VDC.
4. Unless indicated as otherwise on the Contract Drawings, the UPS equipment shall be the line-interative type and operate at 120VAC.
5. UPS equipment shall provide surge, EMI
6. Acceptable Manufacturers
   a. Powerware 5000 series (line-interactive) or 9000 series (online).
   b. Sola SDU Series (24VDC UPS).
   c. Or Approved Equal.

K. Power Supplies

1. Provide 24VDC Power Supplies or other DC voltages as required for the application.
2. All power supplies shall be oversized for a minimum 150% of the calculated load.
3. All power supplies shall be properly protected by a DIN rail mount circuit breaker whose trip rating is per the manufacturer's recommendation.
4. All power supplies shall have a set of dry contacts that indicate when the power supply is operating normally.
5. Where shown on the Contract Drawings, provide redundant power supplies and corresponding diodes.
6. Power supplies shall meet the following criteria:
   a. Input Voltage: 100 to 240VAC.
   b. Output Voltage: ±1% of rated output.
   c. Operating Temperature: 0°C to 60°C.
   d. Built in transient surge protection.
   e. DIN rail mountable, metal housing.

7. Acceptable Manufacturers
    a. Phoenix Contact Quint Series.
    b. Or Approved Equal.

L. Signal Isolators/Converters

1. Furnish signal isolators as required that optically isolate the input signal from the output signal. If output signal is to be a different type of signal than the output than the isolator shall convert the signal as required.
2. Isolators output shall be adjustable for zero and span.
3. If input signal is part of a Hart system, the isolator shall be made specifically to pass on the Hart signal.
4. Acceptable Manufacturers
    a. Phoenix Contact.
    b. Action Instruments.
    c. Or Approved Equal.

M. Intrinsically Safe Barriers

1. Provide intrinsically safe barriers wherever analog or discrete input signals are coming from classified areas.
2. Intrinsically safe barriers shall be located in their own enclosure whose assembly is UL rated. Install the barriers and field wiring as per the requirements of NEC and the manufacturer's installation guidelines.
3. If input signal is part of a Hart system, the isolator shall be made specifically to pass on the Hart signal.
4. Acceptable Manufacturers
    a. Phoenix Contact.
    b. Pepperl Fuchs.
    c. Or Approved Equal.

N. Relays

1. Provide relays whose contact ratings are sized according to the load requirements and size of the protection device associated with the circuit in which the contacts are wired. As a minimum contact ratings shall be 10A resistive up to 250VAC.
2. Provide relays whose coil voltage is as required by the application.
3. Relays with DC rated coils shall have a freewheel diode installed across the coil.
4. Relays with AC rated coils shall have a surge suppressor installed across the coil.
5. Relays shall have based with relays which plug into the base. Bases shall have screw-type connections.
6. Relays shall have an LED indicating when the relay is coil is energized.
7. Provide enough relay contacts for each relay as required by the application. If the number of contacts required exceeds the number of contacts on the relay, provide additional relay(s) to provide enough sets of contacts.
8. Acceptable Manufacturers
    a. Idec R Series.
    b. Allen-Bradley 700H Series.
    c. Or Approved Equal.

O. Time Delay Relays

1. Provide time delay relays to control on and off delay times as required by the application.
2. Time delay relays shall meet the requirements of relays as listed above with the following additional requirements:
    a. Time delay shall be adjustable from 0.1 seconds to 600 hours.
    b. Timers shall be multi-function and shall be capable of providing on-delay, off-delay, cycle timing and one-shot type timing control.
3. Acceptable Manufacturers
    a. Idec RTE Series.
    b. Phoenix Contact ETD Series.
    c. Or Approved Equal.

P. Panel HVAC Components
1. Provide heating, ventilation, and air conditioning, devices in order to maintain all components within the control panel within the acceptable range as specified in Section 409000.
2. HVAC equipment shall maintain the required NEMA rating for the control panel assembly.
3. Externally mounted HVAC equipment (such as air-to-air exchangers or air conditioners) shall be housed in an enclosure whose material matches the material of the control panel. Where in corrosive environments, all components that will come in contact with outside air shall be corrosion resistant for that environment.
4. All HVAC equipment shall be UL rated. For equipment mounted on the control panel, the equipment shall have a corresponding NEMA rating.
5. Provide power as required for the HVAC equipment. HVAC loads shall be included in feeder and control power transformer sizing calculations.
6. Panel Heating
    a. Heating shall be provided when ambient temperatures are expected to fall below the allowed range as specified in Section 409000. As a minimum, heating shall be sized to keep the panel temperature at or above 50°F.
    b. Except for small anti-condensating heaters, heating equipment shall have fans which distribute the heat throughout the enclosure. Heaters shall be installed according to the manufacturer's installation instructions. Provide enough space between the heating equipment and other components such that the other components to not experience abnormally high temperatures.
    c. Provide anti-condensating heaters for all outdoor enclosures which house electronics, instrumentation and/or motor controllers.
    d. All heaters shall be thermostatically controlled by a DIN rail mounted thermostat.
    e. Acceptable Manufacturers
        1) Hoffman.
        2) Or Approved Equal.
7. Panel Ventilation
    a. Where ventilation is determined to maintain the control panel's maximum temperature as required by Section 409000, the following requirements shall be adhered to:
        1) Ventilation shall maintain the required NEMA rating for the control panel assembly.
        2) For indoor, non-corrosive locations (panels with NEMA 12 ratings), conventional ventilation with fans and vents may be used.
        3) For corrosive or outdoor locations, side or top mounted air-to-air heat exchangers shall be used.

b. The fan(s) and corresponding vents or air-to-air heat exchangers shall be properly sized and located to move enough air through the panel to remove the generated heat as well as allow air flow across all heat generating equipment.
c. All ventilation shall be thermostatically controlled by a DIN rail mounted thermostat.
d. Acceptable Manufacturers
1) Hoffman.
2) Pfannenberg.
3) Or Approved Equal.

8. Panel Air Conditioning
a. Where it is deemed necessary to air condition a control panel to maintain the control panel's maximum temperature as required by Section 409000, the following requirements shall be adhered to:
1) Air conditioners shall be side or top mounted and shall be sized based upon the heat generated within the control panel, the maximum outside air temperature, and the amount of sunlight the control panel may be exposed to. Air conditioners shall be oversized by a safety factor of 25%.
2) Air conditioners shall be thermostatically controlled by a DIN rail mounted thermostat. In addition, the air conditioner shall turn off if the panel door(s) are not closed.
b. Acceptable Manufacturers
1) Hoffman.
2) Pfannenberg.
3) Thermal Edge.
4) Kooltronics.

PART 3 - EXECUTION

3.1 FACTORY ACCEPTANCE TESTING

A. All control panels shall be factory acceptance tested (FAT).

3.2 INSTALLATION

A. All control panels shall be installed so that their surfaces are plumb and level.

B. All control panels shall be properly mounted so as to withstand the seismic requirements for the Site. Anchor panels securely to the wall or floor at each corner as a minimum.

C. Control panels shall have been designed according to locations for conduit entry. Floor mounted panels in electrical rooms shall have cutouts in the bottom of the enclosure that were cutout by the panel shop. All conduit holes shall be cut in the field.

D. Field wiring
1. Wires that are terminated in control panels after permanent panel installation are deemed as field wires. Field wiring shall be installed in the allocated wire ducts and shall be properly labeled and terminated.

2. All field wires shall be long enough to reach each corner of the enclosure. Neatly coil up extra wire length at the bottom of the enclosure. Do not use the wire ducts for storing extra wire length.

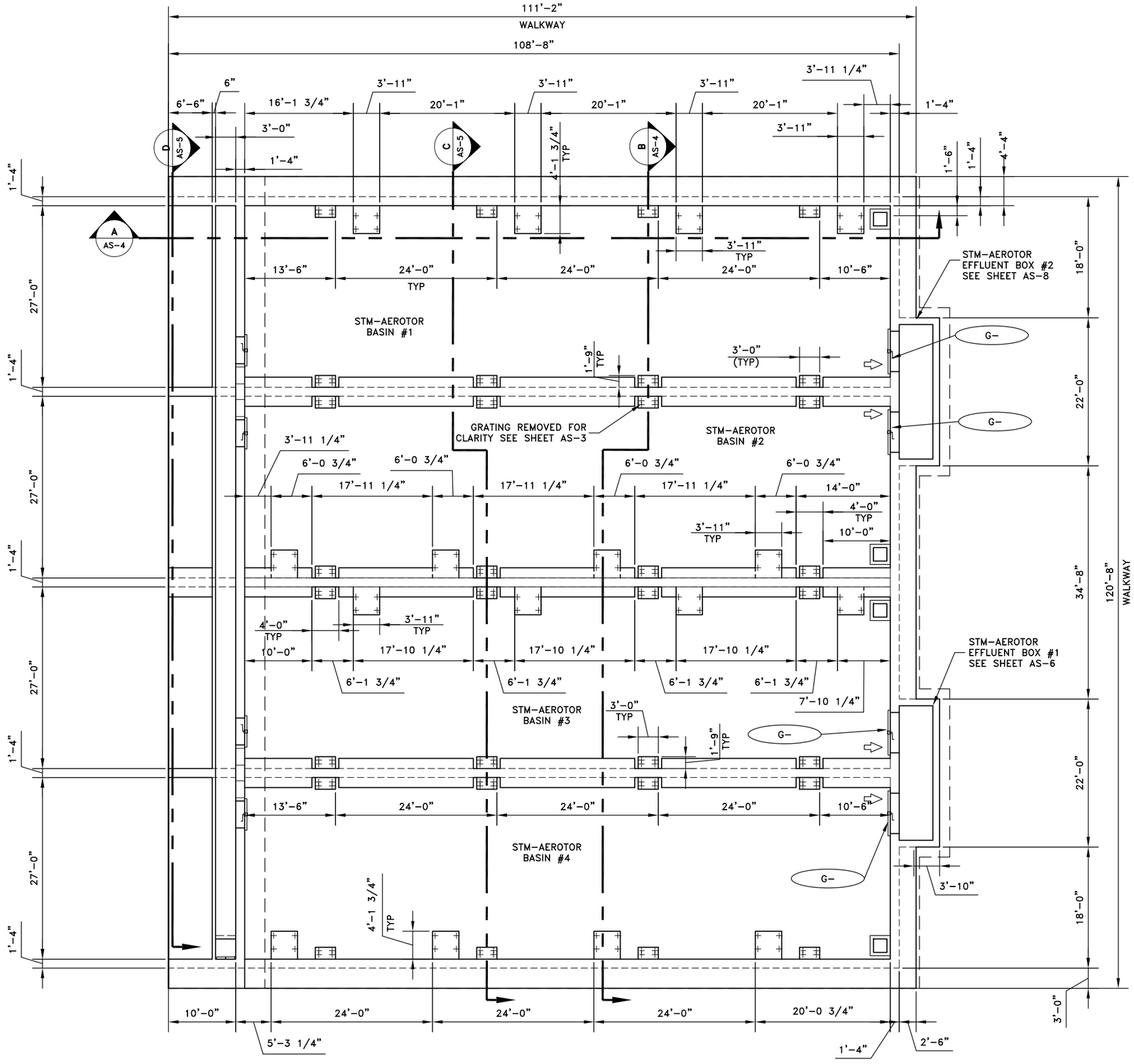
END OF SECTION 409513

EXHIBIT FOUR - PRELIMINARY DESIGN REFERENCE DRAWINGS

Figure 1 – Hybrid Fixed Film Basin Structural Plan
Figure 2 – Hybrid Fixed Film Basin Mechanical Plan
Figure 3 – Hybrid Fixed Film Basin Mechanical Section
Figure 4 – Anoxic Basin Plan
Figure 5 – Secondary Clarifier Plan
Figure 6 – Owner Handrail Detail (for clarifier walkways)
Figure 7 – DAFT Plan (for retrofit into existing structure)

*** All drawings are preliminary and for reference purposes only.**

FIGURE 1



STRUCTURAL PLAN

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

0 8 16
Scale In Feet

NOTES:

PRIOR TO BACKFILL AND COMPACTION OF BACKFILL SOIL AROUND THE STRUCTURE, THE CONTRACTOR SHALL:

1- DO HYDROSTATIC TESTING TO 11'-0" MAX FROM BASE OF WALL.

2- AFTER BACKFILL SOIL HAS BEEN PLACED AND COMPACTED HYDROSTATIC TEST TO 18'-6" (FULL OPERATIONAL HEIGHT).

ORIGINAL			
NO.	DATE	DESIGN	DRAWN	CHECKED
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REVISIONS

LAS GALLINAS VALLEY SANITARY DISTRICT

SECONDARY TREATMENT AND RWP UPGRADE
STM-AEROTOR BASIN
STRUCTURAL PLAN

AQUA ENGINEERING
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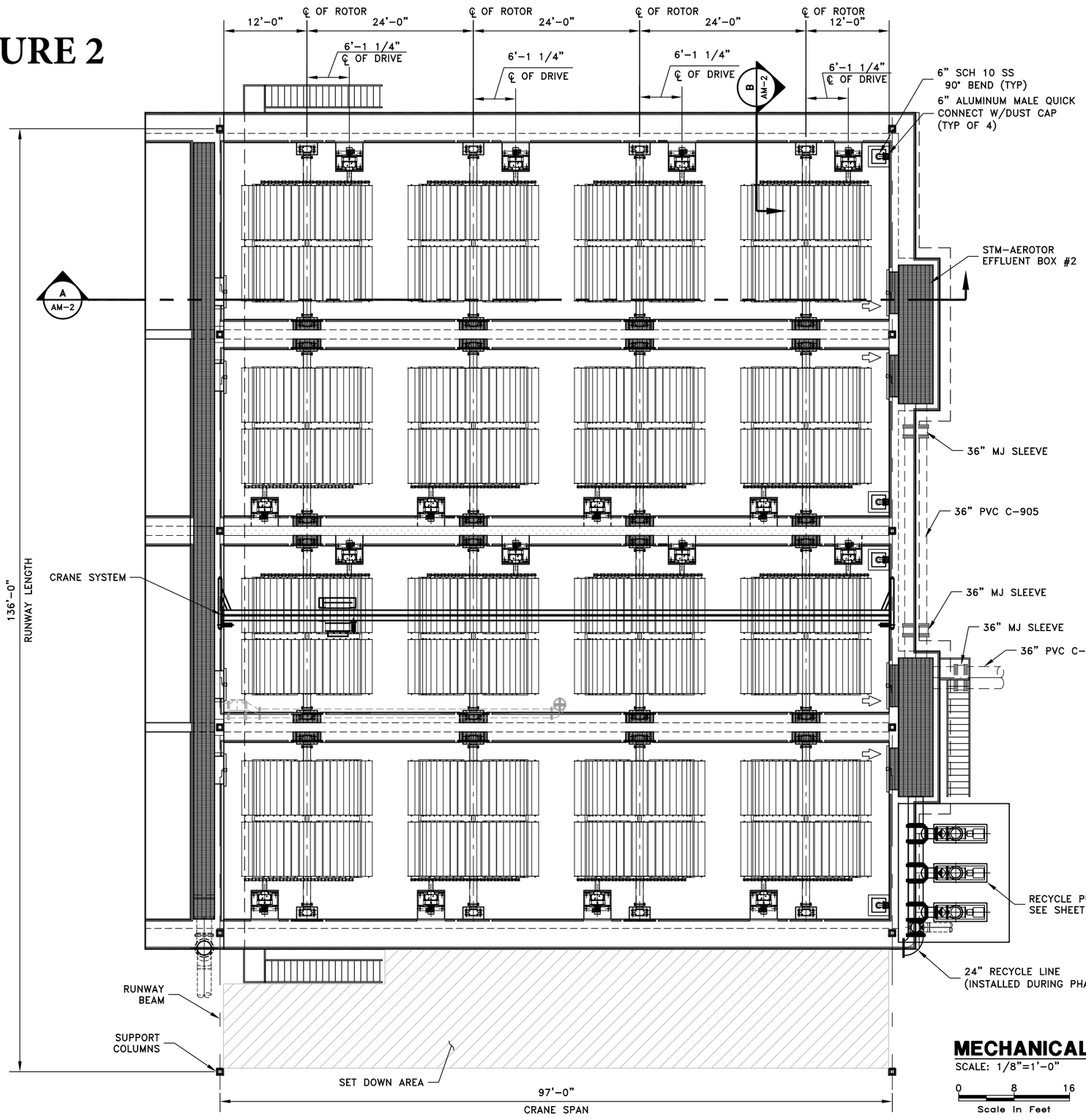
ENGINEERING CONSULTANTS

0 1/2 1
DRAWING IS TO SCALE
IF BAR MEASURES:
1" = FULL SCALE
1/2" = HALF SCALE

SHEET
AS-1

10/17/2016 X:\Las Gallinas\LASG150119-Secondary Treatment Upgrades\Drafting\STM\AS-1.dwg

FIGURE 2



NOTES:

1- FOR MECHANICAL EQUIPMENT AND VALVE SCHEDULES REFER TO SHEETS SCH-2 AND SCH-3.

MECHANICAL PLAN

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

0 8 16

Scale In Feet

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REVISIONS

LAS GALLINAS VALLEY SANITARY DISTRICT

SECONDARY TREATMENT AND RWP UPGRADE
STM-AEROTOR BASIN
MECHANICAL PLAN

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0 1/2 1

DRAWING IS TO SCALE
IF BAR MEASURES:
1" = FULL SCALE
1/2" = HALF SCALE

SHEET
AM-1

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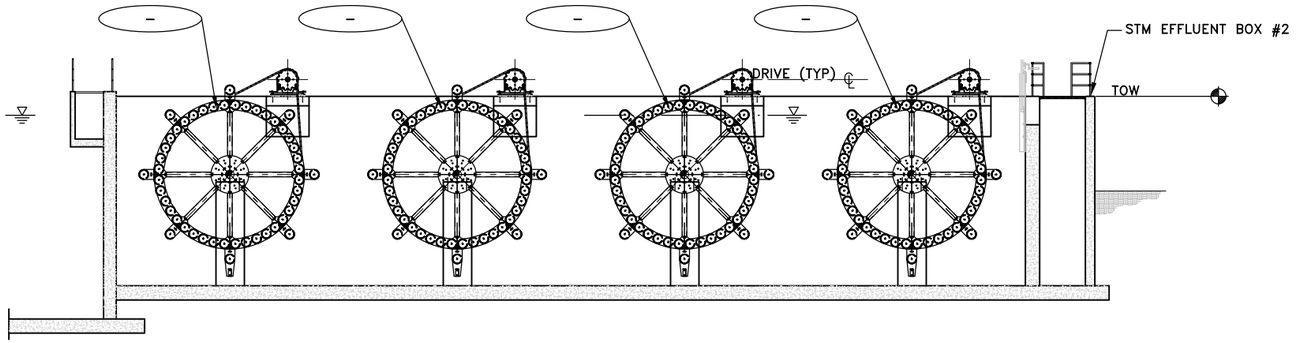
FIGURE 3

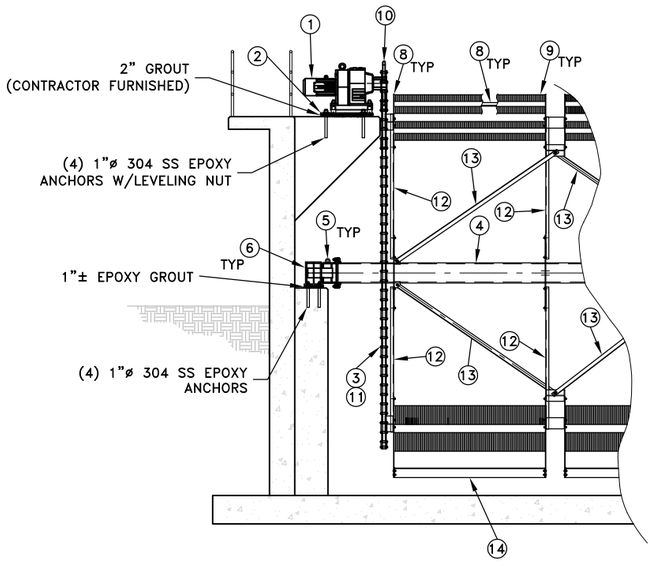


SECTION A
SCALE: 1/8"=1'-0" AM-1

0 8 16
Scale In Feet

NOTES:

1- FOR MECHANICAL EQUIPMENT AND VALVE SCHEDULES REFER TO SHEETS SCH-_ THRU SCH-_.



EQUIPMENT LIST

1. DRIVE - 10 HP
2. DRIVE MOUNTING PLATE W/CHAIN ADJUSTING SYSTEM (HDG)
3. DRIVE CHAIN (STL)
4. CENTER SHAFT (STL)
5. SHAFT END
6. ROTOR BEARING (STL/VESCONITE)
7. WHEEL SECTION (HDG)
8. DISC SUPPORT SHAFT (HDG)
9. STM-AEROTOR DISC ASSEMBLY (POLYPROPYLENE)
10. DRIVE SPROCKET (HDG)
11. WHEEL SPROCKET (HDG)
12. ROTOR SUPPORT FRAME (HDG)
13. FRAME BRACE (HDG)
14. MIXING PADDLE (HDG)

SECTION B
SCALE: NTS AM-1

ORIGINAL				
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REVISIONS

LAS GALLINAS VALLEY SANITARY DISTRICT

SECONDARY TREATMENT AND RWP UPGRADE
STM-AEROTOR BASIN
MECHANICAL SECTIONS

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FAX (951) 788-1256

0 1/2 1
DRAWING IS TO SCALE
IF BAR MEASURES:
1" = FULL SCALE
1/2" = HALF SCALE

SHEET
AM-2

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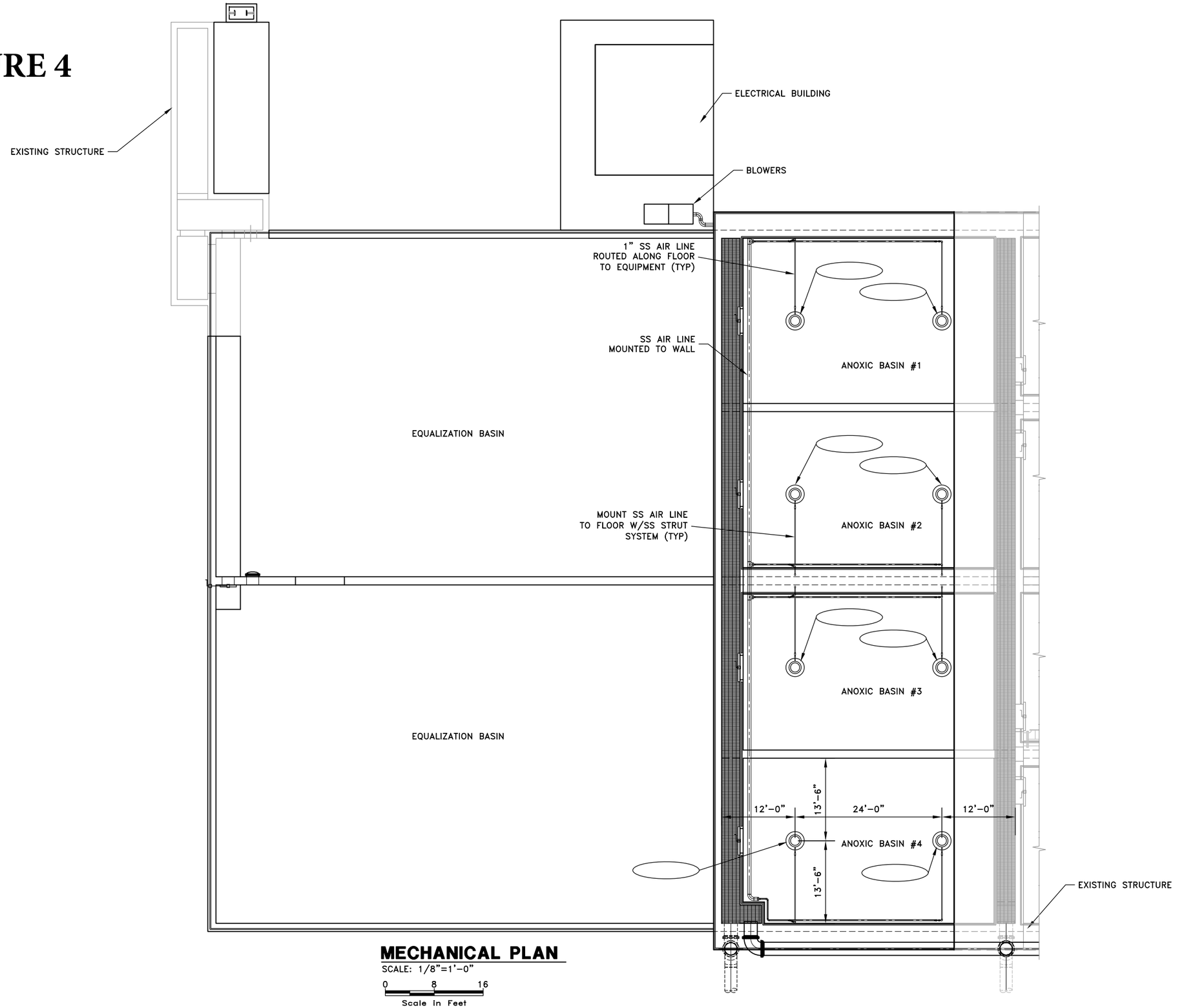
FIGURE 4



MECHANICAL PLAN

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

0 8 16

Scale in Feet

ORIGINAL			
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REVISIONS

LAS GALLINAS VALLEY SANITARY DISTRICT

SECONDARY TREATMENT AND RWP UPGRADE
EQUALIZATION BASIN
MECHANICAL PLAN

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ENGINEERING CONSULTANTS

0 1/2 1

DRAWING IS TO SCALE
IF BAR MEASURES:
1" = FULL SCALE
1/2" = HALF SCALE

SHEET

EQM-1

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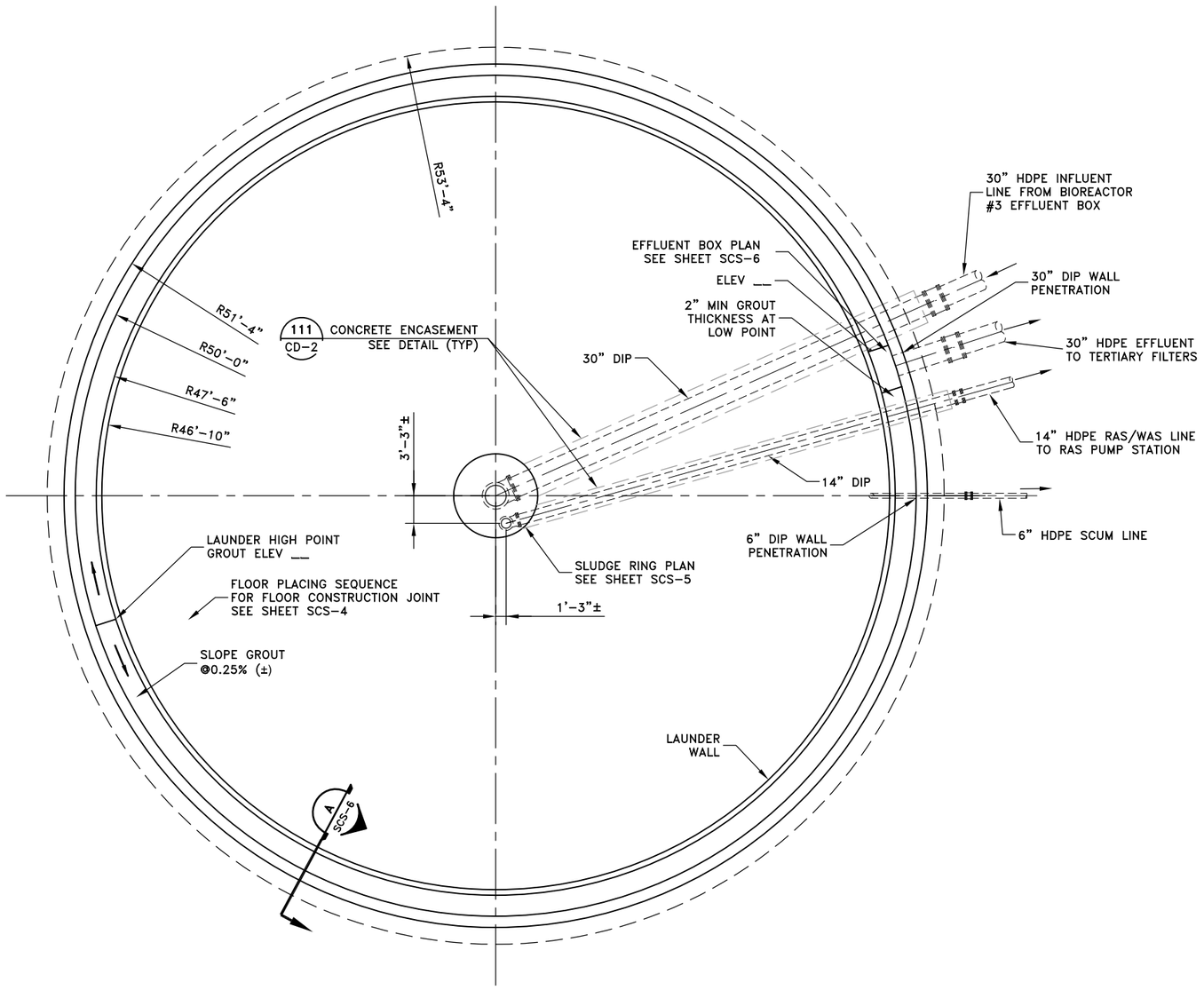
FIGURE 5



NOTE:

1– REFER TO SECTION 312000 OF THE TECHNICAL SPECIFICATIONS FOR DETAILS REGARDING SUBGRADE PREPARATION AND REQUIREMENTS.

2– COORDINATE/VERIFY PIPE LOCATIONS, EQUIPMENT, ANCHORAGE, ETC WITH EQUIPMENT SUPPLIER.

STRUCTURAL PLAN

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

0 8 16

Scale in Feet

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REVISIONS

LAS GALLINAS VALLEY SANITARY DISTRICT

SECONDARY TREATMENT AND RWP UPGRADE
SECONDARY CLARIFIER #3
STRUCTURAL PLAN

AQUA ENGINEERING
533 W 2600 S, Suite 275, BOUNTIFUL, UTAH 84010 (801) 299-1327 FAX (801) 299-1327

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RIVERSIDE, CA 92506
PH (951) 686-1070
FAX (951) 788-1256

0 1/2 1

DRAWING IS TO SCALE
IF BAR MEASURES:
1" = FULL SCALE
1/2" = HALF SCALE

SHEET

SCS-3

FIGURE 6

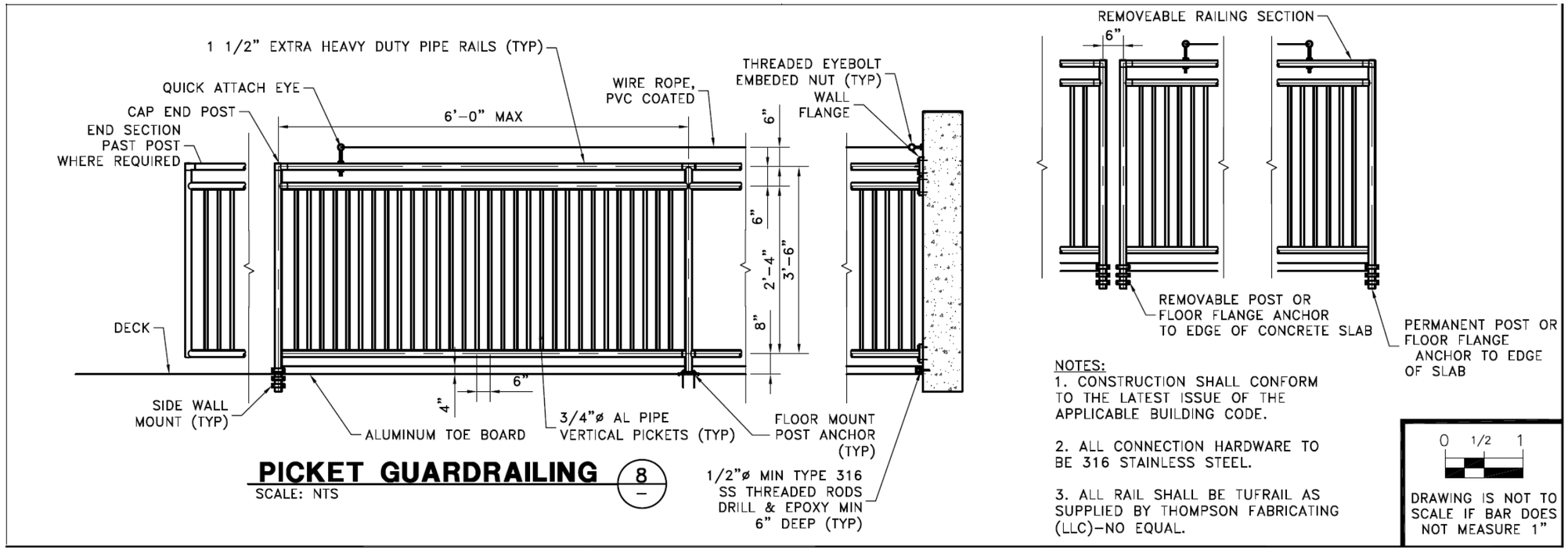
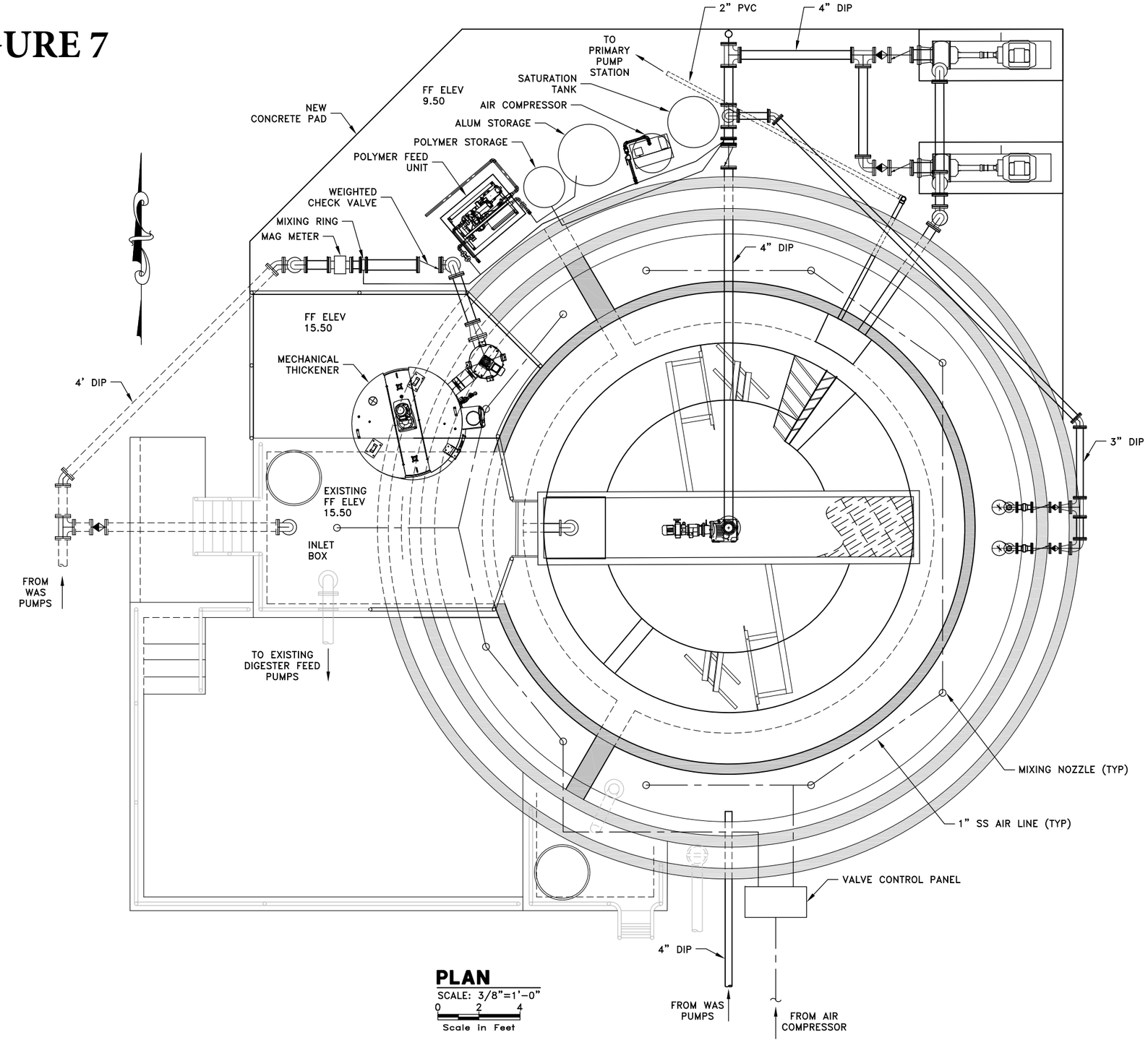

1 1/2" EXTRA HEAVY DUTY PIPE RAILS (TYP)
QUICK ATTACH EYE
CAP END POST
END SECTION PAST POST WHERE REQUIRED
6'-0" MAX
WIRE ROPE, PVC COATED
THREADED EYEBOLT EMBEDED NUT (TYP)
WALL FLANGE
6"
6"
2'-4"
3'-6"
8"
DECK
SIDE WALL MOUNT (TYP)
4"
6"
ALUMINUM TOE BOARD
3/4"ø AL PIPE VERTICAL PICKETS (TYP)
FLOOR MOUNT POST ANCHOR (TYP)
1/2"ø MIN TYPE 316 SS THREADED RODS DRILL & EPOXY MIN 6" DEEP (TYP)
PICKET GUARDRAILING
SCALE: NTS
8
REMOVEABLE RAILING SECTION
6"
REMOVABLE POST OR FLOOR FLANGE ANCHOR TO EDGE OF CONCRETE SLAB
PERMANENT POST OR FLOOR FLANGE ANCHOR TO EDGE OF SLAB
NOTES:
1. CONSTRUCTION SHALL CONFORM TO THE LATEST ISSUE OF THE APPLICABLE BUILDING CODE.
2. ALL CONNECTION HARDWARE TO BE 316 STAINLESS STEEL.
3. ALL RAIL SHALL BE TUFRAIL AS SUPPLIED BY THOMPSON FABRICATING (LLC)–NO EQUAL.
0 1/2 1
DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1"

FIGURE 7



PLAN
SCALE: 3/8"=1'-0"
0 2 4
Scale in Feet

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REVISIONS				

LAS GALLINAS VALLEY SANITARY DISTRICT

SECONDARY TREATMENT AND RWP UPGRADE
DAF BUILDING
SLUDGE THICKENER PLAN

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0 1/2 1
DRAWING IS TO SCALE
IF BAR MEASURES:
1" = FULL SCALE
1/2" = HALF SCALE

SHEET
DM-1

RSW 10/17/2016 X:\Las Gallinas\LASG150119-Secondary Treatment Upgrades\Drafting\DAF\DM-1.dwg

EXHIBIT FIVE - AGREEMENT FOR MATERIAL / EQUIPMENT PURCHASE

THIS AGREEMENT is made and entered into by and between LAS GALLINAS VALLEY SANITARY DISTRICT (OWNER) and *_____ ("Vendor").

RECITALS:

WHEREAS, the Vendor is qualified, experienced, and competent to provide the equipment which are required by OWNER; and

WHEREAS, equipment was requested by OWNER by way of a Request for Proposal (RFP) attached hereto; and

WHEREAS, the Vendor is willing to provide such equipment, as hereinafter defined, on the following terms and conditions.

NOW, THEREFORE, in consideration of the mutual agreements contained herein and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, and intending to be legally bound hereby, the parties agree as follows:

AGREEMENT:

1. Scope of Service. Subject to the terms and conditions set forth in this Agreement, the Vendor shall provide to OWNER the services described in Exhibit One for <INSERT EQUIPMENT NAME> - Bid Item #_____. The Vendor shall provide the equipment at the time, place, and in the manner specified in Exhibit One.

2. Compensation. OWNER hereby agrees to pay the Vendor and the Vendor agrees to accept payment, according to the formula or rates set forth in Exhibit 2, for all of the equipment required by this Agreement provided that total compensation for the Vendor's equipment shall not exceed the sum of *_____.

3. Effective Date and Term. The effective date of this Agreement is *_____, provided that the Vendor shall not commence any work under this Agreement unless and until OWNER provides the Vendor with a written notice to proceed. This Agreement shall terminate on, and all services hereunder shall be rendered by *_____.

4. Billings. The Vendor shall not invoice OWNER for duplicate services performed by more than one person. The Vendor's invoices shall include the following information: a brief description of equipment or service provided; the date the equipment was delivered or services were performed. In no event shall the Vendor submit any invoicing for an amount in excess of the maximum amount of compensation provided in paragraph 2 above.

5. **Status Reports**. The Vendor shall provide OWNER with monthly written reports of all significant developments arising during performance of its services / delivery of equipment hereunder.

6. **Assignment and Subcontracting.** It is recognized by the parties hereto that a substantial inducement to OWNER for entering into this Agreement was, and is, the professional reputation and competence of the Vendor. Neither this Agreement nor any interest therein may be assigned by the Vendor without the prior written approval of OWNER. Except for the subcontract with *----------, as specified in Section *_____ of Exhibit One of this Agreement, the Vendor shall not subcontract any portion of the performance contemplated and provided for herein without prior written approval of OWNER's Administrator. NEED TO ADD LANGUAGE TO ASSIGN TO CONTRACTOR.

7. **Insurance.** On or before beginning any of the services or work called for by any term of this Agreement, the Vendor, at its own cost and expense, shall carry, maintain for the duration of the Agreement, and provide proof thereof that is acceptable to OWNER, the insurance specified in subsections a. through c. below with insurers and under forms of insurance satisfactory in all respects to OWNER. The Vendor shall not allow any subcontractor to commence work on any subcontract until all insurance required of the Vendor has also been obtained for the subcontractor.

a. **Workers' Compensation.** Satisfactory Workers' Compensation Insurance and Employer's Liability Insurance for any and all persons employed directly or indirectly by the Vendor who will be on site shall be provided with limits not less than one million dollars ($1,000,000.00). In the alternative, the Vendor may rely on a self-insurance program to meet these requirements so long as the program of self-insurance complies fully with the provisions of the California Labor Code. The insurer, if insurance is provided, or the Vendor, if a program of self-insurance is provided, shall waive all rights of subrogation against OWNER for loss arising from work performed under this Agreement.

b. **Commercial General and Automobile Liability.** The Vendor, at the Vendor's own cost and expense, shall maintain commercial general and automobile liability insurance for the period covered by this Agreement in an amount not less than one million dollars per occurrence ($1,000,000.00), combined single limit coverage for risks associated with the work contemplated by this Agreement. If a Commercial General Liability Insurance or an Automobile Liability form or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to the work to be performed under this Agreement or the general aggregate limit shall be at least twice the required occurrence limit. Such coverage shall include but shall not be limited to, protection against claims arising from bodily and personal injury, including death resulting there from, and damage to property resulting from activities contemplated under this Agreement including the use of owned and non-owned automobiles. Coverage shall be at least as broad as Insurance Services Office Commercial General Liability occurrence form CG 0001 (ed. 11/88) and Insurance Services Office Automobile Liability form CA 0001 (ed. 12/90) Code 1 (any auto). No endorsement shall be attached limiting the coverage.

Each of the following shall be included in the insurance coverage or added as an endorsement to the policy:

(1) OWNER, its officers, employees, agents, and volunteers are to be covered and insured's as respects each of the following: Liability arising out of activities performed by or on behalf of the Vendor, including the insured's general supervision of the Vendor; products and completed operations of the Vendor; premises owned, occupied or used by the Vendor; or automobiles owned, leased, hired, or borrowed by the Vendor. The coverage shall contain no

special limitations on the scope of protection afforded OWNER, its officers, employees, agents, or volunteers.

(2) The policy must contain a cross liability or severability of interest clause.

(3) The insurance shall cover on an occurrence or an accident basis, and not on a claims-made basis.

(4) An endorsement must state that coverage is primary insurance and that no other insurance affected by OWNER will be called upon to contribute to a loss under the coverage.

(5) Any failure of the Vendor to comply with reporting provisions of the policy shall not affect coverage provided to OWNER and its officers, employees, agents, and volunteers.

(6) Insurance is to be placed with California-admitted insurers with a Best's rating of no less than A:VII.

(7) Written notice of cancellation or non-renewal must be received by OWNER at least thirty (30) days prior to such change.

c. Deductibles and Self-Insured Retentions. The Vendor shall disclose the self-insured retentions and deductibles before beginning any of the services or work called for by any term of this Agreement. During the period covered by this Agreement, upon express written authorization of OWNER Risk Manager, the Vendor may increase such deductibles or self-insured retentions with respect to OWNER, its officers, employees, agents, and volunteers. OWNER's Risk Manager may condition approval of an increase in deductible or self-insured retention levels upon a requirement that the Vendor procure a bond guaranteeing payment of losses and related investigations, claim administration, and defense expenses that is satisfactory in all respects to each of them.

d. Notice of Reduction in Coverage. In the event that any coverage required under subsections a., b., or c. of this section of the Agreement is reduced, limited, or materially affected in any other manner, the Vendor shall provide written notice to OWNER at the Vendor's earliest possible opportunity and in no case later than five (5) days after the Vendor is notified of the change in coverage.

e. OWNER Remedies. In addition to any other remedies OWNER may have if the Vendor fails to provide or maintain any insurance policies or policy endorsements to the extent and within the time herein required, OWNER may, at its sole option:

(1) Obtain such insurance and deduct and retain the amount of the premiums for such insurance from any sums due under the Agreement;

(2) Order the Vendor to stop work under this Agreement or withhold any payment which becomes due to the Vendor hereunder, or both stop work and withhold any payment, until the Vendor demonstrates compliance with the requirements hereof;

(3) Terminate this Agreement.

Exercise of any of the above remedies, however, is an alternative to other remedies OWNER may have and is not the exclusive remedy for the Vendor's failure to maintain insurance or secure appropriate endorsements.

8. Vendor's Responsibility. It is understood that the Vendor has the skills, experience and knowledge necessary to perform the work agreed to be performed under this Agreement, and that OWNER relies upon the Vendor's representations about its skills, experience and knowledge to perform the Vendor's work in a competent manner. Acceptance by OWNER of the work performed under this Agreement does not operate as a release of said Vendor from responsibility for the work performed. It is further understood and agreed that the Vendor is apprised of the scope of the work to be performed under this Agreement and the Vendor agrees that said work can and shall be performed in a fully competent manner.

9. Indemnification. The Vendor shall indemnify, defend, and hold OWNER, its officers, employees, agents and volunteers harmless from and against any and all liability, claims, suits, actions, damages, and causes of action arising out of any personal injury, bodily injury, loss of life, or damage to property, or any violation of any federal, state or municipal law or ordinance, or other cause in connection with the acts or omissions of the Vendor, its employees, subcontractors, or agents, or on account of the performance or character of this work, except for any such claim arising out of the sole negligence or willful misconduct of OWNER, its officers, employees, agents, or volunteers. It is understood that the duty of the Vendor to indemnify and hold harmless includes the duty to defend as set forth in Section 2778 of the California Civil Code. Within fifteen (15) days of OWNER notice that it has been made a party to an action arising out of the Vendor's acts or omissions under this Agreement, the Vendor shall provide a defense to OWNER in that action. In the event the Vendor fails to provide such a defense to OWNER, the Vendor shall be liable to OWNER for its attorney's fees and litigation costs incurred to defend itself beginning on the sixteenth (16th) day from the date of OWNER notice and request for a defense. Acceptance of insurance certificates and endorsements required under this Agreement does not relieve the Vendor from liability under this indemnification and hold harmless clause. This indemnification and hold harmless clause shall apply whether or not such insurance policies shall have been determined to be applicable to any of such damages or claims for damages.

10. Licenses. If a license of any kind having terms intended to include evidence of registration is required of the Vendor, its employees, agents, or subcontractors by federal or state law, the Vendor warrants that such license has been obtained, is valid and in good standing, and the Vendor shall keep it in effect at all times during the terms of this Agreement, and that any applicable bond has been posted in accordance with all applicable laws and regulations.

11. Termination. This Agreement may be terminated by OWNER immediately for violation of any provision of this Agreement or upon fifteen (15) days written notice by OWNER to the Vendor. In the event of termination, the Vendor shall be entitled to compensation for services performed to the effective date of termination; provided, however, that OWNER may condition payment of such compensation upon the Vendor's delivery to OWNER of any or all documents, photographs, computer software, video and audio tapes, and other materials provided to the Vendor or prepared by or for the Vendor or OWNER in connection with this Agreement and upon satisfactory completion of the services which the Vendor has performed.

12. Ownership of Materials. Any and all documents, including draft documents where completed documents are unavailable, or materials prepared or caused to be prepared by the Vendor pursuant to this Agreement shall be the property of OWNER at the moment of their preparation. All materials and records of a finished nature, such as final plans, specifications, reports, and maps, prepared or obtained in the performance of this Agreement, shall be delivered to and become the property of OWNER. All materials of a preliminary nature, such as survey notes, sketches, preliminary plans, computations and other data, prepared or obtained in the performance

of this Agreement, shall be made available, upon request, to OWNER at no additional charge and without restriction or limitation on their use consistent with the intent of the original design.

13. Conflict of Interest. The Vendor warrants and covenants that the Vendor presently has no interest in, nor shall any interest be hereinafter acquired in, any matter which will render the services required under the provisions of this Agreement a violation of any applicable state, local, or federal law. In the event that any conflict of interest should nevertheless hereinafter arise, the Vendor shall promptly notify OWNER's Risk Manager of the existence of such conflict of interest so that OWNER may determine whether to terminate this Agreement. The Vendor further warrants its compliance with the Political Reform Act (Gov. Code Section 81000 et seq.) respecting this Agreement. In addition, the Vendor possesses no authority with respect to any OWNER decision beyond the rendition of information, advice, recommendation or counsel.

14. Time is of the Essence. The Vendor agrees to diligently prosecute the services to be provided under this Agreement to completion and in accordance with any schedules specified herein. In the performance of this Agreement, time is of the essence.

15. Compliance with Laws. In the performance of this Agreement, the Vendor shall abide by and conform to any and all applicable laws of the United States and the State of California, and all ordinances of OWNER. The Vendor warrants that all work done under this Agreement will be in compliance with all applicable safety rules, laws, statutes, and practices, including but not limited to Cal/OSHA regulations.

16. Abandonment by the Vendor. In the event the Vendor ceases performing services under this Agreement or otherwise abandons the project prior to completing all of the services described in this Agreement, the Vendor shall, without delay, deliver to OWNER all materials and records prepared or obtained in the performance of this Agreement, and shall be paid for the reasonable value of the services performed up to the time of cessation or abandonment, less a deduction for any damages or additional expenses which OWNER incurs as a result of such cessation or abandonment.

17. Liquidated Damages. The parties to this Agreement agree that, in the event that the services described in this Agreement are not completed on time, OWNER will sustain damage and that it will be impracticable and extremely difficult to ascertain the actual damage, which OWNER will sustain. In the event that the Vendor fails to complete all of the services described in this Agreement on or before any completion date provided herein, or within the period of any authorized extension, the Vendor shall pay as and for liquidated damages, the sum of *Fifteen Hundred dollars ($1,500) for each calendar day that completion is delayed and said sum may be deducted from any payment due the Vendor under this Agreement.

18. Waiver. The waiver by either party of a breach by the other of any provision of this Agreement shall not constitute a continuing waiver or a waiver of any subsequent breach of either the same or a different provision of this Agreement.

19. Attorney's Fees. If a party brings any action, including an action for declaratory relief, to enforce or interpret the provisions of this Agreement, the prevailing party is entitled to reasonable attorneys' fees in addition to any other relief to which that party may be entitled. Such fees may be set by the court in the same action or in a separate action brought for that purpose.

20. Notices. All notices under this Agreement shall be in writing and shall be delivered by personal service or by certified or registered mail, postage prepaid, return receipt requested, of the

parties. Any written notice to any of the parties required or permitted hereunder shall be deemed to have been duly given on the date of service if served personally or if served by facsimile transmission (with confirmation of receipt), or seventy-two (72) hours after the mailing. Rejection or other refusal to accept or the inability to deliver because of changed address of which no notice was given as provided hereunder shall be deemed to be receipt of the notice, demand or request sent. Notices of the parties shall be addressed as follows:

To Vendor: *

To OWNER: *Administrator
Las Gallinas Valley Sanitary District
300 Smith Ranch Road
San Rafael, CA 94903

Each party shall provide the other party with telephone and written notice of any change in address as soon as practicable.

21. No Third-Party Rights. The parties intend not to create rights in, or to grant remedies to, any third party as a beneficiary of this Agreement or of any duty, covenant, obligation, or undertaking established herein.

22. Whole Agreement. This Agreement has *_____ pages, excluding the exhibits described on its signature page. This Agreement constitutes the entire understanding and agreement of the parties. This Agreement integrates all of the terms and conditions mentioned herein or incidental hereto and supersedes all negotiations or previous agreements between the parties with respect to all or any part of the subject matter hereof.

23. Amendments. This Agreement may be modified or amended only by a written document executed by both the Vendor and OWNER Administrator and approved as to form by OWNER Council. Such document shall expressly state that it is intended by the parties to amend the terms and conditions of this Agreement.

24. Interpretation. The agreements contained herein shall not be construed in favor of or against either party but shall be construed as if all parties prepared this Agreement. The masculine and neuter genders, the singular number and the present tense shall be deemed to include the feminine gender, the plural number and past and future tense, respectively, where the context so requires.

25. Controlling Law. This Agreement and all matters relating to it shall be governed by the laws of the State of California. Venue in any action shall be in the Superior Court of the County of Marin.

26. Severability. Should any part of this Agreement be declared by a final decision by a court or tribunal of competent jurisdiction to be unconstitutional, invalid, or beyond the authority of either party to enter into or carry out, such decision shall not affect the validity of the remainder of this Agreement, which shall continue in full force and effect, provided that the remainder of this Agreement, absent the unexcised portion, can be reasonably interpreted to give effect to the intentions of the parties.

27. Counterparts. This Agreement may be executed in multiple identical counterparts, each of which shall be deemed an original, but all of which together will constitute one and the same instrument but the parties agree that the agreement on file in the Office of OWNER's Clerk is the version of the agreement that shall take precedent should any differences exist among counterparts of the document.

SIGNATURE PROVISIONS

IN WITNESS WHEREOF, the Vendor has executed this Agreement, and OWNER, by its Appointed Administrator, who is authorized to do so, has executed this Agreement.

VENDOR

Dated:_____ By:_____

LAS GALLINAS VALLEY SANITARY DISTRICT

Dated:_____ By:_____

Reviewed by: _____ _____

Attachment B

Revised Section 260000 – General Electrical Requirements (Volume 3B)

SECTION 260000 – GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. General requirements which apply to all electrical aspects of the work.

B. Related Sections

1. The Contract Documents are a single integrated document. As such, all Divisions and Sections are applicable. The Contractor and its Subcontractors are responsible to review all parts of the Contract Documents in order to provide a complete and coordinated project.

1.2 REFERENCES

A. The installation and commissioning of the Electrical System shall conform to all applicable codes, regulations, standards and specifications, including, but not limited to those listed below. These publications are referenced to by designation but not by edition. The latest edition accepted by the Authority Having Jurisdiction in effect at the time of bid shall govern.

1. State and Local Codes and Authority Having Jurisdiction (AHJ)
2. National Electric Code (NEC).
3. National Fire Protection Association (NFPA)
4. Institute of Electrical and Electronic Engineers (IEEE)
5. American National Standards Institute (ANSI)
6. American Society for Testing and Materials (ASTM)
7. Insulated Cable Engineers Association (ICEA)
8. National Electrical Manufacturers Association (NEMA)
9. Federal Occupational Safety and Health Act (OSHA)
10. Underwriters Laboratories, Inc. (UL)
11. International Society of Automation (ISA)

1.3 DEFINITIONS

A. Refer to the Contract Drawings sheet GE-01 for a list of abbreviations associated with the Electrical System. In addition, the following definitions are used in this section:

1. AHJ – Authority Having Jurisdiction
2. I&C – Instrumentation and Controls
3. IS – Instrumentation Supplier
4. NEC – National Electric Code
5. VFD – Variable Frequency Drive
6. UL - Underwriters Laboratories, Inc.

1.4 ELECTRICAL SYSTEMS REQUIREMENTS

A. The Work is to provide all labor and materials necessary for erecting a complete and operational Electrical System, tested and ready for continuous use as described by the Contract Documents. The Electrical System shall be constructed in accordance with the Contract Documents, and Federal, State, and Local codes and regulations. In addition, the Work shall adhere to the following general provisions:

1. The Electrical Contractor shall obtain all necessary permits required by the AHJ. In addition, the Electrical Contractor shall ensure that all inspections required by the AHJ are coordinated, conducted and documented.

2. All work shall be completed in a neat, workmanlike manner in accordance with the latest NEC standards of installation under competent supervision.

3. The Electrical Contractor shall visit the job site prior to bidding to become familiar with existing conditions and other factors, which may affect the execution of the work. Include all related costs in the initial bid proposal.

4. Coordinate work with the utilities providing services on this project. This may include but is not limited to the electric utility, telephone utility, cable TV/Internet utility. All electrical work associated with utilities shall be provided and installed per the utility requirements.

5. All materials shall be new and of the best quality, manufactured in accordance with the requirements listed in part 1.2 of this section. The Contractor shall furnish and install the parts and pieces necessary to the installation of equipment, in accordance with the best practice of the trade, and in conformance with the requirements of these Contract Documents.

6. Protect all electrical material and equipment that is being stored or has been installed against damage by other trades, weather conditions, or any other preventable causes. Equipment damaged during shipping, storage or construction, prior to acceptance by the engineer or the owner, will be rejected as defective.

7. Leave the site clean. Remove all debris, empty cartons, tools, conduit, wire scraps and all miscellaneous spare equipment and materials used in the work during construction. All components shall be free of dust, grit and foreign materials, left as new before final acceptance of work. Damaged paint and finishes shall be touched up or repainted with matching color paint and finish.

8. Electrical equipment shall be capable of operating successfully at full-rated load, without failure, at an ambient air temperature of 40 degrees C, and specifically rated for the altitude indicated on the Plans. Electrical equipment not rated for operation at that temperature shall be provided with air conditioning to meet the manufacturers' operating temperature.

9. If any contradictions, contrasts, non-homogeneity, or inconsistency appears, the most strict criteria noted and the collective requirements in any and all of the Contract Documents shall apply.

10. The Electrical Contractor shall perform necessary saw cutting, core drilling, excavating, removal, shoring, backfilling, and other work required for the proper installation of conduits, whether inside, or outside of the buildings and structures. The Electrical Contractor shall repair and patch where demolition has taken place in a manner to match existing original structure.

B. In order to provide a complete system, oversee and coordinate with all electrical equipment and services being provided outside of Contractor's scope.

1. The Engineer is responsible to ensure that equipment being supplied by others related to the electrical system complies with the requirements of the Contract Documents

2. The Electrical Contractor is responsible to coordinate the installation, commissioning and scheduling of equipment related to the I&C System that are provided by others.

C. Oversee and coordinate with all equipment and services being provided by the Contractor but outside of the Electrical Contractor's scope.

1. Inform all vendors and suppliers providing equipment related to the Electrical System the requirements of Division 26.

2. The Owner is not responsible for any additional costs incurred by requiring vendors and/or subcontractors to meet the requirements of Division 26.

3. If a vendor or supplier is unable to meet the requirements of Division 26, the Contractor may submit in writing to the Engineer the reasons for non-compliance. The Engineer will then evaluate the reasons and determine whether a solution may be determined or if a different vendor or supplier is required.

D. Prepare Electrical System Submittals as required by Division 26 and Section 01 33 00 "Contractor Submittals". Coordinate with the IS and the requirements of Division 40 to ensure that all equipment being supplied by the Electrical Contractor and/or IS has been submitted.

E. Oversee the installation of the Electrical System.

F. Actively participate in loop testing as outlined in Division 40.

G. Actively participate in commissioning as outlined in Division 40.

H. Maintain record drawings.
1. Maintain on the construction site a set of the Electrical Drawings that shall be continuously marked up during construction.
   a. The drawings should be updated at least weekly and will be checked monthly by the Owner's representative.
   b. Upon completion of startup, submit the marked up drawings to the Engineer for review and for drafting.

I. Prepare O&M manuals.
1. Provide O&M manuals in accordance with Section 01 78 23 "Operation and Maintenance Data".

J. Provide training on electrical equipment that has been installed.

1.5 ACTION SUBMITTALS

A. General
   1. Submittals for Division 26 shall meet the requirements of Section 01 33 00 "Contractor Submittals". In addition, the following requirements shall be met:
      a. Submittals shall include bills of materials with quantities, makes, models, exact part numbers and descriptions.
      b. Edit all submittals such that only pertinent information is submitted. Neatly cross out information that does not apply, options that are not being supplied, etc.
      c. Show product dimensions, construction and installation details, wiring diagrams, and specifications.
      d. If there are exceptions to the Contract Drawings and Specifications, provide a list of exceptions with detailed explanations for the exceptions. The Engineer will review the list of exceptions and determine whether a solution may be determined or if the exception(s) will not be allowed.
   2. Furnish submittals required by each Section within Division 26.
   3. When submitting on equipment, use the equipment and instrumentation tags depicted in the Contract Drawings.

B. Recommended Spare Parts Submittal
   1. Submit a list of spare parts for all of the equipment associated with the Electrical System. The list of spare parts shall include list pricing for each item.
   2. Provide the name, address and phone number for each manufacturer and manufacturer's local sales representative.
   3. Indicate whether or not the spare parts are being provided under this contract or not.

1.6 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.7 QUALITY ASSURANCE

A. All equipment supplied for this project shall meet the requirements of the NEC and shall be listed by and bearing the label of the UL.

B. The Electrical Contractor shall be a company that has been actively involved in the installation and commissioning of Electrical Systems for a minimum period of five years.

C. The Electrical Contractor shall have adequate facilities, manpower and technical expertise to perform the Work associated with the Electrical System and as outlined by the Contract Documents.

D. The Electrical Contractor shall have similar project experience of at least four successfully completed projects for a similar wastewater system. The Electrical Contractor company must have performed similar work for these projects as required herein.

PART 2 - PRODUCTS

2.1 MATERIALS AND METHODS

A. Materials, equipment, and parts comprising any unit, or part thereof, specified or indicated on the Plans, shall be new and unused, of current manufacture, and of highest grade consistent with the state of the art. Damaged or dirty materials, equipment, and parts, are not considered to be new and unused, and will not be accepted.

B. Field verification of scale dimensions on Plans is directed, since actual locations, distances, and levels will be governed by actual field conditions. The Contractor shall also review architectural, structural, yard, mechanical, and other Plans, and the accepted electrical and mechanical shop drawings, and shall adjust their work to conform to the conditions indicated therein.

C. The fabricator of major components, such as distribution panelboards, switchgear, and motor control centers, shall also be the manufacturer of the major devices therein. Where possible, the major components shall be manufactured and supplied by the same fabricator.

2.2 MANUFACTURERS

A. All equipment provided for the Electrical System shall be the most recent field-proven models marketed by their manufacturers at the time of submittal of the Shop Drawings unless otherwise required to match existing equipment.

B. Refer to various Division sections for individual equipment manufacturers. Indicated manufacturers are subject to strict compliance with the specifications and complete project documents. The reference to a particular manufacturer does not relieve the Electrical Contractor from conforming to the specified requirements.

C. When providing like electrical components they shall be furnished by a single manufacturer and shall be consistent throughout the project. For example, a 20A 2-way light switch in one building should match a 20A 2-way light switch in another building in both make, model and features.

2.3 EQUIPMENT ASSEMBLIES

A. Equipment assemblies, such as Service Entrance Sections, Switchgear, Switchboards, Control and Distribution Panels, and other custom fabricated electrical enclosures shall bear a UL label as a complete assembly. The UL label on the individual components making up the assembly will not be considered sufficient to meet the present requirement. Whenever a generic UL label does not apply for the assembly, a serialized UL label shall be affixed to the assembly, and the serial number shall be submitted with the assembly record shop drawings.

B. Custom fabricated electrical control panels, and enclosures shall bear a serialized UL label affixed by a local inspector, and the serial number shall be submitted with the assembly record shop drawings.

2.4 OPERATING CONDITIONS

A. The Electrical System shall be designed and constructed for satisfactory operation and long, low maintenance service under the following conditions:
   1. Environment: Type the type of facility this is for such as “Wastewater Treatment Plant”.
   2. Temperature Extremes: -4°F to 104 °F (Outdoors); 40°F to 104 °F (Indoors).
   3. Relative Humidity: 20% to 90%, non-condensing.

B. Indoor and outdoor electrical equipment shall be suitable for operation in the ambient conditions associated with the locations designated in the Contract Documents. Heating, cooling, and dehumidifying devices shall be provided in order to maintain electrical devices 20 percent within the minimums and maximums of their rated environmental operating ranges. The Contractor shall provide power wiring for these devices. Enclosures suitable for the environment shall be furnished. Electrical equipment in hazardous areas shall be suitable for and rated for use in the particular hazardous or classified location in which it is to be installed.

2.5 SEISMIC RESTRAINT

A. The construction area is classified by the International Building Code (IBC) as Seismic Class C. The Code requires that not only the structures, but also major electrical components be designed and installed in a manner which will preclude damage during a seismic event. All electrical equipment shall be securely anchored and seismic braced in accordance with regulations contained in the most recent adopted edition of the IBC, and the Sheet Metal and Air Conditioning Contractor’s National Association (SMACNA) "Guidelines for Seismic Restraints of Electrical Systems".

B. Units mounted and secured directly to structure shall be provided with connectors of sufficient strength to meet the restraining criteria.

C. All electrical equipment which is securely anchored (hard mounted) to the building or structure shall have supports designed to withstand lateral and vertical "G" loadings equal to or greater than IBC requirements and SMACNA guidelines.

D. Shop drawings are required for all equipment anchors, supports and seismic restraints. Submittals shall include weights, dimensions, load/deflection data, center of gravity, standard connections, manufacturer's recommendations, and behavior problems (vibration, thermal, expansion, etc.) associated with equipment.

2.6 SPECIAL TOOLS

A. The Electrical Contractor shall furnish a priced list of special tools required to maintain the electrical equipment provided. The Owner and Engineer will select which tools are to be purchased and the IS will supply them at the prices listed.

B. Special tools shall be delivered to the Owner before startup commences.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

A. After completion of shop assembly, factory test, and approval, equipment, cabinets, panels, and consoles shall be packed in protective crates and enclosed in heavy duty polyethylene envelopes or secured sheeting to provide complete protection from damage, dust, and moisture. Dehumidifiers shall be placed inside the polyethylene coverings. The equipment shall then be skid-mounted for final transport. Lifting rings shall be provided for moving without removing protective covering. Boxed weight shall be shown on shipping tags together with instructions for unloading, transporting, storing, and handling at the Site.

B. Special instructions for proper field handling, storage, and installation required by the manufacturer shall be securely attached to each piece of equipment prior to packaging and shipment.

C. Each component shall be tagged to identify its location, instrument tag number, and function in the system. A permanent stainless steel or other non-corrosive material tag firmly attached and permanently and indelibly marked with the instrument tag number, as given in the tabulation, shall be provided on each piece of equipment in the PCIS. Identification shall be prominently displayed on the outside of the package.

D. Equipment shall not be stored outdoors. Equipment shall be stored in dry permanent shelters, including in-line equipment, and shall be adequately protected against mechanical injury. If any apparatus has been damaged, such damage shall be repaired by the Contractor. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through tests as directed by the Engineer. If such tests reveal defects, the equipment shall be replaced.

3.2 MANUFACTURER'S SERVICES

A. Manufacturer's services shall be furnished for the following equipment:
   1. Vendor supplied equipment that contain programmable controllers, operator interfaces and/or instrumentation that requires site calibration.
   2. Equipment that is equipped with VFD's
   3. Electrical generation equipment

3.3 INSTALLATION

A. The Electrical System indicated throughout the design is diagrammatic and therefore locations of equipment are approximate. The exact locations and routing of wiring and cables shall be governed by structural conditions and physical interferences and by the location of electrical terminations on equipment. Equipment shall be located and installed so that it will be readily accessible for operation and maintenance. Installation of systems and equipment is subject to clarification as indicated in reviewed shop drawings and field coordination. Where job conditions require reasonable changes in approximated locations and arrangements, or when the Owner exercises the right to require changes in location of equipment which do not impact material quantities or cause material rework, the Contractor shall make such changes without additional cost to the Owner.

B. Discrepancies indicated on different Plans, between Plans and actual field conditions, or between Plans and Contract Documents shall be promptly brought to the attention of the Engineer for clarification, prior to purchasing and installing equipment.

C. The alignment of equipment and conduit shall be adjusted to accommodate architectural changes, or to avoid work of other trades, without extra expense to the Owner.

D. Items not specifically mentioned in these Contract Documents, or noted on the Plans, or indicated on reviewed shop drawings, but which are obviously necessary to make a complete working installation, shall be deemed to be included herein.

E. The Electrical Contractor shall layout and install electrical work prior to placing floors and walls. Furnish and install sleeves and openings through floors and walls, required for installation of conduits. Sleeves shall be rigidly supported and suitably packed, or sealed, to prevent ingress of wet concrete. Spacers shall be installed in order to prevent conduit movement. Dimensions indicated for electrical equipment and their installation are restrictive dimensions.

F. The Electrical Contractor shall furnish and install inserts and hangers required to support conduits and other electrical equipment. If the inserts, hangers, sleeves, or other mounting hardware are improperly placed, or installed, the Contractor shall do necessary work, at their own expense, to rectify the errors.

G. The Electrical System is integrally connected to I&C, mechanical and structural systems. Coordinate with these other disciplines the installation of these related components.

H. Electrical equipment shall be anchored by methods that comply with seismic requirements applicable to the Site.

I. The Contract Documents show necessary conduit and instruments required to make a complete instrumentation system. The Contractor shall be responsible for providing any additional or different type connections as required by the instruments and specific installation requirements. Such additions and such changes, including the proposed method of installation, shall be submitted to the Engineer for approval prior to commencing that Work. Such changes shall not be a basis of claims for extra Work or delay.

J. Instrumentation, control panels, wiring and all other I&C equipment shall be properly tagged and/or labeled per the requirements of Section 26 05 53 “Identification for Electrical Systems”.

K. Installation of the I&C System shall be according to the finalized Loop Drawings

3.4 MOTOR CONTROL TEST (MCT)

A. The MCT shall consist of a test of all networked power and motor control devices (MCC’s, VFD’s, etc.) in the factory environment. The MCT shall be conducted at a facility within 200 driving miles of the project site.

B. The Contractor shall assemble at the test site, for this test, the following:
   1. All networked VFD’s and associated switches.
   2. All networked MCC’s and associated switches.

3. All PLC's which are to communicate with the devices above.
4. Any other networked devices.

C. Provide electric power, networking, and provisions for the Owner's Programmer to connect a temporary SCADA server to the networked devices.

D. The test can be combined with the FAT's specified in Section 409000, or run independently. If need be for construction sequencing or schedule considerations, the PLC's for the MCT may consist of control panel backpanels including the PLC's, and the control panel enclosures can be shipped to the site.

E. In advance of the MCT, each manufacturer shall provide a complete list of available registers/signal interfaces and recommended means of effecting basic monitoring and control. Coordinate among vendors, with the IS, and with the Owner's Programmer, and cooperate in configuring all devices prior to testing.

F. As a formal submittal prior to the MCT, submit details of the location, the intended interconnection. Provide test procedures/checkoffs which will demonstrate that all networked interfaces function as intended.

G. Allow the following for the MCT.
1. Contractor setup: As required.
2. Programmer advance setup connection: 1 day.
3. MCT: 3 days.
4. Corrections: As required.

3.5 FACTORY ACCEPTANCE TESTING (FAT)

A. The IS shall arrange for the manufacturers of the equipment and fabricators of panels and cabinets supplied under this Section to allow the Engineer and Owner to inspect and witness the testing of the equipment at the site of fabrication. Equipment shall include the cabinets, special control systems, and other pertinent systems and devices. A minimum of 10 days notification shall be furnished to the Engineer prior to testing. No shipments shall be made without the Engineer's approval.

B. For each FAT, the IS shall develop and submit a FAT Plan and Procedure Document within 10 days of the FAT. The FAT Plan and Procedure shall as a minimum shall have the following:
1. Descriptions of test methods to be performed during the FAT.
2. FAT Schedule and Procedure
3. FAT Checklists that allow for sign-off and comments for each test method and procedure.

C. Control Panel Completion Test Methods: The following test methods should be performed during the FAT for each control panel:
1. Completed Shop Drawings: Demonstrate that the control panel has been built according to the shop drawings and that the shop drawings are accurate.
2. Panel Layout: Demonstrate that the control panel has been laid out as designed and as required by Division 40.
3. Power Distribution: Demonstrate all power distribution circuits, including but not limited to AC power circuits, UPS operation, signals and circuits and DC circuits.

4. Control Circuits: Demonstrate the correct installation of each control circuit. Using a signal generator or multi-meter, show the correct operation of each input, output, relay, barrier, buttons, switches, or any other control device. Demonstrate the proper functionality of any hard-wired interlocks that may be associated with each control circuit.
5. Panel Networking/Communications: If any form of communications is associated with the control panel, verify the proper operation of each communication port and link.

D. Control Loop Test Methods: In order to demonstrate that the control panel will provide its function as intended, provide the following control loop test methods. If programming for the control panel is provided by others, coordinate with the programmer to have all programming completed and tested prior to the FAT. If needed, coordinate to have the programmer present for the FAT.
1. Alarm Functions: Verify and/or simulate each alarm condition associated with each control loop.
2. Local Manual and Auto Functions: Verify and/or simulate each Local Manual and/or Auto function associated with each control loop.
3. SCADA Manual and Auto Functions: Verify and/or simulate each SCADA Manual and/or Auto function associated with each control loop.
4. Control Loop Interlocks: Demonstrate the functionality of any software interlocks that may be associated with each control loop.

E. If the FAT does not pass and needs to be repeated, the IS shall be responsible for additional per diem costs incurred by the Engineer and Owner.

F. All changes and/or corrections made during the FAT shall be noted on the checklists.

G. Following completion and approval of all FAT, provide the finalized checklists to the Engineer and as part of the equipment shop drawings.

3.6 FIELD QUALITY CONTROL

A. Allow for inspections by the Engineer and/or Owner of the I&C System at any time during the construction. Inspections shall be conducted to verify that the installation is per the requirements of the Contract Documents.

3.7 CALIBRATION

A. As specified in Section 40 80 00 “Commissioning of Process Systems”.

3.8 LOOP TESTING

A. As specified in Section 40 80 00 “Commissioning of Process Systems”.

3.9 COMMISSIONING

A. As specified in Section 40 80 00 “Commissioning of Process Systems”.

3.10 TRAINING

A. Provide training in accordance with Section 26 00 00 “General Electrical Requirements”.

B. Develop a Training Plan for the training requirements of Division 40 and submit it to the Engineer for approval. Coordinate with the Engineer and Owner the time and locations of each training session. Schedule the trainings for after the equipment has been pre-commissioned.

C. As part of the Training Plan, submit a résumé for each individual to be providing training. Training shall be performed by qualified representatives of the equipment manufacturers and shall be specific to each piece of equipment.

D. Each training session shall include a written agenda.

E. The Contractor shall train the Owner’s personnel on the maintenance, calibration and repair of instruments provided.

F. Within 10 days after the completion of each session, the Contractor shall submit the following:
   1. A list of Owner personnel who attended the training.
   2. A copy of the training materials used during the session with notes, diagrams and comments.

END OF SECTION 26 00 00

Attachment C

New Section 312319 – Drilled Concrete Piers (Volume 3B)

SECTION 316329 – DRILLED CONCRETE PIRS AND SHAFTS

PART 1 - GENERAL

1.1 SUMMARY

A. SCOPE OF WORK

1. The Drilling Contractor shall furnish all labor, materials, services, equipment (including temporary casings and/or dewatering where required), and shall install all piers at the locations and depths shown on the drawings or as otherwise directed by the Owner's Geotechnical Engineer. Installation methods compatible with the design may be used if acceptable to the Owner's Geotechnical Engineer. Methods that are not compatible with the design shall be excluded from consideration.

2. The Drilling Contractor shall furnish and place all reinforcing steel, dowels, and anchor bolts that are shown on the drawings to be embedded in the pier.

3. The Drilling Contractor shall furnish all materials and labor as required to perform the load tests as specified herein and on the drawings.

4. The General Contractor shall provide all necessary excavation, sheeting and bracing or other adequate maintenance of excavation banks, suitable runways and ramps as necessary for access of pier drilling, control of ground and surface water as necessary to keep the work area sufficiently dry, suitable access roads for movement of equipment and materials to and from pier locations, field layout required for pier work including setting and maintaining a location stake for each pier and giving cut-off grades on all piers, removal and replacement of all overhead and underground obstructions as required, and coordination of all concrete ordering and delivery.

B. RELATED DOCUMENTS:

1. Design drawings and general provisions of Contract, including general and supplementary conditions.
2. Geotechnical Reports (Section 319000) and Earth Moving (Section 312000) specifications.
3. Section 032000 – Reinforcement Steel
4. Section 033000 – Cast-in-Place Concrete

C. DEFINITIONS:

1. Casing: Steel cylinder used to resist earth and water pressures, to serve as concrete form, and to protect personnel.
2. Dry Method: A method of pier installation in which concrete is placed in the dry. Casing may or may not be used to maintain sidewall stability.
3. Owner's Representative: The Engineer, or Geotechnical Engineer authorized to act on behalf of the Owner.

4. Owner's Representative - Geotechnical Engineer: The Geotechnical Engineer or other 3rd party inspector specifically authorized to carry out the responsibilities defined in this specification.
5. Probe hole: A 1.6 to 2.5 inch diameter hole usually drilled by air percussion methods to a required depth below the pier bottom. The Geotechnical Engineer feels the probe hole by lowering and raising a hooked rod. The size and amount of seams found enables the determination of the soundness of the subsurface formation.
6. Slurry Displacement Method: Method of drilling and concreting in which controlled slurry consisting of water, with or without additives such as bentonite, attapulgite, or polymer, is used to stabilize the hole. The slurry may be used either to maintain the stability of the uncased drilled pier hole or to allow concrete placement when water seepage into a drilled pier hole is too severe to permit concreting in the dry or both.
7. Tremie method: Procedure for placing concrete under water or slurry using a watertight steel pipe or tube to place concrete without washing out cement fines.

1.2 STANDARDS

A. The following Standards are listed in this specification:
1. ASTM A36 Standard Specification for Carbon Structural Steel
2. ASTM A283 Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
3. ASTM A929 Standard Specification for Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe
4. ASTM C33 Standard Specification for Concrete Aggregates
5. ASTM C94 Specification for Ready Mixed Concrete
6. ASTM C150 Specification for Portland Cement
7. ASTM D1143 Standard Test Method for Piles Under Static Axial Compressive Load
8. ASTM D4380 Standard Test Method for Density of Bentonitic Slurries
9. ASTM D4381 Standard Test Method for Sand Content by Volume of Bentonitic Slurries
10. ASTM D4972 Standard Test Method for pH of Soils

1.3 UNIT PRICES

A. Drilled Piers: Actual net volume of drilled piers in place and approved. Actual length, shaft diameter, and bell diameter if applicable, may vary, to coincide with elevations where satisfactory bearing strata are encountered. These dimensions may also vary with actual bearing value of bearing strata determined by an independent testing and inspecting agency. Adjustments are made on net variation of total quantities, based on design dimensions for shafts and bells.

1. Base bids on indicated number of drilled piers and, for each pier, the design length from top elevation to bottom of shaft, extended through the bell, if applicable, and the diameter of shaft and bell.
2. Unit prices include labor, materials, tools, equipment, and incidentals required for excavation, trimming, shoring, casings, dewatering, reinforcement, concrete fill, testing and inspecting, and other items for complete drilled-pier installation.

B. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed outside dimensions of drilled piers cast against rock. Unit prices for rock excavation include replacement with approved materials.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at the project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture.

C. Shop Drawings: For concrete reinforcement.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Material certificates.

C. Material test reports.

D. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Record drawings.

1.8 QUALITY ASSURANCE

A. Concrete Standards:

1. ACI 301 - "Specifications for Structural Concrete for Buildings".
2. ACI 117 - “Specifications for Tolerances for Concrete Construction and Materials."
3. ACI 318 - "Building Code Requirements for Reinforced Concrete".
4. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice".

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."

C. Qualifications: Drilled piers shall be installed by a specialty Drilling Contractor with suitable equipment, competent personnel, and a reputation of satisfactorily performing the work. The

Contractor shall have a minimum of 5 years successful experience and a minimum of 5 successful installations on projects of a similar size and scope to this project and of using similar installation methods as may be anticipated for this project. Evidence of compliance with this section shall be submitted to the Engineer prior to entering into a contract for the work.

1.9 FIELD CONDITIONS

A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from this data.

1. Make additional test borings and conduct other exploratory operations necessary for drilled piers.
2. The geotechnical report is included as Section 319000 (Volume 3B) of the design documents.

B. Survey Work: Engage a qualified land surveyor or professional engineer to perform surveys, layouts, and measurements for drilled piers. Before excavating, lay out each drilled pier to lines and levels required. Record actual measurements of each drilled pier's location, shaft diameter, bottom and top elevations, deviations from specified tolerances, and other specified data.

1. Record and maintain information pertinent to each drilled pier and indicate on record Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Drilled-Pier Standard: ACI 336.1 except as modified in this Section.

2.2 STEEL REINFORCEMENT

A. Reference Section 032000 Reinforcement Steel.

2.3 CONCRETE MATERIALS

A. Refer to the requirements in Section 033000 for general cast-in-place concrete requirements. The following exceptions/modifications are made to these requirements:
1. The 28-day compressive strength (f'c) for caisson piers shall be **TYPE V cement with 6000 psi** with 9-inch maximum slump. Concrete for caissons is also subject to the following modifications:
- The maximum aggregate size shall be ¾" with fine aggregate content ranging between 45 and 55% by volume of the total aggregate.

- Concrete slump for caissons utilizing a tremie shall be between 7" and 9"maximum.
- Entrained air content shall not exceed 5%.
- Pozzolan (fly ash) shall be 12% maximum of the cementitious material weight.
- Maximum water to cement ratio plus pozzolan is 0.45.
- Use of water-reducing/retarding admixtures is acceptable.
- Use of superplasticizers is **not** permitted.

2. The 28-day compressive strength (f'c) for the slab, grade beams, and walls (i.e. all structural concrete above the caisson) shall be **5,000 psi** with 4-inch maximum slump and ¾" maximum aggregate.
3. Concrete free fall is not permitted. Caisson concrete shall be placed form bottom of hole with tremie. In wet installation conditions, tremie shall be moved gradually to avoid breaching the concrete.
4. All caisson concrete placement under wet conditions shall be installed with a tremie pipe (West shaft construction process) and shall be still be subject to non-destructive testing as described below.
5. See testing requirements below for additional requirements.
6. Limit water-soluble, chloride-ion content in hardened concrete to **0.15** percent by weight of cement.
7. Continuous special inspection is required during concrete placement for all caissons.

2.4 STEEL CASINGS

A. Steel Pipe Casings: ASTM A283/A283M, Grade C, or ASTM A36/A36M, carbon-steel plate, with joints full-penetration welded according to AWS D1.1/D1.1M.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Unclassified Excavation: Excavate to bearing elevations regardless of character of surface and subsurface conditions encountered.

B. Classified Excavation: Excavation is classified as standard excavation, special excavation, and obstruction removal and includes excavation to bearing elevations as follows:

1. Standard excavation includes excavation accomplished with conventional augers fitted with soil or rock teeth, drilling buckets, or underreaming tools attached to drilling equipment of size, power, torque, and downthrust necessary for the Work.
2. Special excavation includes excavation that requires special equipment or procedures where drilled-pier excavation equipment used in standard excavation, operating at maximum power, torque, and downthrust, cannot advance the shaft.
3. Obstructions: Payment for removing unanticipated boulders, concrete, masonry, or other subsurface obstructions that cannot be removed by conventional augers fitted with soil or rock teeth, drilling buckets, or underreaming tools attached to drilling equipment of size,

power, torque, and downthrust necessary for the Work is according to Contract provisions for changes in the Work.

C. Excavate shafts for drilled piers to indicated elevations. Remove loose material from bottom of excavation.

D. Notify and allow testing and inspecting agency to test and inspect bottom of excavation. If unsuitable bearing stratum is encountered, make adjustments to drilled piers as determined by Engineer or Geotechnical Engineer.

1. Do not excavate shafts deeper than elevations indicated unless approved by Engineer or Geotechnical Engineer.
2. Payment for additional authorized excavation is according to Contract provisions for changes in the Work.

E. End-Bearing Drilled Piers: Probe with auger to a depth below bearing elevation, equal to diameter of the bearing area of drilled pier. Determine whether voids, clay seams, or solution channels exist.

F. Temporary Casings: Install watertight steel casings of sufficient length and thickness to prevent water seepage into shaft; to withstand compressive, displacement, and withdrawal stresses; and to maintain stability of shaft walls.

1. Remove temporary casings, maintained in plumb position, during concrete placement and before initial set of concrete.

G. Bells: Excavate bells for drilled piers to shape, base thickness, and slope angle indicated. Excavate bottom of bells to level plane and remove loose material before placing concrete.

H. Tolerances: Construct drilled piers to remain within ACI 336.1 tolerances.

3.2 INSTALLATION

A. Install steel casings of minimum wall thickness indicated and of diameter not less than diameter of drilled pier. Implement methods as necessary to ensure that rebar cages are properly placed in the shaft, allowing for proper clearance and concrete coverage as required in the design drawings.

B. Comply with recommendations in CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

C. Place concrete in continuous operation and without segregation immediately after inspection and approval of shaft by the Owner's 3rd party Inspector (or Geotechnical Engineer).

D. Place concrete to fall vertically down the center of drilled pier without striking sides of shaft or steel reinforcement.

E. Coordinate withdrawal of temporary casings with concrete placement to maintain at least a 60-inch head of concrete above bottom of casing. Vibrate top 60 inches of concrete after withdrawal of temporary casing.

3.3 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Drilled piers.
2. Excavation.
3. Concrete.
4. Steel reinforcement welding.
5. Post-installation (non-destructive) performance/strength verification.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Drilled-Pier Tests and Inspections: For each drilled pier, before concrete placement.

1. Soil Testing: Bottom elevations, bearing capacities, and lengths of drilled piers indicated have been estimated from available soil data. Actual elevations and drilled-pier lengths and bearing capacities are determined by testing and inspecting agency. Final evaluations and approval of data are determined by Engineer.

2. Ensure proper placement of reinforcement steel cage in the opening.

3. Allow for inspection of the rebar and boring condition, including verification that the bottom of the drilled excavation is clean, free from debris, and located in suitable material.

D. Concrete Tests and Inspections:

1. Each set of testing cylinders shall consist of **four (4)** cylinders. The first cylinder shall under testing at 3-days, with the second cylinder tested at 7 days. Testing of cylinders shall continue until the concrete has proven to meet the minimum required compressive strength.

2. Every fourth pier, representing 25% of all installed caisson piers, shall be equipped with the devices and equipment and preparation necessary to conduct Cross-Hole Sonic Logging (CSL) (or similar) non-destructive testing to verify the installation quality and completeness. Testing method shall be presented to Owner and its Engineer/Special Inspector prior to caisson installation for review and approval. Testing materials and methods should be implemented to mitigate and minimize the potential for interference with results. Results of this testing and onsite observation/inspections shall be used to verify the strength and quality of the pier foundation installation. ‘

E. Corrective Measure: Should testing as described above) or other observation indicate that certain aspects of the foundation installation are inadequate or will otherwise not performed as required by the structural design, Contractor shall discuss and coordinate corrective measures

with Owner and Owner's Engineer. Any deficiency that is caused by faulty materials or installation must be corrected as determined by Owner and its representatives.

3.4 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 316329

Attachment D

Revised Section 409000 – Instrumentation Control for Process Systems (Volume 3B)

SECTION 409000 – INSTRUMENTATION AND CONTROL FOR PROCESS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. General requirements which apply to all Instrumentation and Control for Process Systems (hereafter referred to as I&C).

B. Related Sections

1. The Contract Documents are a single integrated document. As such, all Divisions and Sections are applicable. The Contractor and its Subcontractors are responsible to review all parts of the Contract Documents in order to provide a complete and coordinated project.

C. Complete I&C System

1. The requirements for the I&C System shall be the responsibility of a single company hereafter referred to as the Instrumentation Supplier (IS). The IS shall be responsible for all parts of this Section and Sub-Sections as well as all other related sections that may pertain to the I&C System.
2. The Contractor, through the IS and qualified electrical and mechanical installers, shall be responsible to the Owner for the implementation of a complete I&C System. The IS shall provide all necessary coordination, material and labor such that the entire system be complete and functional. This includes but is not limited to the proper operation and monitoring of electrical power systems, process systems, mechanical equipment, instrumentation, control panels, programmable controllers, communications/networking, and SCADA system.
3. The overall I&C system design is based upon non-certified information that has been furnished by various equipment manufacturers and vendors. It is the Contractor's responsibility to include in the bid and installation all labor and material to provide a complete system based upon actual information from equipment being supplied for the project. Any changes or additions due to non-certified manufacturer or vendor information shall be provided at no additional cost to the Owner.

1.2 REFERENCES

A. The installation and commissioning of the I&C System shall conform to all applicable codes, regulations, standards and specifications, including, but not limited to those listed below. These publications are referenced to by designation but not by edition. The latest edition accepted by the Authority Having Jurisdiction in effect at the time of bid shall govern.

1. State and Local Codes and Authority Having Jurisdiction (AHJ)
2. American National Standards Institute (ANSI)

3. American Petroleum Institute (API)
4. Federal Communications Commission (FCC)
5. Federal Occupational Safety and Health Act (OSHA)
6. International Society of Automation (ISA)
7. Institute of Electrical and Electronic Engineers (IEEE)
8. National Electric Code (NEC).
9. National Electrical Manufacturers Association (NEMA)
10. National Fire Protection Association (NFPA)
11. Underwriters Laboratories, Inc. (UL)

1.3 DEFINITIONS

A. The following definitions may be used throughout this section and subsections (refer to the contract drawings sheet GI-1 for instrumentation abbreviations):

1. CTC: Communications termination cabinet.
2. FAT: Factory acceptance test.
3. HMI: Human machine interface.
4. I&C: Instrumentation and control for process systems
5. IS: Instrumentation supplier.
6. LAN: Local area network.
7. LCP: Local control panel.
8. NC: Normally closed.
9. NO: Normally open.
10. OIT: Operator interface terminal.
11. OSI: Owner's System Integrator.
12. PC: Personal computer.
13. PID: Control action, proportional plus integral plus derivative.
14. PLC: Programmable logic controller.
15. P&ID: Process and instrumentation diagram
16. RIO: Remote input/output
17. SCADA: Supervisory control and data acquisition.
18. UPS: Uninterruptible power supply.
19. VCP: Vendor control panel.
20. WAN: Wide area network

1.4 I&C SYSTEM REQUIREMENTS

A. Work provided outside of Contractor's scope:
   1. The following equipment is being furnished by the Owner:
      a. No Owner furnished equipment.
   2. The following equipment is being furnished by others under separate contract(s):
      a. See Volume 3, Appendix A, Owner Selected Equipment.
   3. All PLC equipment being supplied by the IS is to be programmed by the Owner's Programmer.
      a. All PLC equipment not specified in Volume 3, Appendix A, Owner Selected Equipment is being supplied by the IS, to be programmed by the Owner's Programmer.

4. All HMI equipment being supplied by the IS is to be programmed by the Owner's Programmer.
5. All PLC and OIT Owner-selected equipment specified in Volume 3, Appendix A, shall be programmed by the equipment manufacturer. Those manufacturers shall provide complete control strategies, tag/register lists, and participate in all aspects of network system integration.

B. The Work is to provide a complete and operational I&C System as described by the Contract Documents. This includes but is not limited to the following:

1. Before providing a bid as the IS, coordinate with all bidders such that all costs associated with a complete I&C System are accounted for. The Owner shall not be responsible for any additional costs for scope items that have been excluded from the bid as a result of not coordinating with all bidders.

2. The IS shall submit a statement of qualifications verifying that it meets the requirements of 409000.1.8. The IS must be approved by the Engineer before proceeding with the Work.

3. In order to provide a complete system, oversee and coordinate with all equipment and services being provided outside of Contractor's scope.
   a. The Engineer is responsible to ensure that equipment being supplied by others related to the I&C System complies with the requirements of the Contract Documents
   b. The Contractor and IS are responsible to coordinate the installation, commissioning and scheduling of equipment related to the I&C System that are provided by others.

4. Oversee and coordinate with all equipment and services being provided by the Contractor but outside of the IS's scope.
   a. Inform all vendors and suppliers providing equipment related to the I&C System the requirements of Division 40.
   b. The Owner is not responsible for any additional costs incurred by requiring vendors and/or subcontractors to meet the requirements of Division 40.
   c. If a vendor or supplier is unable to meet the requirements of Division 40, the Contractor may submit in writing to the Engineer the reasons for non-compliance. The Engineer will then evaluate the reasons and determine whether a solution may be determined or if a different vendor or supplier is required.
   d. The Contractor and IS are responsible for coordinating with vendors and suppliers the FAT, installation, commissioning, calibration and scheduling for the associated I&C equipment.
   e. The IS is responsible to insure that panel and loop drawings be supplied for vendor and subcontractor equipment. If the vendors and/or subcontractors are preparing the panel and/or loop drawings, they shall comply with the requirements of Division 40 and shall match those provided by the IS.

5. The IS shall conduct a Pre-Submittal Conference before producing any submittals. The conference should include all parties involved with the I&C System including Contractor Representatives, the Engineer, Package System PLC Vendors, Owner, and Owner's Programmer. The purpose of the conference shall be to review the project as a whole,

make sure all parties understand their roles and responsibilities and to review submittal and coordination requirements.

6. Prepare I&C System Submittals which includes the following:
   a. Instrumentation hardware submittal (including TR20 forms).
   b. Control panels design and submittal.
   c. Loop drawings design and submittal.
   d. Recommended spare parts submittal.
   e. PLC tag list submittal for Owner selected equipment (programmed by the equipment manufacturer)
   f. HMI tag list submittal for Owner selected equipment (programmed by the equipment manufacturer)

7. Following submittal approvals, do the following:
   a. Procure all instrumentation hardware and accessories.
   b. Procure hardware for and fabricate all control panels being provided.
   c. Perform FAT's for all control panels being provided.

8. Programming and integration shall be supplied by the OSI. Oversee and coordinate the programming and integration with the OSI for a complete I&C System.

9. Oversee the installation of the I&C System.

10. Perform bench and field calibrations of instruments as required.

11. Oversee and document loop testing.

12. Oversee and document commissioning.

13. Maintain record drawings.
   a. Maintain on the construction site a set of the Instrumentation Drawings that shall be continuously marked up during construction.
   b. The drawings should be updated at least weekly and will be checked monthly by the Owner's representative.
   c. Upon completion of startup, submit the marked up drawings to the Engineer for review and for drafting.

14. Prepare O&M manuals.
   a. Provide O&M manuals in accordance with Section 017823.
   b. Prepare an O&M manual for each major process area or building. Each of these manuals shall be divided into the following categories:
      1) Table of Contents/Index.
      2) Process & Instrumentation Diagrams
      3) Control Panel Record Drawings, Bill of Materials and Design Data.
      4) Record Loop Drawings
   c. Prepare O&M manuals that cover comprehensive information for the I&C System. These manuals shall include the following:
      1) Table of Contents/Index.
      2) Finalized Instrument Summary
      3) Finalized TR20 Instrument Forms
      4) Instrumentation Installation Details

5) Instrument Operational Manuals
6) Recommended Spare Parts List and sources.

15. Provide training.

1.5 ACTION SUBMITTALS

A. General
1. Submittals for Division 40 shall meet the requirements of Section 013300 Contractor Submittals. In addition, the following requirements shall be met:
   a. Submittals shall include bills of materials with quantities, makes, models, exact part numbers and descriptions.
   b. Edit all submittals such that only pertinent information is submitted. Neatly cross out information that does not apply, options that are not being supplied, etc.
   c. Show product dimensions, construction and installation details, wiring diagrams, and specifications.
   d. If there are exceptions to the Contract Drawings and Specifications, provide a list of exceptions with detailed explanations for the exceptions. The Engineer will review the list of exceptions and determine whether a solution may be determined or if the exception(s) will not be allowed.
2. Furnish submittal required by each Section within Division 40.
3. When submitting on equipment, use the equipment and instrumentation tags depicted in the Contract Drawings.

B. Instrumentation hardware submittal
1. Provide a comprehensive submittal that includes all instrumentation being supplied by the IS. Divide the submittal into the following:
   a. Table of Contents/Index.
   b. Instrument summary.
   c. Instrument TR20 Forms.
   d. Instrument Cut Sheets.
   e. Instrument Installation Drawings.
2. Provide an instrument summary (sorted by tag number) that has the following information:
   a. Tag number.
   b. Make, model and description.
   c. Associated process.
   d. Location.
   e. Calibrated range.
   f. Referenced loop drawing number and P&ID.
   g. Associated PLC.
3. Furnish TR20 instrumentation forms for each instrument using the forms outlined in ISA-TR20.00.01-2007. This requirement includes all instruments that are being installed as part of the project, whether they are Contractor, Owner and/or Vendor supplied. Show on each sheet who is the responsible party for supplying the instrument. The TR20 sheets should be provided electronically in Microsoft Word or Excel as well.
4. Provide instrument cut sheets for each instrument make and model being supplied for the project. Each cut sheet should have a list of instrument tag numbers that pertain to that particular cut sheet. The cut sheets should have enough information to verify that the instrument conforms to the Contract Drawings and Specifications.

5. Instrument installation drawings
    a. Provide instrument installation drawings for each make and model of instrument being supplied.
    b. Delineate what is being supplied by the IS and what is being supplied by other installers.
    c. Show overall dimensions, mounting locations and elevations.
    d. Show all cabling, conduit and piping locations.
    e. Show the ambient conditions of the location where the instrument is being installed which includes ambient temperature and humidity extremes, whether or not the atmosphere is corrosive and the area classification.
    f. Show mounting requirements, brackets, stands and anchoring.
    g. Show means for sun protection where required.

C. Control panels submittal
1. Provide a comprehensive submittal that includes all control panels supplied by the IS. The submittal should show that the panels are in conformance with the requirements of Section 409513. Divide the submittal into the following:
    a. Table of Contents/Index.
    b. Panel Bill of Materials and Design Data.
    c. Panel Shop Drawings.
    d. Panel Hardware Cut Sheets.
2. The Panel Bill of Materials and Design Data shall include the following:
    a. Each panel will have its own Bill of Materials and Design Data information presented in association with the panel drawings. The Bill of Materials shall include all hardware inside or on the enclosure. The design data will include UPS and/or battery load calculations to show that the UPS is sized appropriately for load and for backup time. The design data will show panel weight, materials and finishes. HVAC design data shall be shown. Seismic criteria shall be shown if required by the Contract Documents.
3. Panel Shop Drawings:
    a. Each control panel shall be designed to perform its function(s) as shown in the Contract Drawings. The control panel designs shall take into account information shown throughout the Contract Drawings and Specifications.
    b. Show every internal wire and connection diagrammatically. Show all interfaces between the control panel and external equipment to be connected for power, controls, signal, communications, etc.
    c. All shop drawings shall include a title block with the name of the firm designing the control panels. The title block shall also include project information, Owner information and/or logo, drawing number and description, revision fields and date.
    d. All shop drawings shall be developed utilizing AutoCAD version 2008 or later. All shop drawings should be submitted in PDF and AutoCAD formats and as required by Section 013300.
    e. Panel layout drawing(s):
        1) Each control panel shall have shop drawing(s) which depict the front, back, sides and top/bottom of the panel. This includes showing any hardware mounted on the inside or outside of the panel.
        2) Layout drawings should include subpanel and swing-out panel layouts.
        3) Layout drawings should show locations of panel penetrations for cutouts, conduit entry and/or access plates.
        4) Layout drawings should show all of the components and provide a reference to the bill of materials.

5) Show the elevations of door devices from the finished floor.

f. AC and/or DC power distribution diagrams:
   1) Each panel shall show power distribution schematics that show how the panel receives power and feeds all of its internal loads as well as associated external loads.

g. Communications and/or Network diagrams:
   1) For panels that utilize any means of communications both internally and externally, provide a diagram depicting each communication connection.

h. Input/Output and/or Internal wiring diagrams

i. Terminal block diagrams

4. Provide panel hardware cut sheets for each make and model of equipment being supplied for the project. The cut sheets should have enough information to verify that the equipment conforms to the Contract Drawings and Specifications.

D. Loop Drawings Submittal

1. Provide a comprehensive submittal that includes loop drawings for every control loop on the project. This includes but is not limited to all loops shown on the P&ID's, all loops associated with auxiliary inputs/outputs not shown on the P&ID's (e.g. UPS status information).
2. Loop drawings may only be finalized after all control panels, MCC's and other electrical submittals, and instrumentation submittals have been approved. Obtain all of the required information from each of these submittals to properly show the wiring of each control loop. The loop drawings shall not be submitted with incomplete information due to the lack of obtaining the appropriate information for each loop.
3. The loop drawings shall designed for and printed to 11x17 size paper. Divide the submittal into the following:
   a. Laminated Cover and Back and Spiral Binding.
   b. Table of Contents/Index (by loop number).
   c. Loop Drawings.
4. Loop Drawings Requirements:
   a. All loop drawings shall include a title block with the name of the firm designing the loop drawings. The title block shall also include project information, Owner information and/or logo, drawing number and description, revision fields and date.
   b. All loop drawings shall be developed utilizing AutoCAD version 2008 or later. All loop drawings should be submitted in PDF and AutoCAD formats and as required by Section 013300.
   c. Each loop drawing shall have a look and feel that follows that of the example loop drawing shown in the Contract Drawings.
   d. Each loop drawing should have the following as a minimum:
      1) Six area divisions, from left to right which are:
         a) Field/Process Area (this area will show field and process equipment).
         b) Junction Boxes (this area will show any field junction boxes associated with the loop).
         c) Local Control Panel (this area will show any local control panels associated with the loop).
         d) Electrical Room (this area will show electrical equipment such as starters, VFD's, power feeders, etc. associated with the loop).
         e) Programmable Logic Controller (this area will show PLC Inputs/Outputs associated with the loop).
         f) SCADA (this area will show logical connections for the Inputs/Outputs from the PLC to the SCADA System).

e. Each loop drawing will show each instrument or field device associated with the loop and its wiring connections and wire labels.
f. Each electrical enclosure (junction box, local control panel, PLC panel, starter panel, etc.) will show terminal numbers and terminal block group references.
g. All wires to be installed by the Contractor shall be dashed while all wires installed by the panel shop should be solid.
h. Show continuation lines to associated loops that may interface with each loop.
i. Show all wiring associated for the loop including power, controls, signal and communications.

E. Recommended Spare Parts Submittal
1. Submit a list of spare parts for all of the equipment associated with the I&C System. The list of spare parts shall include list pricing for each item.
2. Provide the name, address and phone number for each manufacturer and manufacturer's local sales representative.
3. Indicate whether or not the spare parts are being provided under this contract or not.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.8 QUALITY ASSURANCE

A. All equipment supplied for this project shall meet the requirements of the National Electric Code (NEC) and shall be listed by and bearing the label of the Underwriters' Laboritories (UL).

B. The IS shall be a company that has been actively involved in the installation and commissioning of I&C Systems for a minimum period of five years.

C. The IS shall have adequate facilities, manpower and technical expertise to perform the Work associated with the I&C System and as outlined by the Contract Documents.

D. The IS shall have similar project experience of at least four successfully completed projects for a similar wastewater system. The IS company must have performed similar work for these projects as required herein.

E. Experience requirements for the Control Systems Supervisor are specified later in this Section.

1.9 CONTROL SYSTEMS SUPERVISOR

A. The Contractor shall designate an individual as project Control Systems Supervisor. This individual shall have at least 5 years of total experience in selection of instrumentation components and preparation of shop drawings, and startup and commissioning of instrumentation and control systems for municipal water or wastewater treatment plants. This

experience shall consist of at least $15 million in electrical and instrumentation construction volume since January 1, 2010.

B. The Control Systems Supervisor shall oversee all activities associated with planning, scheduling, documenting, and executing startup and testing of plant instrumentation and control systems. Systems include everything specified in Division 40, and applicable instrumentation and controls described in mechanical and package system specifications.

C. Within 3 weeks of Notice to Proceed, the General Contractor shall provide a formal submittal declaring the identity of the Control Systems Supervisor, including evidence of his or her qualifications. This individual, once qualifications are favorably reviewed, may not be replaced without written consent of the Owner.

D. The Control Systems Supervisor's responsibilities shall include, but not be limited to, the following:

1. Participate in development of overall project schedules and construction sequencing, with specific attention to instrumentation and controls prerequisites and milestones.
2. Take the lead in coordinating signal definitions and quantities, data formats, communications protocols and standards (hardware and software), control interfaces, and other aspects of integration with the plant control system. The Control Systems Supervisor shall document and resolve interface issues among the Contractor's organization, and for items irresolvable within the organization develop explicit Requests for Information (RFI's). RFI's shall include specific suggestions as to options and recommendations for resolution.
3. Review and coordinate interconnection including control wiring, signal wiring, and communications interconnection among systems, devices, and sources of supply. This includes devices and systems installed under this project, as well as existing systems with which this project interfaces.
4. Participate in workshops.
5. Develop and/or review each submittal and RFI relating to instrumentation and controls.
6. Supervise instrumentation and controls-related field investigations and development of submittals.
7. Coordinate instrument and process control ranges and setpoints. Review instrument and configuration submittals and test procedures for these items, and coordinate among disciplines. Supervise selection of instrument options and ranges, mounting heights, and zero and span settings. Supervise development of preliminary instrument datasheets, and following plant startup supervise issuance of comprehensive instrument "as-built" settings.
8. Review each applicable schedule, submittal, RFI, test procedure, test results, change, and other documents which include any instrumentation and/or controls to be transmitted to the Owner (regardless of where specified), and shall include with that transmittal a declaration such as the following.

   "I, _____, have reviewed the accompanying documentation and find that it is in conformance with the requirements of the Contract Documents. I further attest that the signal interfaces and senses/ranges have been coordinated among devices and systems, that the functional requirements are met, that the physical characteristics and installations are coordinated and are suitable for the application, and that interconnection has been coordinated."
9. Prior to submissions, review test plans and results associated with the control systems, including package systems with hardwired interfaces or networked interfaces. The Control Systems Supervisor shall provide a written statement similar to that above, to be

included with each submittal, that the test plans and results have been fully reviewed and are in conformance with the requirements of the contract documents.

10. Participate in all project testing and training activities as described elsewhere in the Specifications.
11. Take the lead in all aspects of startup planning which involve electrical, instrumentation, controls, programmed systems, and integration among existing/new systems and packages. Contribute to Contractor-specified deliverables. Account for outages and downtime limitations.
12. Supervise startup of instrumentation and control systems, regardless of where specified.
13. Supervise unwitnessed and witnessed factory and field testing of instrumentation and control systems.
14. Coordinate integration work with the existing plant control system.
15. Take overall responsibility/leadership for activities of the IS specified herein.

1.10 WORKSHOPS

A. Refer to Section 013100 – Project management and Coordination. Prepare for, conduct, and contribute to recordkeeping for workshops pertaining to control systems

1.11 SUMMARY OF RESPONSIBILITIES

A. This Article summarizes selected responsibilities associated with instrumentation and control for process systems, with emphasis on startup and testing. All specified requirements apply, regardless of whether they are listed below. The purpose is to draw attention to certain joint and coordination responsibilities.

	Where Specified	Where Executed		Responsible Parties	
Work Item		Factory	Field	Contractor's Organization	Owner's Programmer
Factory Testing of I&C Systems:					
FAT (unwitnessed)	409000	✓		✓	
FAT (witnessed)	409000	✓		✓	Participate in automated testing.
Factory Testing of Networked Motor Control:					
MCT (unwitnessed)	260000	✓		✓	
MCT (witnessed)	260000	✓		✓	✓
Factory Testing of Packages/Equipment:					
As specified	409000		✓	✓	
Precommissioning Tests:					
EPSET	017500		✓	✓	
ORT's	Various		✓	✓	

Work Item	Where Specified	Where Executed		Responsible Parties	
		Factory	Field	Contractor's Organization	Owner's Programmer
Commissioning Tests:					
FAT's	Various		✓	✓	Participate in automated testing.
RAT	017500		✓	✓	
Test Planning And Procedures:					
Factory Test Procedures	Various			✓	Automation insert for selected items.
Field Test Procedures	Various			✓	Automation inserts for selected items.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials provided under this Contract shall be new and free from defects.

2.2 MANUFACTURERS

A. All equipment provided for the I&C System shall be the most recent field-proven models marketed by their manufacturers at the time of submittal of the Shop Drawings unless otherwise required to match existing equipment.

B. Instruments which utilize a common measurement principle (for example, float switches) shall be furnished by a single manufacturer. Panel mounted instruments shall have matching style and general appearance. Instruments performing similar functions shall be of the same type, model, or class, and shall be from a single manufacturer.

2.3 OPERATING CONDITIONS

A. The I&C System shall be designed and constructed for satisfactory operation and long, low maintenance service under the following conditions:
   1. Environment: Type the type of facility this is for such as "Wastewater Treatment Plant".
   2. Temperature Extremes: -4°F to 104°F (Outdoors); 40°F to 104°F (Indoors).
   3. Relative Humidity: 20% to 90%, non-condensing.

B. Indoor and outdoor control panels and instrument enclosures shall be suitable for operation in the ambient conditions associated with the locations designated in the Contract Documents. Heating, cooling, and dehumidifying devices shall be provided in order to maintain instrumentation devices 20 percent within the minimums and maximums of their rated environmental operating ranges. The Contractor shall provide power wiring for these devices. Enclosures suitable for the environment shall be furnished. Instrumentation in hazardous areas

shall be suitable for use in the particular hazardous or classified location in which it is to be installed.

2.4 SPECIAL TOOLS

A. The IS shall furnish a priced list of special tools required to calibrate and maintain the instrumentation provided. The Owner and Engineer will select which tools are to be purchased and the IS will supply them at the prices listed.

B. In addition to the IS proposed special tools, the IS shall furnish the following:
   1. Fluke 789 Portable Process Meter, no equal.
   2. Fluke 726 Precition Multifunction Process Calibrator, no equal.

C. Special tools shall be delivered to the Owner before startup commences.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

A. After completion of shop assembly, factory test, and approval, equipment, cabinets, panels, and consoles shall be packed in protective crates and enclosed in heavy duty polyethylene envelopes or secured sheeting to provide complete protection from damage, dust, and moisture. Dehumidifiers shall be placed inside the polyethylene coverings. The equipment shall then be skid-mounted for final transport. Lifting rings shall be provided for moving without removing protective covering. Boxed weight shall be shown on shipping tags together with instructions for unloading, transporting, storing, and handling at the Site.

B. Special instructions for proper field handling, storage, and installation required by the manufacturer shall be securely attached to each piece of equipment prior to packaging and shipment.

C. Each component shall be tagged to identify its location, instrument tag number, and function in the system. A permanent stainless steel or other non-corrosive material tag firmly attached and permanently and indelibly marked with the instrument tag number, as given in the tabulation, shall be provided on each piece of equipment in the PCIS. Identification shall be prominently displayed on the outside of the package.

D. Equipment shall not be stored outdoors. Equipment shall be stored in dry permanent shelters, including in-line equipment, and shall be adequately protected against mechanical injury. If any apparatus has been damaged, such damage shall be repaired by the Contractor. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through tests as directed by the Engineer. If such tests reveal defects, the equipment shall be replaced.

3.2 MANUFACTURER'S SERVICES

A. Manufacturer's services shall be furnished for the following equipment:
   1. Vendor supplied equipment that contain programmable controllers, operator interfaces and/or instrumentation that requires site calibration.

2. Chlorine Analyzers
3. pH Analyzers
4. ORP Analyzers
5. Dissolved Oxygen Analyzers

B. The Contractor shall furnish the following manufacturer's services for the instrumentation listed below:
1. Perform bench calibration.
2. Oversee installation.
3. Verify installation of installed instruments.
4. Certify installation and reconfirm manufacturer's accuracy statement.
5. Oversee loop testing and pre-commissioning
6. Train the Owner's personnel.

3.3 INSTALLATION

A. Instrumentation shall be installed per the Instrument Installation Drawings that have been submitted and approved and per the requirements of Division 40. This includes all instrumentation for the I&C System, regardless of who the supplier is. Instrumentation shall be mounted so that it is easily accessible and viewable and such that it does not restrict access to other equipment. Mount instrumentation to pipe stands or wall mounts if they are not directly mounted or if the Contract Drawings indicate otherwise.

B. The I&C System indicated throughout the design are diagrammatic and therefore locations of equipment are approximate. The exact locations and routing of wiring and cables shall be governed by structural conditions and physical interferences and by the location of electrical terminations on equipment. Equipment shall be located and installed so that it will be readily accessible for operation and maintenance. Where job conditions require reasonable changes in approximated locations and arrangements, or when the Owner exercises the right to require changes in location of equipment which do not impact material quantities or cause material rework, the Contractor shall make such changes without additional cost to the Owner.

C. The I&C System is integrally connected to electrical, mechanical and structural systems. Coordinate with these other disciplines the installation of these related components. All conduit, cables and field wiring shall be as required by Division 26.

D. Instruments, control panels and all other I&C System related equipment shall be anchored by methods that comply with seismic requirements applicable to the Site.

E. Each existing instrument to be removed and reinstalled shall be cleaned, reconditioned, and recalibrated by an authorized service facility of the instrument manufacturer. The Contractor shall provide certification of this Work prior to reinstallation of each instrument.

F. The Contract Documents show necessary conduit and instruments required to make a complete instrumentation system. The Contractor shall be responsible for providing any additional or different type connections as required by the instruments and specific installation requirements. Such additions and such changes, including the proposed method of installation, shall be submitted to the Engineer for approval prior to commencing that Work. Such changes shall not be a basis of claims for extra Work or delay.

G. Instrumentation, control panels, wiring and all other I&C equipment shall be properly tagged and/or labeled per the requirements of Section 260553.

H. Installation of the I&C System shall be according to the finalized Loop Drawings

3.4 FACTORY ACCEPTANCE TESTING (FAT)

A. The IS shall arrange for the manufacturers of the equipment and fabricators of panels and cabinets supplied under this Section to allow the Engineer and Owner to inspect and witness the testing of the equipment. The test location shall be within 20 driving miles of the project site. Equipment shall include the cabinets, special control systems, networked devices, and other pertinent systems and devices.

B. The IS shall develop and submit a FAT Plan and Procedure Document within 10 days of the FAT. IS-developed FAT procedures shall provide a complete framework for testing and control panel hardware and PLC/supervisory system software functions. Test procedures for software functions will be provided by the Owner's Programmer. The FAT Plan and Procedure shall as a minimum shall have the following:
   1. Descriptions of test methods to be performed during the FAT.
   2. FAT Schedule and Procedure
   3. FAT Checklists that allow for sign-off and comments for each test method and procedure.
   4. Placeholders for automaton testing, on a loop-by-loop basis. The IS shall use the Contract Control Descriptions, amended by workshop results, as the basis.

C. Control Panel Completion Test Methods: The following test methods should be performed during the FAT for each control panel:
   1. Completed Shop Drawings: Demonstrate that the control panel has been built according to the shop drawings and that the shop drawings are accurate.
   2. Panel Layout: Demonstrate that the control panel has been laid out as designed and as required by Division 40.
   3. Power Distribution: Demonstrate all power distribution circuits, including but not limited to AC power circuits, UPS operation, signals and circuits and DC circuits.
   4. Control Circuits: Demonstrate the correct installation of each control circuit. Using a signal generator or multi-meter, show the correct operation of each input, output, relay, barrier, buttons, switches, or any other control device. Demonstrate the proper functionality of any hard-wired interlocks that may be associated with each control circuit.
   5. Panel Networking/Communications: If any form of communications is associated with the control panel, verify the proper operation of each communication port and link

D. Test procedures shall be submitted in advance of testing. Allow for two submittal rounds in scheduling.

E. Provide no less than 20 days' advance notice of any test, and adjust the schedule within reason to accommodate others' schedules

F. Except for test steps requiring participation by the Owner's Programmer, the FAT shall be planned and executed unwitnessed, prior to scheduling the witnessed FAT. Test results shall be submitted in advance of conducting the test witnessed. For unwitnessed verification of signals

from the physical environment to within the programmed environment, the IS shall monitor states within the PLC's or use other IS-developed means to prove continuity.

G. The purpose of the FAT is not only verification of functionality of all Contractor-furnished automation, but it will also comprise a forum for factory testing Owner-furnished programming, and identification of Owner-desired changes to that programming in advance of fieldwork. The Contractor shall allow the following in support of those goals:
   1. Provide physical space, power, and network connections for SCADA servers which will be Owner-furnished for testing purposes. Network connections shall include those with the control network, plus Internet access for general use and testing of alarm notification
   2. Allow in the schedule, 1 day for setup by the Owner's Programmer, in advance of the witnessed FAT.
   3. The FAT schedule shall allow adequate hours for execution of the scope of testing specified herein, plus allow for the following dedicated to testing and demonstration of programmed supervisory and PLC functions:
      a. Eight (8) days total for testing of automation, including District witnessing.
      b. Allow 3 days for changes by the Owner's Programmer, for programming corrections and execution of Owner-desired changes.
      c. Allow 3 days for retesting.
      d. Any time for Contractor corrections/fixes are in addition to the intervals above.
   4. Section 260000 includes requirements for Motor Control Testing (MCT) whose purpose is to validate in the factory environment the networked interfaces. The MCT can be combined with the FAT, at the Contractor's discretion, or conducted separately if test location(s), project delivery schedules so require. If the MCT is to be combined, then the durations specified for the MCT shall be appended to the FAT durations for planning and scheduling.

H. The Owner's Programmer may choose to include in the FAT additional PLC's as proxies for existing Plant PLC's, to prove out in a factory environment the PLC-to-PLC handshaking and interlocking. The IS shall accommodate such a request, and allow for up to these additional PLC's (likely the two spare PLC's plus one more Owner-furnished PLC). Provide power and network connections. Testing of the additional PLC's will be the subject of the witnessed FAT, and configuring and simulation of values within those PLC's will be the responsibility of the Owner's Programmer.

I. Control Loop Test Methods: In order to demonstrate that the control panel will provide its function as intended, provide the following control loop test methods. Control Loop testing of Owner-selected equipment specified in Volume 3, Appendix A, shall include the equipment manufacturers programmer on site.

3.5 FIELD QUALITY CONTROL

A. Allow for inspections by the Engineer and/or Owner of the I&C System at any time during the construction. Inspections shall be conducted to verify that the installation is per the requirements of the Contract Documents.

3.6 CALIBRATION

A. Devices provided under Division 40 shall be calibrated according to the manufacturer's recommended procedures to verify operational readiness and ability to meet the indicated functional and tolerance requirements.

B. Each instrument shall be calibrated at 0, 25, 50, 75, and 100 percent of span using test instruments to simulate inputs. The test instruments shall have accuracies traceable to National Institute of Standards and Testing.

C. Instruments that have been bench-calibrated shall be examined in the field to determine whether any of the calibrations are in need of adjustment. Such adjustments, if required, shall be made only after consultation with the Engineer.

D. Instruments which were not bench-calibrated shall be calibrated in the field to insure proper operation in accordance with the instrument loop diagrams or specification data sheets.

E. Each analyzer system shall be calibrated and tested as a workable system after installation. Testing procedures shall be directed by the manufacturers' technical representatives. Samples and sample gases shall be furnished by the manufacturers.

F. For each instrument calibration, provide a calibration sheet and update the corresponding TR20 Instrument Form with the new calibration data. The Calibration sheet shall include the following as a minimum:
   1. Date of calibration
   2. Project Name.
   3. Tag Number.
   4. Manufacturer, model and serial number.
   5. Calibration data including range, input, output and measurement at each calibration point.
   6. Space for comments.
   7. Space for sign-off by party performing calibration.

G. A calibration and testing tag shall be attached to each piece of equipment or system at a location determined by the Engineer. The IS shall sign the tag when calibration is complete. The Engineer will sign the tag when the calibration and testing has been accepted.

3.7 LOOP TESTING

A. Each control loop shall have been installed according to the finalized loop drawing. Prior to the commencement of loop testing, the following pre-requisites should have been met:
   1. All associated equipment, conduit and wire has been permanently installed, terminated and inspected.
   2. All wiring has been properly pulled, terminated and labeled.
   3. Each wire has been tested with a point-to-point test.
   4. All control panels and electrical equipment have been checked out and tested as required by Division 26.
   5. All instrumentation has been appropriately installed and calibrated.
   6. Loop Test Forms for each loop to be tested have been created and will be available during the loop testing.

B. Each loop test shall have a Loop Test Form prepared and ready prior to each loop test. The loop test form shall have the following:
   1. Loop Number and Description
   2. Check-Off List with room for sign-off and dated by the IS, Programmer, and Owner's Witness as well as room for comments. The list of items to be checked off for each loop should include but is not limited to the following:
      a. Each power distribution circuit.
      b. Each control circuit.
      c. Each alarm circuit.
      d. Each PLC input/output point.
      e. Each Local Manual, Local Auto, SCADA Manual & SCADA Auto function.
      f. Each hard-wired and software interlock.

C. Upon completion of the above pre-requisites for loop testing, the IS shall oversee and coordinate each loop test. The IS is responsible to be present for all loop testing, whether the equipment was supplied by the IS or not. The IS is responsible to have all responsible parties associated with each loop present. This includes but is not limited to manufacturer representatives, vendor technicians, electrical installers, mechanical installers, and programmer. The IS shall coordinate with the Owner and Engineer to allow for witnessing of loop testing as deemed necessary by the Owner and Engineer.

D. Issues that arise during loop testing should be addressed and fixed immediately. If it is not feasible to immediately fix the issues, the loop testing should be re-scheduled as soon as possible to avoid delays. Any costs associated with re-testing and requiring all parties to return to the site shall in no way be incurred to the Owner.

E. Following a successful loop test, the appropriate parties should sign and date the Loop Test Forms. All Forms shall be certified and submitted to the Engineer as part of the O&M Manuals.

F. Following loop testing, in no way should any parts of the loop be modified. In no way shall any wiring be re-routed or re-terminated. If any such work occurs, all affected loops shall be re-tested at no expense to the Owner.

3.8 COMMISSIONING

A. The IS shall oversee, coordinate and be present during all commissioning activities. The IS shall be responsible for obtaining the assistance of the Contractor and Subcontractors as may be required for commissioning activities.

B. Commissioning shall commence after acceptance of wire test, calibration tests and loop tests, and inspections have demonstrated that the instrumentation and control system complies with Contract requirements. Pre-commissioning shall demonstrate proper operation of every system with process equipment operating over full operating ranges under conditions as closely resembling actual operating conditions as possible.

C. Commissioning and test activities shall follow detailed test procedures and check lists accepted by the Engineer. Test data shall be acquired using equipment as required and shall be recorded on test forms accepted by the Engineer, which include calculated tolerance limits for each step. Completion of system commissioning and test activities shall be documented by a certified

report, including test forms with test data entered, delivered to the Engineer with a clear and unequivocal statement that system commissioning and test requirements have been satisfied.

D. Where feasible, system commissioning activities shall include the use of water to establish service conditions that simulate, to the greatest extent possible, normal final control element operating conditions in terms of applied process loads, operating ranges, and environmental conditions. Final control elements, control panels, and ancillary equipment shall be tested under startup and steady state operating conditions to verify that proper and stable control is achieved using motor control center and local field mounted control circuits. Hardwired and software control circuit interlocks and alarms shall be operational. The control of final control elements and ancillary equipment shall be tested using both manual and automatic (where provided) control circuits. The stable steady state operation of final control elements running under the control of field mounted automatic analog controllers or software based controllers shall be assured by adjusting the controllers as required to eliminate oscillatory final control element operation. The transient stability of final control elements operating under the control of field mounted, and software-based automatic analog controllers shall be verified by applying control signal disturbances, monitoring the amplitude and decay rate of control parameter oscillations (if any), and making necessary controller adjustments as required to eliminate excessive oscillatory amplitudes and decay rates.

E. Electronic control stations incorporating proportional, integral or differential control circuits shall be optimally tuned, experimentally, by applying control signal disturbances and adjusting the gain, reset, or rate settings as required to achieve a proper response. Measured final control element variable position/speed setpoint settings shall be compared to measured final control element position/speed values at 0, 25, 50, 75, and 100 percent of span and the results checked against indicated accuracy tolerances.

F. Section 017419 includes Functional Acceptance Testing (FATC) which will generally call for participation by the Owner's Programmer. No fewer than 3 working days prior to an FATC which requires participation by the Owner's Programmer, the Control System's Supervisor shall issue a written certification that all instruments, equipment, and systems have been started up, are operable, ORT's are complete, and are ready to be put under full PLC monitoring and control. Exceptions, if any, shall be explicitly noted. If the exceptions are too great in the judgment of the Owner's Representatives, testing shall be delayed and the Contractor shall complete the missing work

3.9 TRAINING

A. Provide training in accordance with Section 409000.

B. Develop a Training Plan for the training requirements of Division 40 and submit it to the Engineer for approval. Coordinate with the Engineer and Owner the time and locations of each training session. Schedule the trainings for after the equipment has been pre-commissioned.

C. As part of the Training Plan, submit a résumé for each individual to be providing training. Training shall be performed by qualified representatives of the equipment manufacturers and shall be specific to each piece of equipment.

D. Each training session shall include a written agenda.

E. The Contractor shall train the Owner's personnel on the maintenance, calibration and repair of instruments provided.

F. Within 10 days after the completion of each session, the Contractor shall submit the following:
   1. A list of Owner personnel who attended the training.
   2. A copy of the training materials used during the session with notes, diagrams and comments.

END OF SECTION 40900

Attachment E

Revised Section 409123 – Miscellaneous Properties Process Measurement Devices (Volume 3B)

SECTION 409123 – MISCELLANEOUS PROPERTIES PROCESS MEASUREMENT DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Dissolved Oxygen Process Measurement Devices.
2. Flow Process Measurement Devices.
3. Level Process Measurement Devices.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Instrumentation TR20 forms.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Equipment to be furnished under this section shall be the product of firms regularly engaged in the design and manufacturing of this type of equipment. Manufacturer shall assume responsibility for, and guarantee performance of equipment furnished. However, this shall not be construed as relieving the Contractor from responsibility for the proper installation and functionality of the work.

B. Examine the Contract Documents and verify that instruments being provided are compatible with the physical and process conditions associated with the instrument. This includes compatibility with liquids, gases, pressures, temperatures, flows, materials, locations and mounting requirements. Provide all necessary accessories to the instrument for a complete and operable system.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver the process measurement equipment as a complete system. Each system shall be properly tagged and identified with its corresponding instrument tag as shown on the P&ID's. Each system shall be factory calibrated and certified prior to delivery.

PART 2 - PRODUCTS

2.1 GENERAL

A. Each process measurement system shall typically consist of a sensor and an analyzer/transmitter. Where shown on the drawings, the analyzer/transmitter may be utilized for multiple sensors. When an analyzer/transmitter is used for multiple sensors, it shall be capable of displaying simultaneously each process measurement.

B. Each analyzer/transmitter shall be equipped with means to transmit process measurement information to the plant SCADA system.

1. For hardwired signals, unless otherwise indicated on the drawings, provide the following:
   a. 4-20mA output signal for each process measurement (for up to 500 Ohm loads)
   b. Two programmable SPDT relay outputs, rated at 5A up to 230VAC, for each process measurement

2. Where shown on the drawings, provide the following digital communications to the plant SCADA system:
   a. Modbus RTU (Two-Wire RS-485)

C. Each analyzer/transmitter shall be powered by 115VAC (+/- 10%) at 60Hz unless specifically shown on the drawings as being powered by 24VDC (+/- 15%). Each analyzer/transmitter shall retain its programmable settings in non-volatile memory.

D. Each sensor and corresponding analyzer/transmitter shall be supplied as a complete and operable system. This includes all cabling, mounting hardware and fasteners. When installed outdoors, the analyzer/transmitter shall be protected from the sun such that direct sunlight will not shine on the display.

E. All analyzers/transmitters shall be waterproof and made from corrosion resistant materials.

F. All sensors to be immersed in liquids shall be rated for permanent submersion and shall be corrosion resistant.

2.2 DISSOLVED OXYGEN PROCESS MEASUREMENT DEVICES

A. Each DO analyzer/transmitter shall be rated for operation with ambient temperature within -4°F to 122°F. If the analyzer/transmitter is to be installed in locations that may experience temperatures less than -4°F, it shall be housed in an enclosure which is equipped with a thermostatically controlled heater. If the analyzer/transmitter is to be installed in locations that may exceed 122°F, it shall be housed in an air conditioned enclosure. All enclosures and air conditioners shall be rated NEMA 4X.

B. The DO Sensor assembly shall meet the following criteria:

1. Contain the sensing elements and electronics for digital communications to the analyzer/transmitter in a self-contained, corrosion-resistant and submersible housing.

2. Built-in temperature compensation.
3. Allowed to be installed in liquids whose temperatures are 32 to 200°F and whose pressure is up to 100 psi.
4. The sensor shall have a measuring range of 0 to 20 ppm.
5. The sensor shall continuously measure dissolved oxygen by exciting a luminescent material and then detecting light emitted by the material that is proportional to the amount of dissolved oxygen in the liquid.

C. Shall not require sample conditioning or electrolyte solutions.

D. Acceptable Manufacturers:

1. Hach model LDO Probe 2 with SC200 or SC1000 analyzer/transmitter.
2. WTW/Xylem FDO 700 IQ with 182 or 2020 analyzer/transmitter.

2.3 FLOW PROCESS MEASUREMENT DEVICES

A. ROTAMETERS

1. Rotameters in chemical solution lines and where indicated shall have vertical bottom inlets and top outlets with ANSI 150-lb flanged ends for vertical mounting.

2. The meters shall have Hastelloy C floats, 10-inch long scales, and a range of 10:1 with an accuracy of plus or minus 2 percent. Meters shall be rated for a minimum working pressure of 150 psi. Flanged rotameters for chemical solutions and where indicated shall be calibrated in gallons per minute.

3. The bodies shall have union ends for ease of maintenance, polysulphone tubes, aluminum or brass end fittings, Type 316 stainless steel internal parts and scales suitable for the indicated capacity range.

4. The meters shall have accuracy within plus and minus 5 percent of the capacity range indicated.

5. Meters in air and pump seal flushing lines shall be of the modified rotameter design with screwed ends, spring-loaded pistons, and union bodies for mounting in any position.

6. For activated carbon solution, bodies shall be Type 316 stainless steel construction with magnetically actuated float and scale.

7. For other chemicals bodies shall have Type 316 stainless steel ends with heavy borosilicate glass tubes and packing glands or other best suitable material.

8. Rotameters with NPT screwed ends for water, air, and fuel gas service shall be calibrated in gallons per minute or cubic feet per minute. The scales shall be suitable for the capacity ranges indicated.

9. Acceptable Manufacturers:
   a. Krohne VA40 Series.

b. Dwyer UV Series.
c. Or Approved Equal.

B. FLOW SWITCHES

1. Thermal dispersion type flow switches

a. Thermal dispersion type flow switches shall be used for pump discharge monitoring, chemical injection monitoring, gas flow monitoring and for flows in pipes with velocities greater than 0.25 fps.

b. The flow element shall be constructed of a material that is best suited for the liquid or gas that it is serving. Typically for chemicals the material will be Hastelloy C and for other liquids or gases it will be 316SS.

c. The switch shall be capable of operating in liquids or gases whose temperatures range from -40°F to 350°F and up to 2000 psi operating pressure.

d. The flow switch assembly shall be insertion type with ¾" male NPT threads. The insertion length shall be such that the thermal dispersion elements are in the center of the pipe.

e. The flow switch shall accept 115VAC or 24VDC as shown on the Contract Drawings. It shall have two SPDT relay outputs rated at 5A up to 240VAC.

f. The flow switch shall be rated to be installed in Class 1, Division I Groups B,C & D hazardous locations. The electronics shall be housed in a powder coated aluminum enclosure that is rated NEMA 4X.

g. Acceptable Manufacturers:
1) Fluid Components International (FCI) FLT93 Series.
2) Sierra Instruments Innova-Switch Series.
3) Or Approved Equal.

C. MAGNETIC FLOW METER

1. Materials

a. All mounting hardware shall be 316 stainless steel, the instrument enclosure and the spool mag shall be rated NEMA 4X, the flow sensor liner shall be hard rubber, and the electrode material shall be hastelloy.

b. Spool size shall be as specified on the drawings.

c. All applications with flow element below grade where no de-watering means or in submersible applications shall provide the flow element as NEMA 6P (IP-68).

d. Transmitter shall be integral or remote to the flow element as shown on the P&ID's.

2. Design and fabrication

a. Utilize characterized field principle of electromagnetic induction to produce signal directly proportional to flow rate. The meter shall use a pulsed DC magnetic field excitation.

b. Provide flanged end connections per ANSI B16 rated for piping system operating and test conditions.

c. Operating pressure: 150 psi.

d. Operating temperature: 122°F.

e. Grounding requirements: per manufacturer requirements. Typically inlet and outlet grounding rings of same material as electrode.

f. When the transmitter is remote to the flow element, provide cable between flow element and transmitter. Coordinate with the installer the length of the cable required. No splices in any way will be allowed.

g. Complete zero stability shall be inherent to the meter system. The system shall have a programmable low flow cutoff.

h. Empty pipe detection to prevent false measurement when pipe is empty or partially filled.

i. Forward and reverse flow measurement and totalization as well as net flow totalization.

j. 4-20mA DC isolated output into maximum 800 ohms. Signal shall be programmable to indicate forward and/or reverse flow.

k. Provide a dry contact output for flow direction indication.

l. Provide a programmable frequency output for flow totalization.

m. +/- 0.5% accuracy for flow rates above 1 fps.

3. Acceptable Manufacturers

a. Siemens SITRANS F 5100W.
b. Endress+Hauser Promag 53.
c. Rosemount 8700.
d. ABB WaterMaster.
e. Or Approved Equal.

D. INSERTION THERMAL MASS FLOW METERS

1. Materials

a. All mounting hardware shall be 316 stainless steel, the instrument enclosure and the spool mag shall be rated NEMA 4X

2. Design and Fabrication

a. Velocity Range: 0-18,000 SFPM (300 SFPS), air at standard conditions of 25°C and 760 mmHg.

b. Velocity Measurement Accuracy: ±2% of reading from 10 to 100% of calibrated range.

c. Output 4-20ma signal proportional to flow rate. 700 ohms maximum resistance.

d. Power Supply 18 to 30 VDC

e. Repeatability: 0.25% or better.

f. Process Temperature Rating: -10°C to +120°C.

g. Process Pressure Rating: 150 PSIG.

h. Sensor Material: 316L Stainless Steel, all welded construction.

i. Sensor Support Material: 316L Stainless Steel all-welded construction.

j. Insertion Length: Per manufacturer's recommendations.

k. Process Line Sizes: 3" pipe and larger.

l. Sensor Electronics Enclosure: NEMA 4X, Class I, Div. 1, Groups B, C, D:

m. Sensor Enclosure Temperature Rating: -20°C to +50°C.

n. Process Connection: 316 Stainless Steel Compression Fitting to fit 1" FNPT Fitting on pipe (by customer).

o. Field Wiring: 1 pair of twisted and shielded 14-18 gauge wire having a maximum loop resistance of 4 ohms.

p. Safety approvals: Non-incentive: Class I, Div.2, GPS A,B,C,D,T5;CSA pending; Explosion-proof: Class I, Div. I, GPS B,C,D,T4, CSA pending; Flameproof: Eex d IIC T4; CENELEC pending.

3. Acceptable Manufacturers
   a. Fluid Component International ST98 Series with Display.
   b. Or Approved Equal.

2.4 LEVEL PROCESS MEASUREMENT DEVICES

A. FLOAT SWITCHES

1. Float switches shall consist of a mechanical switch, hermetically sealed in a plastic casing, freely suspended at the desired height from its own cable. When the liquid level reaches the float switch, the casing will tilt and the mechanical switch will change state.

2. The casing shall be constructed of polypropylene with the sheathed cable extruding from the casing. The cable shall be three conductors, made specifically for underwater use and heavy flexing service.

3. The float switch shall have a 10A resistive rating up to 250VAC.

4. Weight and buoyancy shall be such that contaminants like a cake of grease will not result in the float switch changing operating level more than one inch.

5. A NEMA 4X 316SS junction box shall be supplied for termination of the float cable(s) allowing for conventional wiring and conduit to be run from the junction box to a control panel. It shall have terminal blocks for the required number of circuits and shall accept sealed fittings.

6. Float switch cables shall be suspended in a manner that provides minimum strain to the cable and will not damage it. This is typically achieved with a stainless steel cord support grip or strain relief grip as manufactured by Kellems. When support grips are used, a stainless steel hook shall be installed for hanging the support. All screws, fasteners, boxes and grips shall be 316SS. In no way are any steel or galvanized steel components allowed.

7. The float cable length shall be long enough for easily removing the float from the water for testing and long enough to reach its termination junction box.

8. If the float switch is to be installed in a classified area, an appropriate intrinsically safe barrier shall be utilized to guarantee the circuit may not abnormally create an ignition.

9. Manufacturers:
   a. Flygt ENM-10.
   b. Or Approved Equal.

B. FLOOD SWITCHES

1. High level flood switches shall be the type that is suspended on a column. A ¼" NPT connection with flying leads allows the column and float assembly to be attached to a junction box. The junction box shall be rated NEMA 4X and be nonmetallic. The flood switch shall be CPVC and shall be made for use with liquid chemicals and corrosive liquids. Switch contacts shall be SPST N.O. with 20VA rating minimum.

2. If the flood switch is to be installed in a classified area, an appropriate intrinsically safe barrier shall be utilized to guarantee the circuit may not abnormally create an ignition.

3. Manufacturers:
   a. GEMS LS-74780.
   b. Or Approved Equal.

C. SUBMERSIBLE LEVEL TRANSMITTERS

1. The submersible level transmitter shall consist of a submersible transducer, electronic transmitter, support cable, and interconnecting cable with cable shield and vent tube for atmospheric reference. The vent tube shall be provided with a replaceable moisture barrier. The submersible transducer shall be the strain gauge type suitable for sensing pressure equivalent to the liquid level range indicated.

2. The transducer shall have 316 stainless steel process wetted parts and shall be provided with a waterproof interconnecting cable. The transducer shall be suspended by a corrosion resistant cable as recommended by the manufacturer. The installation shall allow easy removal of the transducer and cable assembly for maintenance purposes. The electronic level transmitter shall be remote mounted and shall produce a 4 - 20 mA DC signal linearly proportional to the level range indicated and be capable of driving a load of 700 ohms.

3. The interconnecting cable shall have a pull strength of 200 pounds, be factory attached to the transducer, and shall be terminated in a NEMA 4X 316SS enclosure. The enclosure shall house the vent tube moisture barrier and local indication.

4. The measurement system shall be suitable for the area classification and operation over a temperature range of 32 to 122 degrees Fahrenheit with an accuracy of plus or minus 0.5 percent of span. The transmitter shall have a non-fouling, large diaphragm (greater than 2”). The diaphragm shall be protected by a spacer assembly that also allows the transducer to sit on the floor of the wet well.

5. For lengths greater than 20 feet the transducer shall have ½” threads and shall be suspended in the wet well by ½” stainless steel conduit.

6. Acceptable Manufacturers
   a. KPSI model 750.
   b. Or Approved Equal.

D. FLANGED LEVEL TRANSMITTERS

1. Flanged level transmitters shall be a flanged, differential pressure-sensing unit. The transmitter shall be a 2 wire device with continuously adjustable span, zero and damping adjustments, integral indicator, scaled in engineering units, with a 4 digit LCD display, solid state circuitry, and 4 - 20 mA output with HART protocol. Accuracy shall be 0.075 percent of span. Process wetted parts, bolts, flanges, adapters, drains and vents shall be stainless steel. Body and mounting brackets shall be corrosion resistant and suitable for the environment. The flanged process connection shall be 316SST ANSI Class 150 4-inch with a 3” 316SST diaphragm. The diaphragm shall extend past the flange such that it is flush with walls of the pipe. The low pressure connection shall be 1/4-inch or 1/2-inch NPT.

2. Components**:** Diaphragm seals shall consist of a flange with flush or extended diaphragm to be flush with the walls of the pipe. It shall have a direct mount, coplanar, welded connection for connection of the transmitter to the seal.

3. Operating Principles: The diaphragm seal shall attach to the inlet connection of a pressure instrument to isolate its measuring element from the process fluid. The space between the diaphragm and the pressure element shall be completely filled with a suitable liquid that is rated for the environmental conditions. Displacement of the liquid fill in the pressure element through the movement of the diaphragm shall transmit process pressure changes directly to a gauge, transmitter, switch, or other pressure instrument.

4. Materials: Exposed surfaces, housings, and diaphragm shall be constructed of 316, stainless steel.

5. Acceptable Manufacturers
   a. Rosemount model 3051L with model 1199 diaphragm seal.
   b. Or Approved Equal.

E. ULTRASONIC LEVEL MEASURING SYSTEM

1. As indicated on the drawings, the ultrasonic level measuring system shall be setup as a level transducer with remote mounted transmitter or as a single transducer/transmitter assembly. For hazardous locations, the single transducer/transmitter shall be utilized. It shall be loop powered and shall be installed with an appropriate intrinsically safe barrier to guarantee the circuit may not abnormally create an ignition.

2. All transducer and transducer/transmitter assemblies shall be rated IP68 for permanent submergence. Remote transmitter shall be in a non-corrosive NEMA 4X housing. Transmitters shall have an LCD display and shall be programmable by buttons on the transmitter or with a handheld programmer. When programmed with a handheld programmer, each transmitter shall be supplied with an accompanying programmer.

3. The transducer shall be encapsulated in chemical and corrosion resistant material, such as Kynar, Teflon or TEFZEL. It shall be capable of operating from -40°F to 158°F. The transducer shall be compatible with the level range as indicated on the Contract Drawings. As a minimum, the transducer shall be capable of measuring a range of 40 feet.

4. When the transducer is remotely mounted from the transmitter, it shall have a waterproof shielded cable whose length is long enough to reach the transmitter. In no way shall splicing of the transducer cable be allowed.

5. Each transmitter shall provide a 4-20mA output signal that is programmable to a user desired level range.

6. Remote transmitters shall be provided to accept two transducers for differential level monitoring or for monitoring two separate levels. A second 4-20mA output signal shall be provided for the second level. The remote transmitter shall have six programmable relays rated at 5A up to 250VAC.

7. Manufacturers:
    a. Siemens SITRANS Probe LU (transducer/transmitter assembly); Hydroranger 200 (remote transmitter) with XPS-15 or greater (transducer).
    b. Or Approved Equal.

2.5 TURBIDITY PROCESS MEASUREMENT DEVICES

A. Each turbidity analyzer/transmitter shall be rated for operation with ambient temperature within -4°F to 122°F. If the analyzer/transmitter is to be installed in locations that may experience temperatures less than -4°F, it shall be housed in an enclosure which is equipped with a thermostatically controlled heater. If the analyzer/transmitter is to be installed in locations that may exceed 122°F, it shall be housed in an air conditioned enclosure. All enclosures and air conditioners shall be rated NEMA 4X.

B. The Turbidity Sensor assembly shall meet the following criteria:

1. Contain the sensing elements and electronics for digital communications to the analyzer/transmitter in a self-contained, corrosion-resistant housing.
2. The turbidity sensor shall be meet the performance criteria of the U.S. Environment Protection Agency in Method 180.1, making it suitable for regulatory reporting.
3. The sensor shall utilize a light source that directs light through the process water to a submerged photocell which detects the amount of light that passes through the water.
4. Allowed to be installed in liquids whose temperatures are 32 to 122°F.
5. The sensor shall have a measuring range of 0 to 100 NTU.
6. Shall not require sample conditioning or electrolyte solutions.

C. Acceptable Manufacturers:
1. Hach model TU5300 Turbidity System with flow sensor, automatic cleaning module and SC200 or SC1000 analyzer/transmitter.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment and materials specified in this section shall be installed, connected, and tested in accordance with the manufacturers' recommendations and as required by these specifications and contract drawings. Contractor shall coordinate with other trades to insure proper connection to piping and other mechanical equipment.

B. Install all analyzers/transmitters five feet off of floor level. Install in a location that is easily accessible while as near to the sensor(s) as possible.

3.2 CALIBRATION AND COMMISSIONING

A. A manufacturer representative shall field calibrate the process measurement system as required by section 409000 and per the manufacturer's documented calibration procedure. The system

shall be calibrated to the proper ranges as required by the Owner and the Engineer. Where analog signals are connected to local or remote monitoring equipment, verify that the calibrated ranges and scaling of the local and remote indicators are correct.

B. Prior to final acceptance of the work, the Contractor shall certify the equipment and installation included under this section to be free of defects, and suitable for trouble-free operation.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect the installation of the process measurement systems. Verify that the incoming power is within the required range. Verify the functionality of all output signals and communications connections.

2. Test the process measurement system for proper operation at low, mid and high process conditions.

B. Document data for each measurement and for system calibration. Update the TR20 instrument forms following testing and calibration.

3.4 TRAINING

A. Provide a minimum of four hours of training for each type of process measurement system provided. Provide training in accordance with section 409000.

END OF SECTION 409123

Attachment F

New Section 432420 – Horizontal Axial Flow Pumps (Volume 3B)

SECTION 432420 – HORIZONTAL AXIAL FLOW PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. This specification covers the furnishing of product lubricated, horizontal type, axial flow pump units as required and to the expectation of the Engineer with regard to the manufacture of the equipment.

B. All equipment must be supplied by the same pump manufacturer. Well drillers, distributors, or other fabrication shops will not be allowed to furnish equipment built in their local fabrication shop. Equipment furnished under this section shall be fabricated and assembled in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

C. Except as modified or supplemented herein, all axial flow pumps shall conform to the applicable requirements of ANSI/AWWA and the Hydraulic Institute Standards for axial-flow type pumps.

1.2 CONDITIONS OF OPERATION

A. The operating point of each pump shall be variable flow capable of flow and head capacities as shown in pump schedule in the design drawings.

1.3 RELATED SECTIONS

A. Common Motor Requirements for Equipment, Section 220513.

1.4 SUBMITTALS

A. Provide complete fabrication and assembly drawings together with detailed specifications and data covering materials, parts, devices and accessories forming a part of the equipment furnished, shall be submitted in accordance with the submittals section. Information and submittals shall conform to the requirements of Section 013300 – Contractor Submittals. The data and specifications for each pumping unit shall not be limited to the following:

1. Name of manufacturer.
2. Type and model of pump including design rotative speed, number of stages, type and line shaft bearings, shaft sizing.
3. Dimensions including size/length of pump column including required ID and OD by the pump and pump can, location and size of discharge outlet connections, weight, and max overall dimensions.
4. Performance curves showing capacity versus head, NPSH required, efficiency, and bhp requirements plotted on scales with unit clearly indicated. Provide VFD curves for each type of unit where a variable flow is required.

5. Also provide diagrams showing installation requirements including minimum clearances from nearby walls, adjacent pump units, distance of suction end from basin or floor bottom, and all other pertinent information required to review the pump unit for performance and installation for each application.

B. Provide operation and maintenance manuals and information in accordance with the requirements of Section 017823 – Operation and Maintenance Data.

1.5 WARRANTY

A. The warranty period shall be a non-prorated period of 12 months from date of installation, not to exceed 18 months from date of shipment.

1.6 QUALITY ASSURANCE

A. The pump manufacturer shall have at least five (5) similar installations in the US with a minimum of five (5) years of continuous operation.

PART 2 - PRODUCTS

2.1 PERFORMANCE

A. Pumping shall meet the requirements outlined in Division 26, including units utilizing a variable frequency drive (VFD).

B. Pump performance shall be stable and free from damaging cavitation, vibration, and noise within the design operating range.

C. It shall be the pump manufacturer's responsibility to compute and add the internal pump losses to the total head to determine the total dynamic head (bowl head) of the pump. The discharge shall be as shown on the plan drawings.

D. Efficiency of any alternate pump proposed shall be no more than 5% less efficient than the pump listed in the pump schedule for each application for all duty points. All internal pump losses shall be computed and accounted for by the pump manufacturer to deliver the design pressure range indicated in the pump schedule.

2.2 MATERIALS OF CONSTRUCTION

A. Bowl Assembly - The discharge bowl shall be of cast iron with a minimum tensile strength of 30,000 P.S.I. The impeller shall be cast bronze alloy 903 and held to the pump shaft by a key and thrust collars.

B. The bowl shaft shall be made from type 416 - PSQ stainless steel. Bronze bushings shall be provided immediately above and below the impeller.

C. Discharge Elbow - The elbow shall be of fabricated mild steel with a minimum thickness of ¼".

The elbow shall be 45° insert type as shown on the plan drawings.

D. The discharge connection shall be flanged with an ASA rating of 125#.

E. The lineshaft shall be made from type 416 - PSQ stainless steel.

F. An adjustable flanged coupling shall be provided for proper adjustment of the pump impeller and use with the horizontal electric motor.

G. Paint - The interior and exterior surfaces of the discharge elbow, column, and bowls shall be sandblasted clean and then given two coats of coal tar epoxy with minimum total dry film thickness of 16 mils. at finish.

H. Pump lubrication system shall be a positive clean water flush to all bearings. Enclosed stainless steel line shaft. A separate flush line to suction line bushing shall be provided and a packing box with gland.

I. Manufacturer shall review the installation location and conditions for each type of pump, and shall furnish any recommended accessories, to improve performance and minimize any issues with operating the pump.

2.3 ANCHOR BOLTS

A. Equipment manufacturer shall furnish all anchor bolts of ample size and strength required to securely anchor each item of equipment. Anchor bolts, hex nuts, and washers shall be # T-316 stainless steel unless noted otherwise. Anchor bolts shall be threaded rods with washers and nuts embedded. Expansion-type anchors will not be acceptable. Anchor bolt design shall be completed by a professional engineer licensed in the State of California and shall be included in the submittal.

B. Anchor bolts shall be set by the CONTRACTOR. Equipment shall be placed on the foundations, leveled, shimmed, bolted down, and grouted with a non-shrinking grout.

2.4 ACCEPTABLE MANUFACTURERS

A. All products must fully comply with these specifications. Standard product must be modified, if required, for compliance.

1. Cascade Pumps (Basis of Design)
2. Weir Floway, Inc.
3. Or Equal

PART 3 - EXECUTION

A. Pumps shall be installed per manufacturer’s recommendations including all auxiliary devices and accessories to minimize vibration, vortexing, cavitation, and otherwise facilitate and maximize the performance and reliable life of the pump unit.

B. Contractor shall coordinate electrical and controls requirement with the pump skid manufacturer to ensure a properly installed and operating pump system. The motor control (and VFD) portions of the pumps will be installed remotely from the pump skid and motors. Contractor is responsible to provide all wiring, conduit, controls, and other aspects to complete the installation of the pumps. All electrical components shall comply with the requirements outlined in Division 26 and Section 220513 – Common Motor Requirements for Plumbing Equipment.

C. All exterior installed items, including pumps, motors, valves, piping, wiring, and other components shall be suitable for exposed, outdoor installation including high ambient operating temperatures for the pump motors and exposure to direct sunlight.

D. Hydrostatic test of bowl, column, and discharge head shall be per Hydraulic Institute standards.

E. Pump shall be furnished with all typical spare parts (or spare parts kit) and any specialty tools as typically supplied and recommended by the pump manufacturer. Submittals shall provide a detailed list of all included spare parts, including party numbers and quantities of each item.

F. Pump supplier shall include services of a qualified representative for a minimum of two (2) trips and two (2) days to oversee the installation, startup, testing, and training of operator personnel. Refer to Section 017900 – Demonstration and Training for details on startup requirements.

END OF SECTION 432420

Attachment G

Pump Schedule (Sheet SCH-12 of Volume 4A)
With Specification Sections Referenced

PUMP SCHEDULE

P#	LOCATION	SERVICE	TYPE	HP (KW)	FLOW (GPM)	TDH	REMARKS	SECTION
52-P-1101	DEEP BED FILTER	REUSE MEMBRANE FILTER FEED PUMP	VERTICAL TURBINE (EXISTING)	75	490 TO 1,150 GPM	70 PSI	WEIR MINERALS MODEL 12DKH 1770 OR EQUAL - EXISTING PUMP	N/A
52-P-1102	DEEP BED FILTER	REUSE MEMBRANE FILTER FEED PUMP	VERTICAL TURBINE (EXISTING)	75	490 TO 1,150 GPM	70 PSI	WEIR MINERALS MODEL 12DKH 1770 OR EQUAL - EXISTING PUMP	N/A
52-P-1013	DEEP BED FILTER	REUSE MEMBRANE FILTER FEED PUMP	VERTICAL TURBINE	125	1.150 TO 2,240 GPM	70 PSI	WEIR FLOWAY MODEL 15DKL 2-STAGE OR EQUAL	432413
52-P-1014	DEEP BED FILTER	REUSE MEMBRANE FILTER FEED PUMP	VERTICAL TURBINE	125	1.150 TO 2,240 GPM	70 PSI	WEIR FLOWAY MODEL 15DKL 2-STAGE OR EQUAL	432413
DP-P-1	UV AWNING (SALVAGE TO OWNER)	REUSE WATER DISTRIBUTION PUMP	VERTICAL TURBINE	75	0.7 TO 1.4 MGD	90 PSI	EXISTING PUMP - SALVAGE TO OWNER	N/A
DP-P-2	UV AWNING (SALVAGE TO OWNER)	REUSE WATER DISTRIBUTION PUMP	VERTICAL TURBINE	75	0.7 TO 1.4 MGD	90 PSI	EXISTING PUMP - SALVAGE TO OWNER	N/A
52-P-1221	UV AWNING	MMWD CLEARWELL SUPPLY	VERTICAL TURBINE	75	1.3 TO 2.7 MGD	42 PSI	WEIR FLOWAY MODEL 15DKL OR EQUAL	432413
52-P-1222	UV AWNING	MMWD CLEARWELL SUPPLY	VERTICAL TURBINE	75	1.3 TO 2.7 MGD	42 PSI	WEIR FLOWAY MODEL 15DKL OR EQUAL	432413
52-P-1223	UV AWNING	MMWD CLEARWELL SUPPLY	VERTICAL TURBINE	75	1.3 TO 2.7 MGD	42 PSI	WEIR FLOWAY MODEL 15DKL OR EQUAL	432413
23-P-1100	PRIMARY PUMP STATION	LOW FLOW PROCESS FEED PUMP	MIXED FLOW	20	0.5-3.5 MGD	24 FT	CASCADE MF 1006-AA4 MIXED FLOW PUMP OR EQUAL	432415
23-P-1200	PRIMARY PUMP STATION	LOW FLOW PROCESS FEED PUMP	MIXED FLOW	20	0.5-3.5 MGD	24 FT	CASCADE MF 1006-AA4 MIXED FLOW PUMP OR EQUAL	432415
23-P-1300	PRIMARY PUMP STATION	HIGH FLOW PROCESS FEED PUMP	MIXED FLOW	40	3.0 - 6.0 MGD	23 FT	CASCADE MF 1406-CD4 MIXED FLOW PUMP W/ 16" FLANGE CONNECTION OR EQUAL	432415
23-P-1400	PRIMARY PUMP STATION	HIGH FLOW PROCESS FEED PUMP	MIXED FLOW	40	3.0 - 6.0 MGD	23 FT	CASCADE MF 1406-CD4 MIXED FLOW PUMP W/ 16" FLANGE CONNECTION OR EQUAL	432415
23-P-1500	PRIMARY PUMP STATION	HIGH FLOW PROCESS FEED PUMP	MIXED FLOW	40	3.0 - 6.0 MGD	23 FT	CASCADE MF 1406-CD4 MIXED FLOW PUMP W/ 16" FLANGE CONNECTION OR EQUAL	432415
36-P-1100	AERATION BASIN - EFFLUENT CHANNEL	AERATION BASIN INTERNAL RECYCLE PUMP	AXIAL FLOW	20	3.2 - 6.4 MGD	2-9 FT	CASCADE 12AF HORIZONTAL DESIGN	432420
36-P-1200	AERATION BASIN - EFFLUENT CHANNEL	AERATION BASIN INTERNAL RECYCLE PUMP	AXIAL FLOW	20	3.2 - 6.4 MGD	2-9 FT	CASCADE 12AF HORIZONTAL DESIGN	432420
36-P-1300	AERATION BASIN - EFFLUENT CHANNEL	AERATION BASIN INTERNAL RECYCLE PUMP	AXIAL FLOW	20	3.2 - 6.4 MGD	2-9 FT	CASCADE 12AF HORIZONTAL DESIGN	432420
51-P-2100	RWTF DISTRIBUTION PUMP STATION	NMWD DISTRIBUTION PUMP	VERTICAL INLINE CENTRIFUGAL	150	525 TO 1,000 GPM	90 - 160 PSI	GOULDS MODEL 3410-V S SIZE 4X6-11 OR EQUAL	432323
51-P-2200	RWTF DISTRIBUTION PUMP STATION	NMWD/MMWD STANDY PUMP	VERTICAL INLINE CENTRIFUGAL	150	525 TO 1,000 GPM	90 - 160 PSI	GOULDS MODEL 3410-V S SIZE 4X6-11 OR EQUAL	432323
51-P-2300	RWTF DISTRIBUTION PUMP STATION	MMWD DISTRIBUTION PUMP	VERTICAL INLINE CENTRIFUGAL	150	525 TO 1,000 GPM	90 - 160 PSI	GOULDS MODEL 3410-V S SIZE 4X6-11 OR EQUAL	432323
51-P-2400	RWTF DISTRIBUTION PUMP STATION	MMWD DISTRIBUTION PUMP	VERTICAL INLINE CENTRIFUGAL	150	525 TO 1,000 GPM	90 - 160 PSI	GOULDS MODEL 3410-V S SIZE 4X6-11 OR EQUAL	432323
P-1C	POND RETURN PUMP STATION	POND RETURN TO RWF	SUBMERSIBLE	20	1.6 MGD	32 FT	XYLEM FLIGHT NP3153 LT3-414 OR EQUAL	432513
P-1D	POND RETURN PUMP STATION	POND RETURN TO RWF	SUBMERSIBLE	20	1.6 MGD	32 FT	XYLEM FLIGHT NP3153 LT3-414 OR EQUAL	432513
P-1E	POND RETURN PUMP STATION	POND RETURN TO RWF	SUBMERSIBLE	20	1.6 MGD	32 FT	XYLEM FLIGHT NP3153 LT3-414 OR EQUAL	432513
61-P-1100	WAS PUMP STATION	WAS FEED PUMP	PROGRESSIVE CAVITY	3	60 GPM	40 FT	SEEPEX MODEL BN 17-6LS OR EQUAL	432357
61-P-1200	WAS PUMP STATION	WAS FEED PUMP	PROGRESSIVE CAVITY	3	60 GPM	40 FT	SEEPEX MODEL BN 17-6LS OR EQUAL	432357
61-P-1300	PROCESS BASIN DRAIN SUMP	BASIN DRAIN PUMP	SUBMERSIBLE CENTRIFUGAL	10	600 GPM	42 FT	XYLEM FLIGHT NP 3127 HT3 ~ 488 NO EQUAL	432513
23-P-2300	DEEP BED FILTER	STORM DRAIN PUMP	SUBMERSIBLE CENTRIFUGAL	10	600 GPM	42 FT	XYLEM FLIGHT NP 3127 HT3 ~ 488 NO EQUAL	432513
23-P-2200	DEEP BED FILTER	STORM DRAIN PUMP	SUBMERSIBLE CENTRIFUGAL	10	600 GPM	42 FT	XYLEM FLIGHT NP 3127 HT3 ~ 488 NO EQUAL	432513
23-P-2100	DEEP BED FILTER	STORM DRAIN PUMP	SUBMERSIBLE CENTRIFUGAL	10	600 GPM	42 FT	XYLEM FLIGHT NP 3127 HT3 ~ 488 NO EQUAL	432513
44-P-1800	UV DISINFECTION BUILDING - BIOASSAY ROOM	EFFLUENT SAMPLE (FUTURE)	CENTRIFUGAL	115	2-20 GPM	26	GRUNDFOS SCALA2 (FUTURE)	N/A
43-P-1400	UV DISINFECTION BUILDING	DECHLOR CHEMICAL DOSING PUMP	PERISTALTIC	120VAC	158 GPH	30 PSIG	BLUE WHITE FLEX-PRO PROSERIES-M MODEL M-424-MNKKL-R-C4 NO EQUAL	437565
43-P-1500	UV DISINFECTION BUILDING	DECHLOR CHEMICAL DOSING PUMP	PERISTALTIC	120VAC	158 GPH	30 PSIG	BLUE WHITE FLEX-PRO PROSERIES-M MODEL M-424-MNKKL-R-C4 NO EQUAL	437565
44-P-2100	SC EFFLUENT TO UV METER VAULT	METER VAULT SUMP PUMP	SUBMERSIBLE	0.5 (120V)	50 GPM	20 FT	GOULDS 1DW - 0.5 HP SS BODY SUMP PUMP W/ INTEGRATED FLOAT OR EQUAL	N/A
51-P-1110	RWTF WATER STORAGE METER VAULT	METER VAULT SUMP PUMP	SUBMERSIBLE	0.5 (120V)	50 GPM	20 FT	GOULDS 1DW - 0.5 HP SS BODY SUMP PUMP W/ INTEGRATED FLOAT OR EQUAL	N/A
62-P-2300	MECHANICAL THICKENING AREA	THICKENED SLUDGE PUMP	PROGRESSIVE CAVITY	7.5	30 GPM	100 PSIG	SEEPEX MODEL BT10-12 OR EQUAL	432357
62-P-2300A	SHELF SPARE	THICKENED SLUDGE PUMP	PROGRESSIVE CAVITY	7.5	30 GPM	100 PSIG	SEEPEX MODEL BT10-12 OR EQUAL	432357
43-P-1100	DECHLOR DOSING FACILITY	DECHLORINATION DOSING PUMP	PERISTALTIC	120VAC	158 GPH	30 PSIG	BLUE WHITE FLEX-PRO PROSERIES-M MODEL M-424-MNKKL-R-C4 NO EQUAL	437565
43-P-1200	DECHLOR DOSING FACILITY	DECHLORINATION DOSING PUMP	PERISTALTIC	120VAC	158 GPH	30 PSIG	BLUE WHITE FLEX-PRO PROSERIES-M MODEL M-424-MNKKL-R-C4 NO EQUAL	437565
43-P-1300	DECHLOR DOSING FACILITY	DECHLORINATION DOSING PUMP	PERISTALTIC	120VAC	158 GPH	30 PSIG	BLUE WHITE FLEX-PRO PROSERIES-M MODEL M-424-MNKKL-R-C4 NO EQUAL	437565
43-P-2100	YARD - DECHLOR INJECTION POINT	PRE DECHLOR SAMPLING PUMP	CENTRIFUGAL	0.5/120 VAC	2.5 GPM	65 FT	PENTAIR STA-RITE MODEL P6E6C-204L OR APPROVED EQUAL	N/A
43-P-2200	YARD - DECHLOR INJECTION POINT	POST DECHLOR SAMPLING PUMP	CENTRIFUGAL	0.5/120 VAC	2.5 GPM	65 FT	PENTAIR STA-RITE MODEL P6E6C-204L OR APPROVED EQUAL	N/A
41-P-2100	HYPOCHLORITE PUMP BUILDING	HYPOCHLORITE DOSING PUMP	PERISTALTIC	120VAC	158 GPH	30 PSIG	BLUE WHITE FLEX-PRO PROSERIES-M MODEL M-424-M-NL TUBE NO EQUAL	437565
41-P-2200	HYPOCHLORITE PUMP BUILDING	HYPOCHLORITE DOSING PUMP	PERISTALTIC	120VAC	158 GPH	30 PSIG	BLUE WHITE FLEX-PRO PROSERIES-M MODEL M-424-M-NL TUBE NO EQUAL	437565
41-P-2300	HYPOCHLORITE PUMP BUILDING	HYPOCHLORITE DOSING PUMP	PERISTALTIC	120VAC	158 GPH	30 PSIG	BLUE WHITE FLEX-PRO PROSERIES-M MODEL M-424-M-NL TUBE NO EQUAL	437565
41-P-2400	CCC WEIR BOX	PRIMARY HCL SAMPLING PUMP	CENTRIFUGAL	0.5/120 VAC	2.5 GPM	65 FT	EXISTING PUMP TO REMAIN IN PLACE	N/A
41-P-2500	WATER STORAGE SAMPLING POINT	BYPASS HCL SAMPLING PUMP	CENTRIFUGAL	0.5/120 VAC	2.5 GPM	65 FT	PENTAIR STA-RITE MODEL P6E6C-204L OR APPROVED EQUAL	N/A
41-P-2511	SHELF SPARE	SHELF SPARE	CENTRIFUGAL	0.5/120 VAC	2.5 GPM	65 FT	PENTAIR STA-RITE MODEL P6E6C-204L OR APPROVED EQUAL	N/A
52-P-3110	RWTF MEMBRANE BUILDING AWNING	CITRIC ACID CHEMICAL DOSING PUMP	PERISTALTIC	120VAC	158 GPH	30 PSIG	BLUE WHITE FLEX-PRO PROSERIES-M MODEL M-324-TK NO EQUAL	437565
52-P-3120	RWTF MEMBRANE BUILDING AWNING	SODIUM HYDROXIDE CHEMICAL DOSING PUMP	PERISTALTIC	120VAC	158 GPH	30 PSIG	BLUE WHITE FLEX-PRO PROSERIES-M MODEL M-324-TK NO EQUAL	437565

Attachment H

Revised Bid Schedule Sheet
From Volume 2 Bid Schedule

Item No.	Description	WBS Code	Units	Cost
16.a	**Owner Selected Equipment Item (FFAS)**	N/A	LS	**$2,152,746.66**
	Item #16.a, in Written Form			
16.b	**Owner Selected Equipment Item (Eductor Tube Mixers)**	N/A	LS	**$77,206.50**
	Item #16.b, in Written Form			
16.c	**Owner Selected Equipment Item (Secondary Clarifiers)**	N/A	LS	**$377,014.00**
	Item #16.c, in Written Form			
16.d	**Owner Selected Equipment Item (GE Pressure Membranes)**	N/A	LS	**$1,606,086.26**
	Item #16.d, in Written Form			

Attachment I

New and Revised Design Drawings From Volume 4A

Sheet C-5
Sheet C-9
Sheet C-13
Sheet C-21
Sheet C-50 (NEW)
Sheet PSM-1
Sheet PSM-3
Sheet PSM-5

MATCHLINE SEE SHEET C-4

Type 'E' Curbing is no longer required along this section. Rather, Preserve and Protect Existing Block wall.

GRADING PLAN

SCALE: 1"=20'-0"
0 20 40
Scale in Feet

SITE GRADING LEGEND

- NEW ASPHALT
- NEW CONCRETE
- NEW PERMEABLE SIDEWALK
- NEW STRUCTURE

NOTES:

1. – SAW CUT, PROVIDE CLEAN EDGE.
2. – MATCH EXISTING ELEVATION.
3. – EXISTING, RAISE RIM/VAULT ELEVATION TO MATCH NEW GRADE.
4. – PIPE BOLLARD. 120/CD-4
5. – ASPHALT PAVING OVER BASE COURSE. 108/CD-2
6. – PERVIOUS CONCRETE. 110/CD-2
7. – CONSTRUCT GAUNTLET FENCE. 145/CD-7
7B – CONSTRUCT CHAIN LINK FENCE. 146/CD-9
8. – RETAINING WALL. SEE SHEET C-43
9. – NEW CATCH BASIN. 104/CD-2, 105/CD-2
10. – NEW SLAB ON GRADE, SEE STRUCTURAL DWGS.
11. – TYPE A CURB.
12. – NATIVE RESEEDING, SEE SPECIFICATIONS.
13. – BID ALTERNATE ASPHALT.
14. – TYPE E CURB. 112/CD-3
15. – TYPE D CURB AND GUTTER. 117/CD-3
16. – SLIDE GATE. 145/CD-7
17. – SWING GATE. 146/CD-9
18. – CONCRETE APPROACH. 121/CD-4.
19. – CONCRETE LANDING. 122/CD-4
20. – PRESERVE AND PROTECT EXISTING MANHOLE, CATCH BASIN, OR VAULT.
21. – REPLACE CATCH BASIN TO ACCOMODATE NEW STORM DRAIN PIPE. 104-105/CD-2.
22. – GRADED TRAIL. PROVIDE 6" DEEP CRUSHER FINE MATERIAL – SEE SECTION 3112000.
23. – REDWOOD HEADER 137/CD-6.
24. – CURB INLET. 106/CD-2.
25. – SIDEWALK 107/CD-2.

PLOTTED: 07/23/2018 X:\Las Gallinas\LASG150119-Secondary Treatment Upgrades\Drafting\Civil\C-4, C-5.dwg
SAVED:

PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR:	No.
RED	0.70MM
YELLOW	0.20MM
GREEN	0.25MM
CYAN	0.40MM
BLUE	0.50MM
MAGENTA	0.20MM
WHITE	0.35MM
GRAY	0.15MM
9	0.15MM
10	1.00MM
100	0.70MM
210	0.60MM

LGVSD 1 FILE: FD144793

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4

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NO.	DATE	DESCRIPTION	BY	APPR'D

REVISIONS

WBS 120

CHECKED	DRAWN	SCALE
JRL	DCH	AS SHOWN
APPROVED	DESIGNED	DATE
JRL	EES	07/26/18
GENERAL MANAGER: Chris DeGabriele	DISTRICT ENGINEER: Michael P Cortez, RCE # 54039	
SHEET	PLAN NO.	DRAWING NO. C-5 / REVISION NO. B

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT AND RW EXPANSION

CIVIL
GRADING PLAN

MATCHLINE SEE SHEET C-8

MATCHLINE SEE SHEET C-12

THICKENER

ADD VALVE ON EX 6" LINE
SEE SHEET C-50

REPLACE VALVE IN
THICKENER PUMP PIT
SEE SHEET C-50

9 C-24 SIMILAR TO DETAIL USE "TEE" INSTEAD OF "WYE"

9 C-24 PIPE CONNECTION SEE DETAIL

128B C-6

26 C-26 PIPE CONNECTION SEE DETAIL

130 C-23

107 C-6

128 C-23

128A C-23

129 C-23

PIPE CONNECTION 27 C-26 SEE DETAIL

DEEP BED FILTERS

109 C-6

RWTF BUILDING

13 C-25 PIPE CONNECTION SEE DETAIL

108 C-6

PRIMARY CLARIFIER #2

MECHANICAL THICKENERS SEE MTS-1

CAP (3) 1" PVC CL LINES

PLUG AND CAP 20" W.S. BYPASS LINE

CAP (3) 3"x1" CPV LINES

PLUG AND CAP ABANDONDED W.S. 18" BYPASS LINE

5 C-24 PIPE CONNECTION SEE DETAIL

15 C-25 PIPE CONNECTION SEE DETAIL

REPLACE 1.5" NPW AS REQUIRED TO ACCOMMODATE REMOVAL OF PUMP STATION BOX.

SECONDARY CLARIFIER #2 SEE SCS-2

MATCHLINE SEE SHEET C-10

NOTES:

1- PROVIDE MINIMUM 2' COVER FOR POTABLE, NPW, AND CHEMICAL LINES.

NPW HYDRANT LEGEND:

(1) - INSTALL NEW 3" YARD HYDRANT PER DETAIL 129/CD-5 WITH HOSE RACK PER DETAIL 513/MD-4.

(2) - CONNECT NEW NPW TO EXISTING HOSE BIB OR YARD HYDRANT.

(3) - CONNECT NPW TO SEAL WATER SYSTEM FOR PUMPS.

(4) - CONNECT NPW TO ABOVE GROUND NPW LOOP.

YARD PIPING PLAN

SCALE: 1"=10'-0"

0 10 20

Scale In Feet

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NO.	DATE	DESCRIPTION	BY	APPR'D
1	9/13/18	DRAWING HAS BEEN REVISED	DCH	EES

REVISIONS

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT AND RW EXPANSION

CIVIL
YARD PIPING PLAN

WBS	CHECKED	DRAWN	SCALE
130	JRL	DCH	AS SHOWN
	APPROVED: JRL	DESIGNED: EES	DATE: 07/26/18
	GENERAL MANAGER: Chris DeGabriele	DISTRICT ENGINEER: Michael P Cortez RCE # 54039	
	SHEET	PLAN NO.	DRAWING NO. C-9
			REVISION NO. B

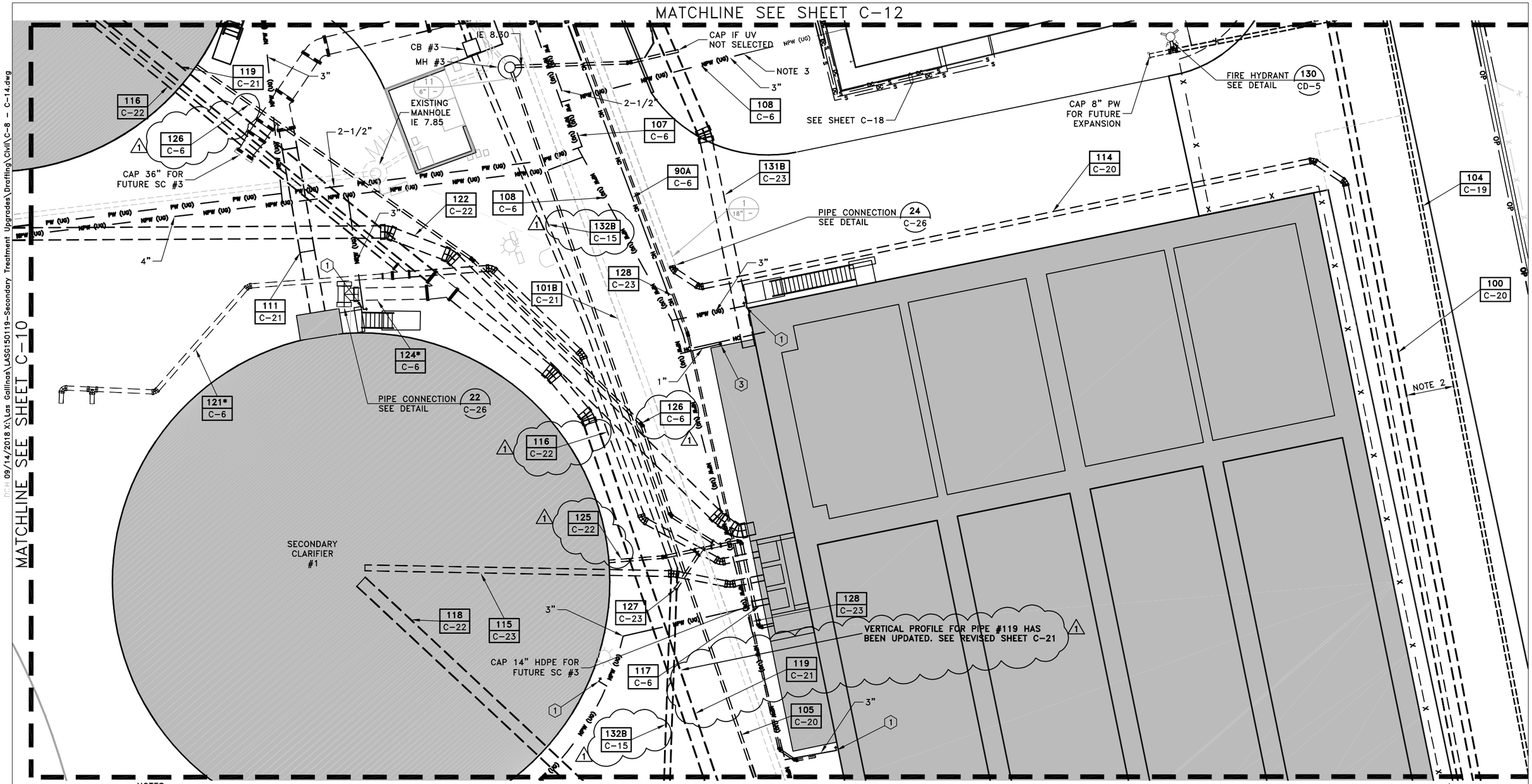
PLOTTED: 09/13/2018 X:\Las Gallinas\LASG150119-Secondary Treatment Upgrades\Drafting\Civil\C-8 - C-14.dwg
SAVED:

PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR:	No.
RED	0.70MM
YELLOW	0.20MM
GREEN	0.25MM
CYAN	0.40MM
BLUE	0.50MM
MAGENTA	0.20MM
WHITE	0.35MM
GRAY	0.15MM
9	0.15MM
10	1.00MM
100	0.70MM
210	0.60MM

LGVSD 1 FILE: FD144793

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4



NOTES:

1– PROVIDE MINIMUM 2' COVER FOR POTABLE, NPW, AND CHEMICAL LINES.

2– PROVIDE MIN 10' HORIZONTAL SEPARATION BETWEEN PIPE 100 AND 104.

3– CAP NPW/PW LINES FOR FUTURE UV BUILDING, IF UV BUILDING ALTERNATE IS NOT SELECTED.

4– SEE SHEET C–18 FOR UV BID ALTERNATE YARD PIPING.

* PIPES 121 AND 124 ARE TEMPORARY LINES CONNECTING TO THE PREVIOUS SECONDARY CLARIFIER (NOT SHOWN IN THIS PLAN) AND WILL BE REMOVED WITH THE OLD CLARIFIER STRUCTURE.

NPW HYDRANT LEGEND:

(1) – INSTALL NEW 3" YARD HYDRANT PER DETAIL 129/CD–5 WITH HOSE RACK PER DETAIL 513/MD–4.

(2) – CONNECT NEW NPW TO EXISTING HOSE BIB OR YARD HYDRANT.

(3) – CONNECT NPW TO SEAL WATER SYSTEM FOR PUMPS.

(4) – CONNECT NPW TO ABOVE GROUND NPW LOOP.

YARD PIPING PLAN

SCALE: 1"=10'–0"

0 10 20

Scale In Feet

ROUTING HAS BEEN UPDATED FOR THE FOLLOWING LINES:
#116 (SC#2 RAS)
#126 (SC#2 SCUM)
#132B (STORM DRAIN)
#125 (SC#1 SCUM)

1

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LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT AND RW EXPANSION

CIVIL
YARD PIPING PLAN

WBS	CHECKED	DRAWN	SCALE
130	JRL	DCH	AS SHOWN
	APPROVED: JRL	DESIGNED: EES	DATE: 07/26/18
	GENERAL MANAGER: Chris DeGabriele	DISTRICT ENGINEER: Michael P Cortez, RCE # 54039	

NO.	DATE	DESCRIPTION	BY	APPR'D
1	9/13/18	DRAWING HAS BEEN REVISED	DCH	EES

REVISIONS

SHEET | PLAN NO. | DRAWING NO. C–13 | REVISION NO. B

PLOTTED: 09/14/2018 X:\Las Gallinas\LASG150119-Secondary Treatment Upgrades\Drafting\Civil\C-8 – C-14.dwg
SAVED:

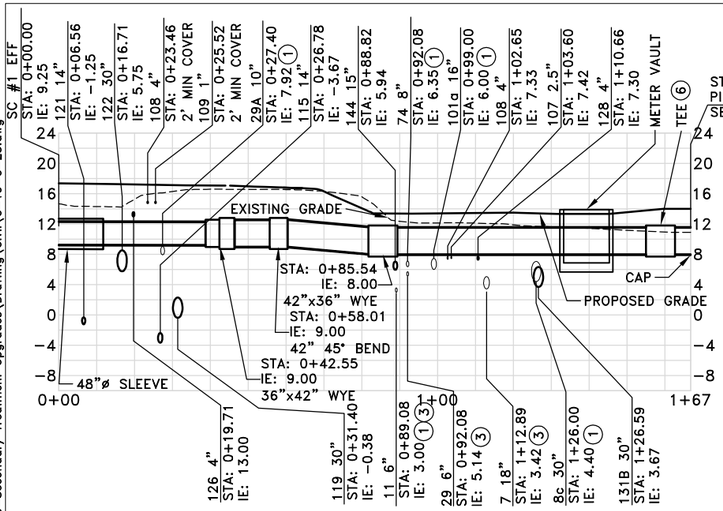
PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR:	No.
RED	0.70MM
YELLOW	0.20MM
GREEN	0.25MM
CYAN	0.40MM
BLUE	0.50MM
MAGENTA	0.20MM
WHITE	0.35MM
GRAY	0.15MM
9	0.15MM
10	1.00MM
100	0.70MM
210	0.60MM

LGVSD 1 FILE: FD144793

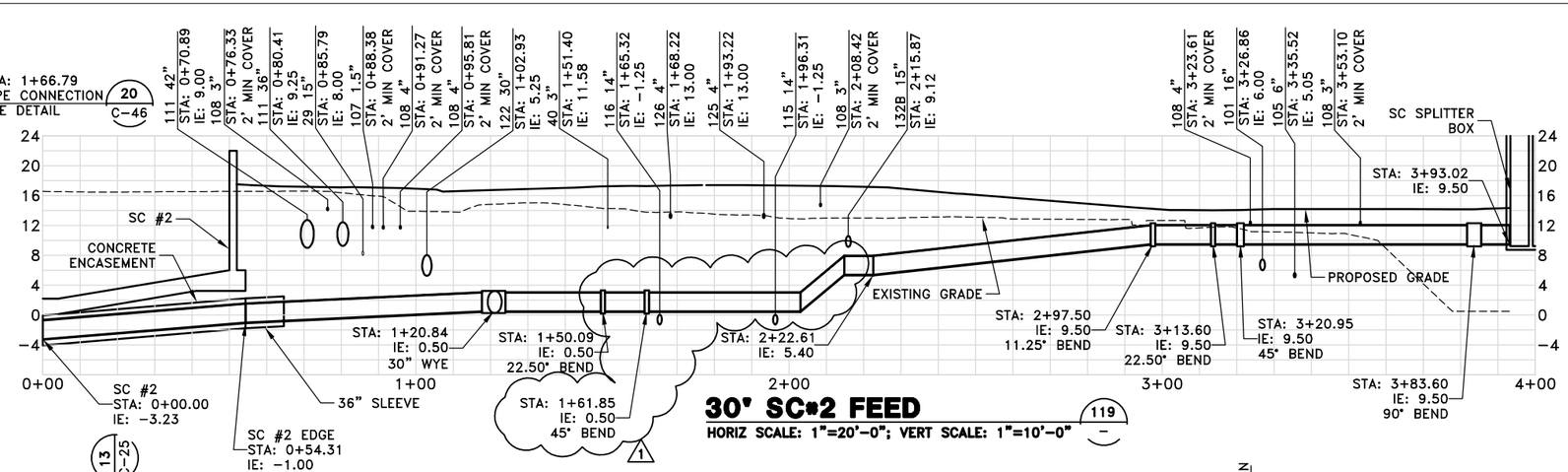
FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4

ADDENDUM 4



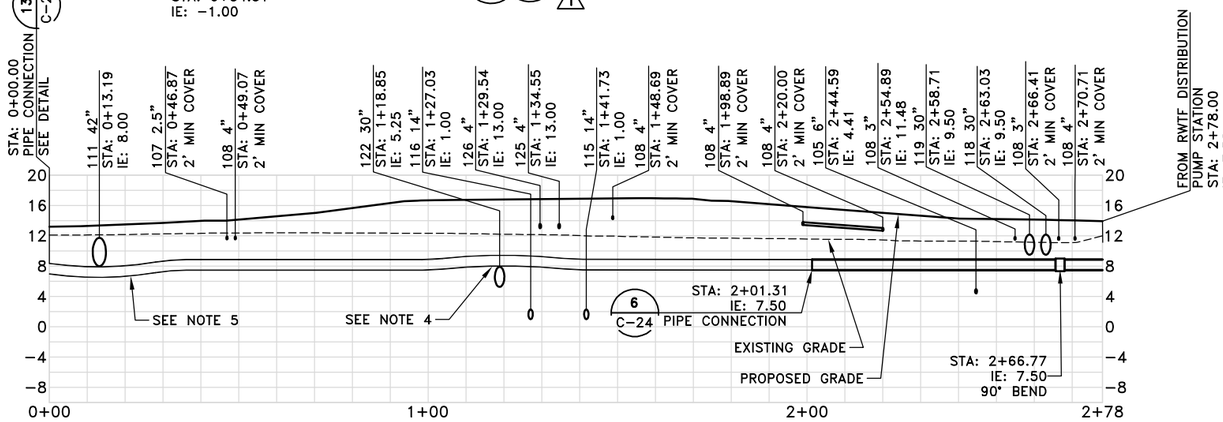
36"&42" SC#1 EFFLUENT TO DISINFECTION (111)

HORIZ SCALE: 1"=20'-0"; VERT SCALE: 1"=10'-0"



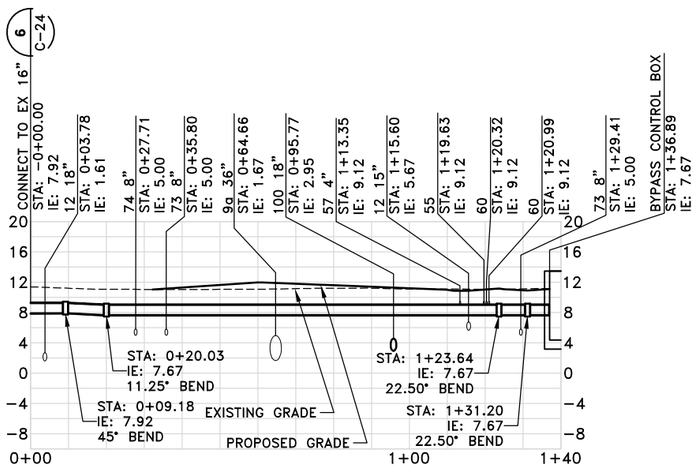
30" SC#2 FEED (119)

HORIZ SCALE: 1"=20'-0"; VERT SCALE: 1"=10'-0"



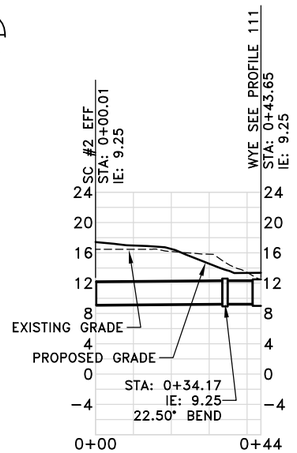
16" NMWD DIST LINES (101)

HORIZ SCALE: 1"=20'-0"; VERT SCALE: 1"=10'-0"



16" MMWD POND RETURN (103)

HORIZ SCALE: 1"=20'-0"; VERT SCALE: 1"=10'-0"



36" SC#2 EFFLUENT (112)

HORIZ SCALE: 1"=20'-0"; VERT SCALE: 1"=10'-0"

NOTES:

1. INVERT ELEVATIONS HAVE NOT BEEN CONFIRMED.
2. CONTRACTOR TO LOOP EXISTING SERVICE LINES AS REQUIRED TO ACCOMMODATE NEW PIPING.
3. TO BE ABANDONED; REMOVE AS REQUIRED.
4. SHIFT EX 16" HDPE UP AS REQUIRED TO PASS ABOVE 30" LINE. CUT AND REROUTE LINE IF NECESSARY.
5. SHIFT EX 16" HDPE DOWN AS REQUIRED TO PASS UNDER 42" LINE. CUT AND REROUTE LINE IF NECESSARY.
6. CONNECT LINE 111 TO HCL OR UV DISINFECTION DEPENDING ON SELECTED OPTION.

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1	9/13/18	DRAWING HAS BEEN REVISED	DCH	EES

REVISIONS

WBS 130

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT AND RW EXPANSION

CIVIL
YARD PIPING PROFILES

CHECKED	DRAWN	SCALE
JRL	DCH	AS SHOWN
APPROVED	DESIGNED	DATE
JRL	EES	07/26/18
GENERAL MANAGER: Chris DeGabriele	DISTRICT ENGINEER: Michael P Cortez, RCE # 54039	

SHEET	PLAN NO.	DRAWING NO.	REVISION NO.
		C-21	B

DCH 09/13/2018 X:\Las Gallinas\LASG150119-Secondary Treatment Upgrades\Drafting\Civil\C-19-C-23.dwg

PLOTTED:
SAVED:

PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR:	No.
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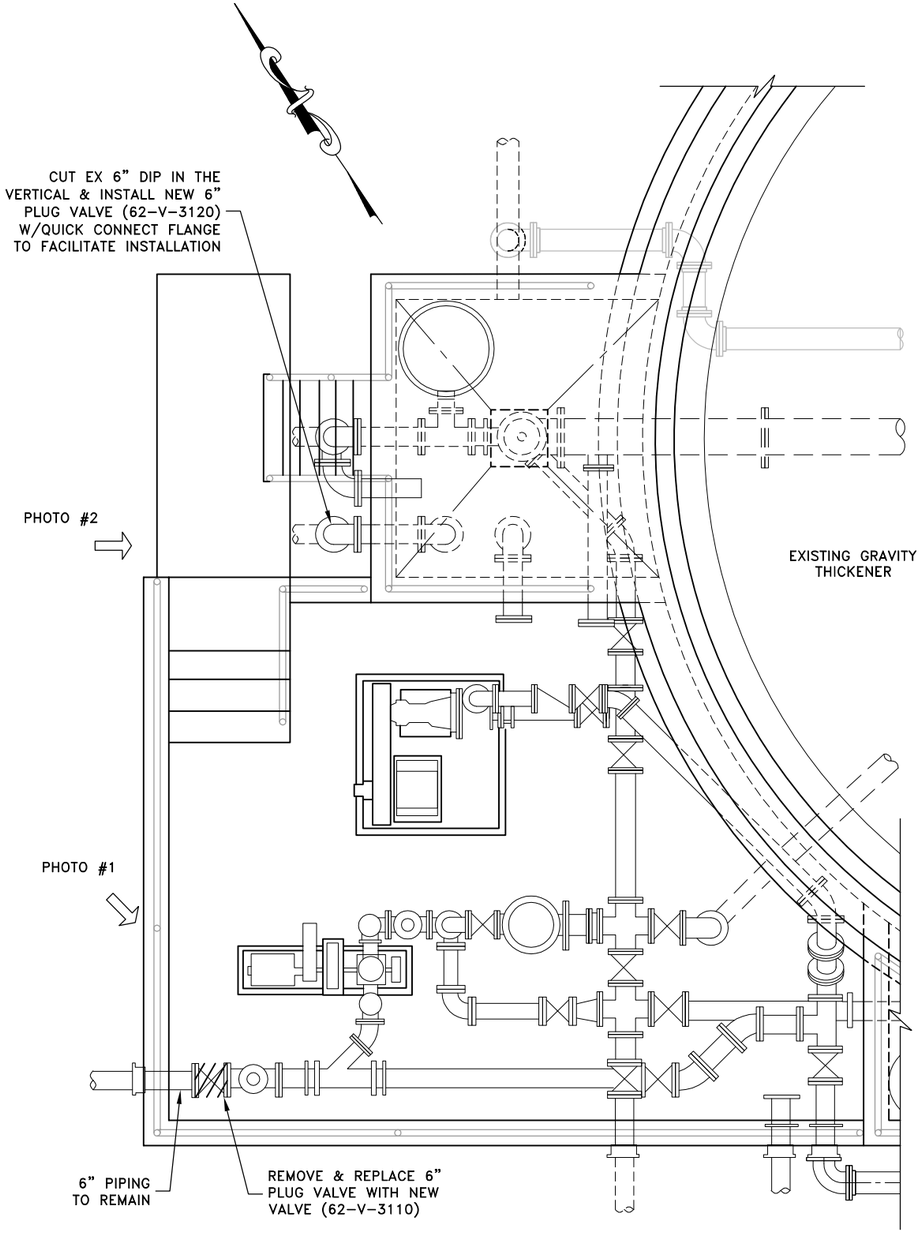
YELLOW	0.20MM
GREEN	0.25MM
CYAN	0.40MM
BLUE	0.50MM
MAGENTA	0.20MM
WHITE	0.35MM
GRAY	0.15MM
9	0.15MM
10	1.00MM
100	0.70MM
210	0.60MM

LGVSD 1 FILE: FD144793

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4

ADDENDUM 4



SLUDGE TRANSFER MODIFICATION PLAN

SCALE: 1/2"=1'-0"

0 2 4
Scale in Feet

PHOTO 1

NOTE:

1- PRESERVE & PROTECT EXISTING CONCRETE & ALL OTHER STRUCTURES, PIPING, AND VALVES THAT ARE TO REMAIN.

NEW SHEET ADDED

PHOTO 2

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NO.	DATE	DESCRIPTION	BY	APPR'D

REVISIONS

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT AND RW EXPANSION

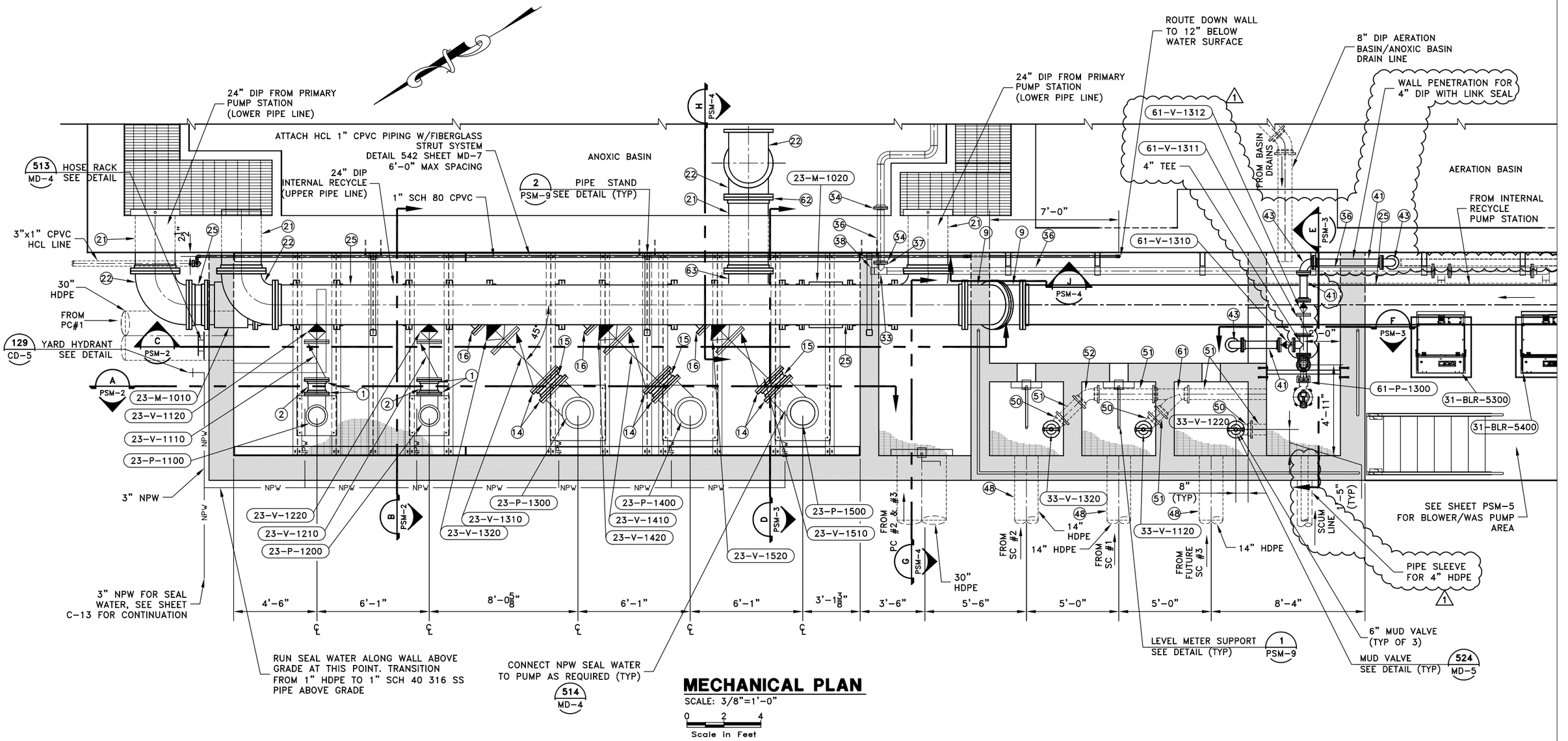
SLUDGE TRANSFER PIPING MODIFICATIONS

CHECKED	DRAWN	SCALE
JRL	SSB	AS SHOWN
APPROVED	DESIGNED	DATE
JRL	EES	09/14/18

GENERAL MANAGER: Chris DeGabriele
DISTRICT ENGINEER: Michael P Cortez, RCE # 54039

SHEET	PLAN NO.	DRAWING NO.	REVISION NO.
		C-50	B

ADDENDUM 4



MECHANICAL PLAN

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

0 2 4

Scale in Feet

NOTES:

1- FOR PIPE SCHEDULE SEE SHEET AM-8.

2- FOR PUMP AND VALVE SCHEDULES SEE SHEETS SCH-5 THRU SCH-13.

3- PROVIDE PIPE SUPPORTS AT LOCATIONS INDICATED WITH AN "X" AND AS REQUIRED. SEE STANDARD DETAILS.

4- ALL BOLTED CONNECTIONS SHALL USE 316 SS. ALL ANCHORS AND HARDWARE SHALL BE 316 SS. BURIED CONNECTIONS SHALL USE 316 SS BOLTS W/ZINC CAPS.

5- REFER TO SECTION 098000 FOR PROTECTIVE COATING REQUIREMENTS.

6- ALL HDPE FITTINGS TO BE FUSION WELDED UNLESS NOTED OTHERWISE.

7- OVERLYING WALKWAY FOR ANOXIC BASIN NOT SHOWN FOR CLARITY.

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LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT AND RW EXPANSION

PRIMARY PUMP STATION MECHANICAL PLAN

WBS	CHECKED	DRAWN	SCALE
230	JRL	CAL	AS SHOWN
	APPROVED JRL	DESIGNED EES	DATE 07/26/18
	GENERAL MANAGER Chris DeGabriele	DISTRICT ENGINEER Michael P Cortez RCE # 54038	

NO.	DATE	DESCRIPTION	BY	APPR'D
1	09/18		EES	JRL

REVISIONS

SHEET	PLAN NO.	DRAWING NO.	REVISION NO.
		PSM-1	B

SSB 09/14/2018 X:\Las Gallinas\LASG150119-Secondary Treatment Upgrades\Drafting\STM\PSM-1.dwg

PLOTTED:
SAVED:

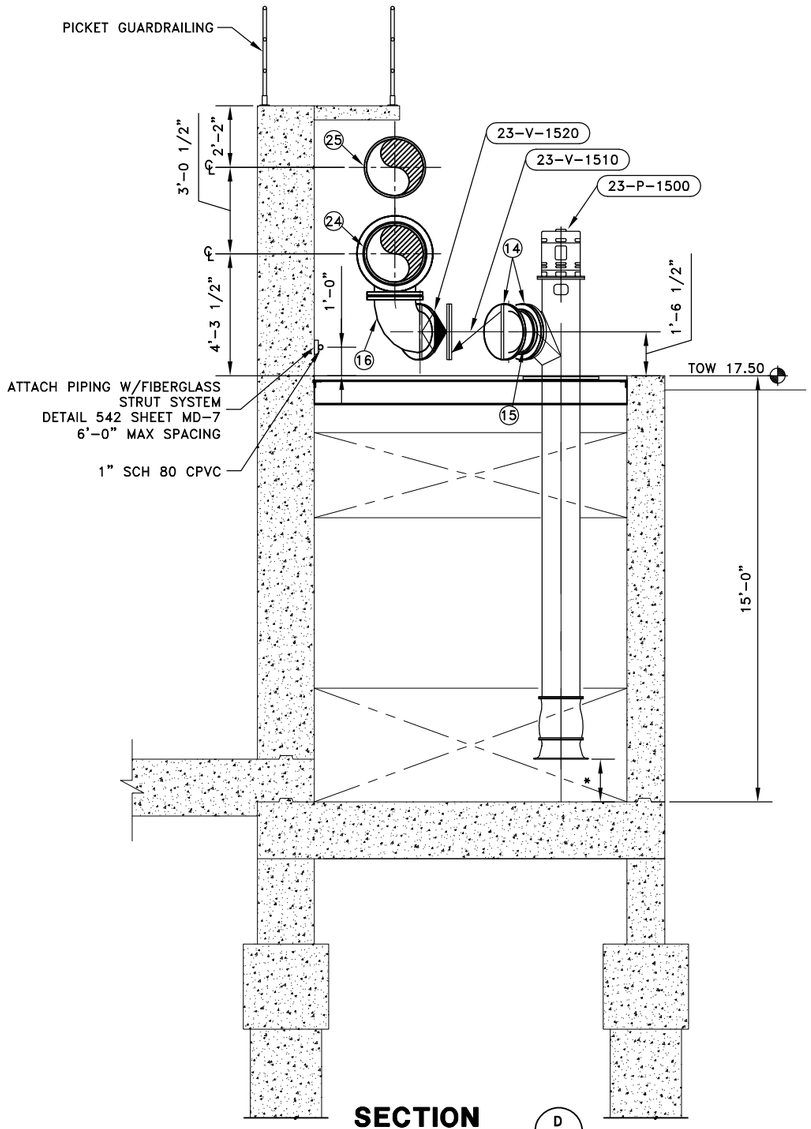
PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR: No.
RED 0.70MM
YELLOW 0.20MM
GREEN 0.25MM
CYAN 0.40MM
BLUE 0.50MM
MAGENTA 0.20MM
WHITE 0.35MM
GRAY 0.15MM
9 0.15MM
10 1.00MM
100 0.70MM
210 0.60MM

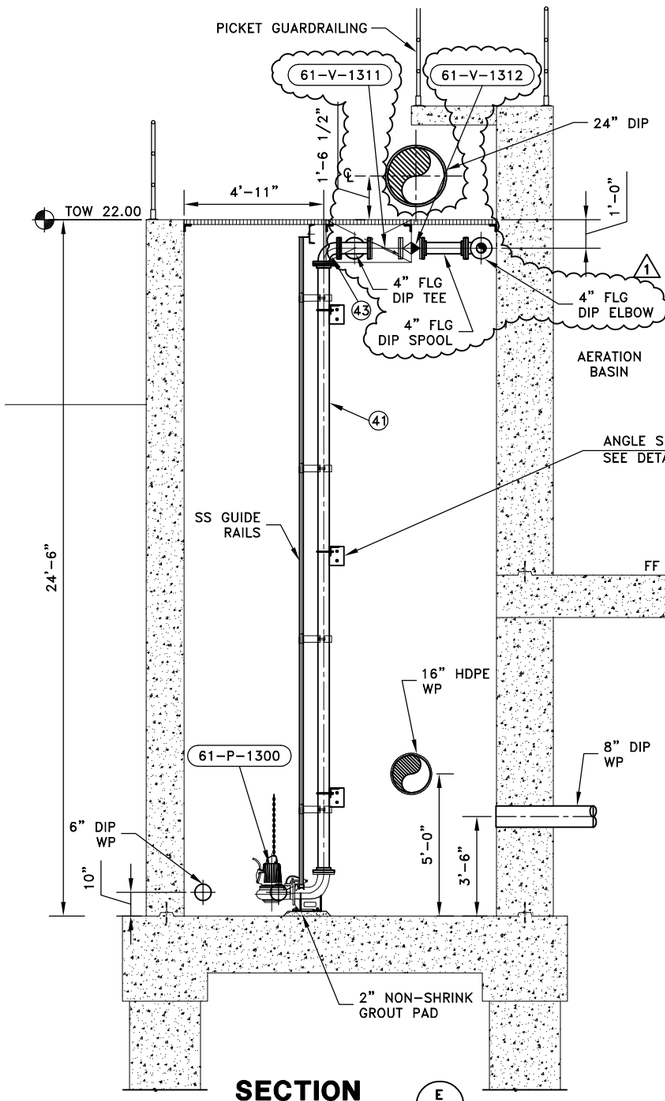
LGVSD 1 FILE: FD144793

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4

ADDENDUM 4



SECTION D PSM-1
SCALE: 3/8"=1'-0"
0 2 4
Scale in Feet



SECTION E PSM-1
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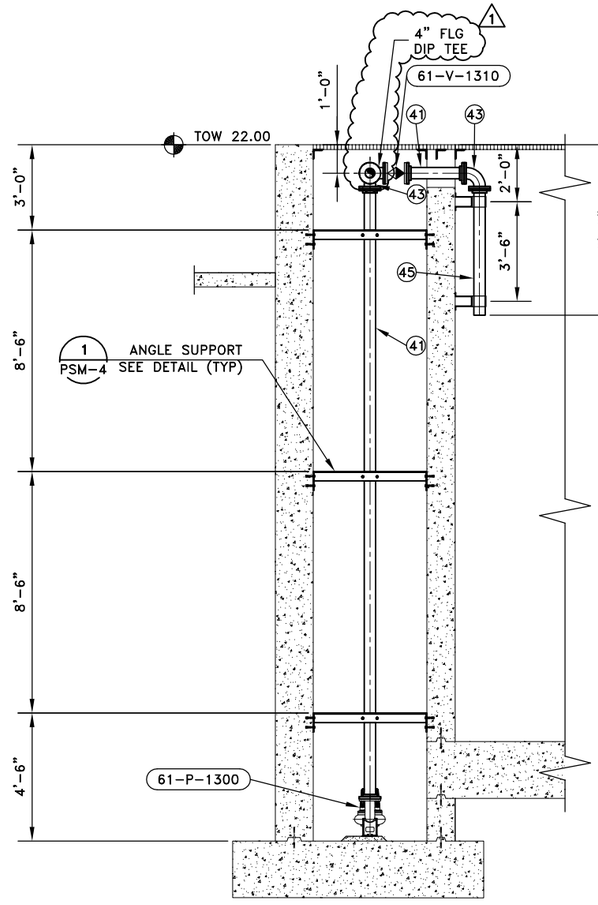
Scale in Feet



SECTION F PSM-1
SCALE: 3/8"=1'-0"
0 2 4
Scale in Feet

NOTES:

1– FOR PIPE SCHEDULE SEE SHEET AM-8.

2– FOR PUMP AND VALVE SCHEDULES SEE SCHEDULE SHEETS.

3– PROVIDE PIPE SUPPORTS AT LOCATIONS INDICATED WITH AN "X" AND AS REQUIRED. SEE STANDARD DETAILS.

4– ALL BOLTED CONNECTIONS SHALL USE 316 SS. ALL ANCHORS AND HARDWARE SHALL BE 316 SS. BURIED CONNECTIONS SHALL USE 316 SS BOLTS W/ZINC CAPS.

5– REFER TO SECTION 098000 FOR PROTECTIVE COATING REQUIREMENTS.

6– ALL HDPE FITTINGS TO BE FUSION WELDED UNLESS NOTED OTHERWISE.

7– (*) PER PUMP MANUFACTURERS REQUIREMENTS.

8– COAT EXPOSED PVC PIPE PER 098000.

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MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT AND RW EXPANSION

PRIMARY PUMP STATION MECHANICAL SECTIONS

WBS	CHECKED	DRAWN	SCALE
230	JRL	CAL	AS SHOWN
	APPROVED: JRL	DESIGNED: EES	DATE: 07/26/18
	GENERAL MANAGER: Chris DeGabriele	DISTRICT ENGINEER: Michael P Cortez, RCE # 54038	

NO.	DATE	DESCRIPTION	BY	APPR'D
1	09/18		EES	JRL

REVISIONS

SHEET	PLAN NO.	DRAWING NO.	REVISION NO.
		PSM-3	B

BDP 09/14/2018 X:\Las Gallinas\LASG150119-Secondary Treatment Upgrades\Drafting\STM\PSM-2,3,4.dwg
PLOTTED:
SAVED:
PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34
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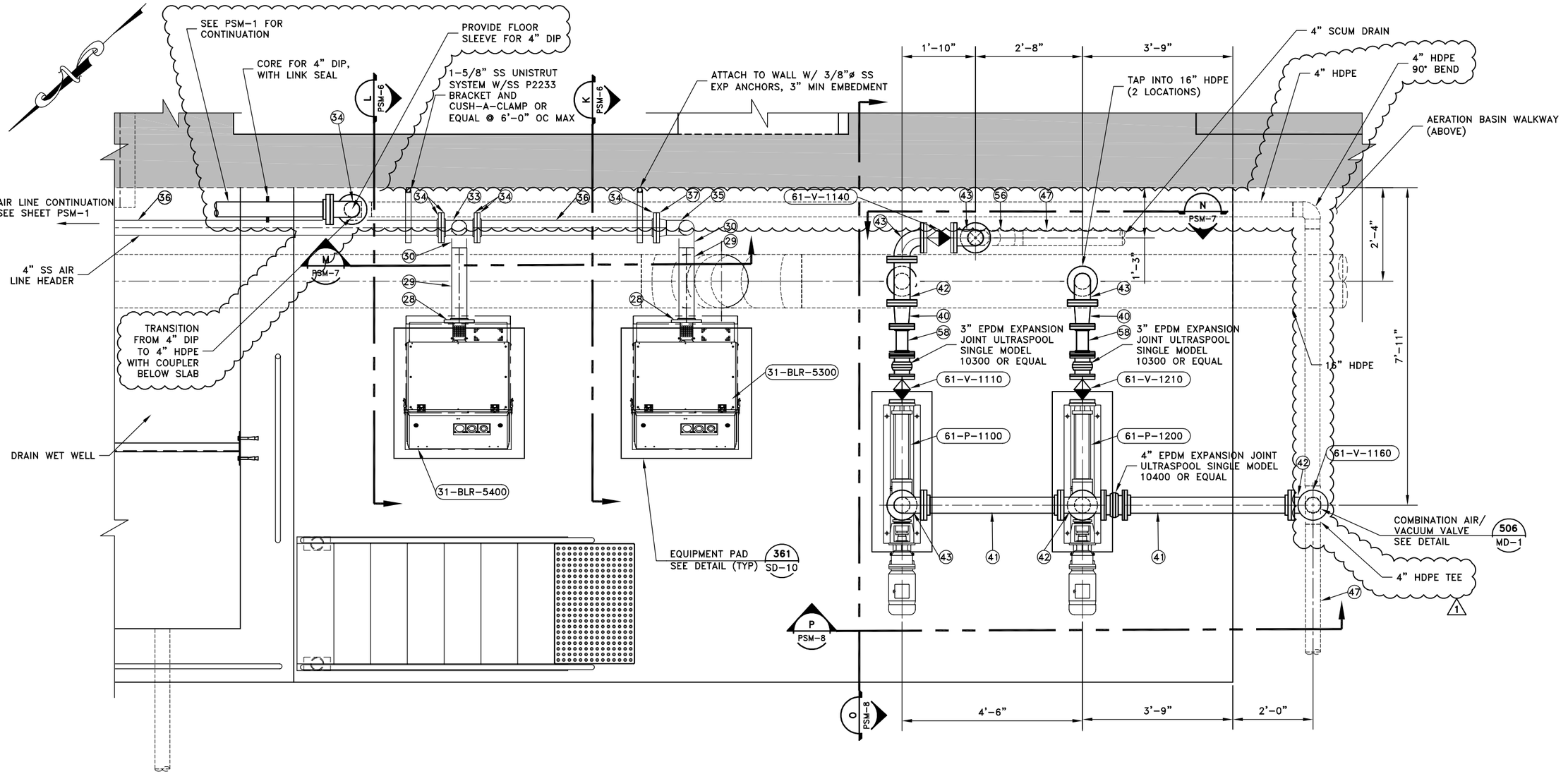
YELLOW 0.20MM
GREEN 0.25MM
CYAN 0.40MM
BLUE 0.50MM
MAGENTA 0.20MM
WHITE 0.35MM
GRAY 0.15MM
9 0.15MM
10 1.00MM
100 0.70MM
210 0.60MM
LGVSD 1 FILE: FD144793
FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4



BLOWER/WAS PUMP AREA PLAN

SCALE: 3/4"=1'-0"

0 1 2
Scale in Feet

NOTES:

1- FOR PIPE SCHEDULE SEE SHEET AM-8.

2- FOR EQUIPMENT, PUMP, AND VALVE SCHEDULES SEE SCHEDULE SHEETS.

3- PROVIDE PIPE SUPPORTS AT LOCATIONS INDICATED WITH AN "X" AND AS REQUIRED. SEE STANDARD DETAILS.

4- ALL BOLTED CONNECTIONS SHALL USE 316 SS. ALL ANCHORS AND HARDWARE SHALL BE 316 SS. BURIED CONNECTIONS SHALL USE 316 SS BOLTS W/ZINC CAPS.

5- REFER TO SECTION 098000 FOR PROTECTIVE COATING REQUIREMENTS.

6- ALL AIR PIPING GASKETS SHALL HAVE A MINIMUM TEMPERATURE RATING OF 220°F.

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NO.	DATE	REVISIONS DESCRIPTION	BY	APPR'D
1	09/18		EES	JRL

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT AND RW EXPANSION

PRIMARY PUMP STATION
BLOWER/WAS PUMP AREA PLAN

WBS	CHECKED	DRAWN	SCALE
230	JRL	CAL	AS SHOWN
	APPROVED JRL	DESIGNED EES	DATE 07/26/18
	GENERAL MANAGER Chris DeGabriele	DISTRICT ENGINEER Michael P Cortez RCE # 54038	
	SHEET	PLAN NO.	DRAWING NO. PSM-5 / REVISION NO. B

SSB 09/14/2018 X:\Las Gallinas\LASG150119-Secondary Treatment Upgrades\Drafting\STM\PSM-5,6,7,8.dwg
PLOTTED:
SAVED:
PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34
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YELLOW 0.20MM
GREEN 0.25MM
CYAN 0.40MM
BLUE 0.50MM
MAGENTA 0.20MM
WHITE 0.35MM
GRAY 0.15MM
9 0.15MM
10 1.00MM
100 0.70MM
210 0.60MM
LGVSD 1 FILE: FD144793
FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4

Attachment J

Revised Design Drawings
From Volume 4B

Sheet PI-26
Sheet NI-02
Sheet NI-03
Sheet SE-02
Sheet SE-06
Sheet SE-07
Sheet LE-02
Sheet LE-03
Sheet LE-04
Sheet LE-10
Sheet LE-14
Sheet LE-17
Sheet E-12
Sheet E-19
Sheet E-20
Sheet E-21
Sheet E-22
Sheet E-23
Sheet E-39
Sheet E-44
Sheet E-45
Sheet E-46
Sheet E-48
Sheet E-49

K:\LAS GALLINAS\000949.D LAS GALLINAS SECONDARY TREATMENT\SKM CAD FILES\01 PI-26 CHLORINE CONTACT BASIN.DWG

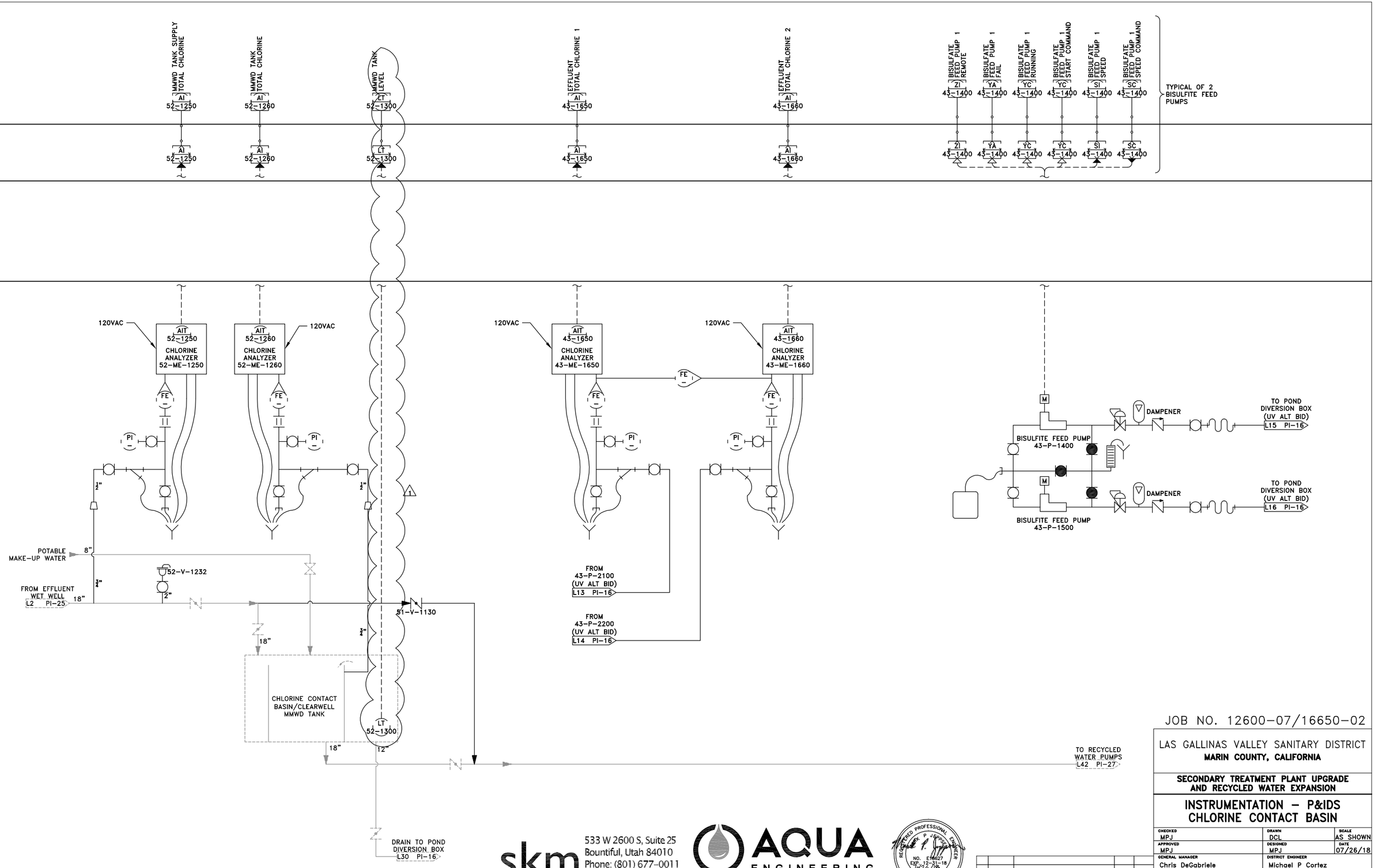
PLOTTED: 9/13/2018
SAVED: 7/18/2018

SCADA

PLC-AB

ELECTRICAL EQUIPMENT

FIELD



BISULFITE FEED PUMPS 43-P-1400, 43-P-1500
LOOPS 43-1400, 43-1500, 43-1650, 43-1660, 52-1250, 52-1260

PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR:	No.
RED	0.70MM
YELLOW	0.20MM
GREEN	0.25MM
CYAN	0.40MM
BLUE	0.50MM
MAGENTA	0.20MM
WHITE	0.35MM
GRAY	0.15MM
9	0.15MM
10	1.00MM
100	0.70MM
210	0.60MM

LGVSD 1 FILE: FD144793

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4

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PHONE (801) 299-1327 FAX (801) 299-0153

REGISTERED PROFESSIONAL ENGINEER MARK P JORGENSEN NO. E16627 EXP 12-31-18 ELECTRICAL STATE OF CALIFORNIA

NO.	DATE	DESCRIPTION	BY	APPR'D
1	9/14/18	ADDENDUM #4	MGJ	LAR

REVISIONS

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT UPGRADE AND RECYCLED WATER EXPANSION

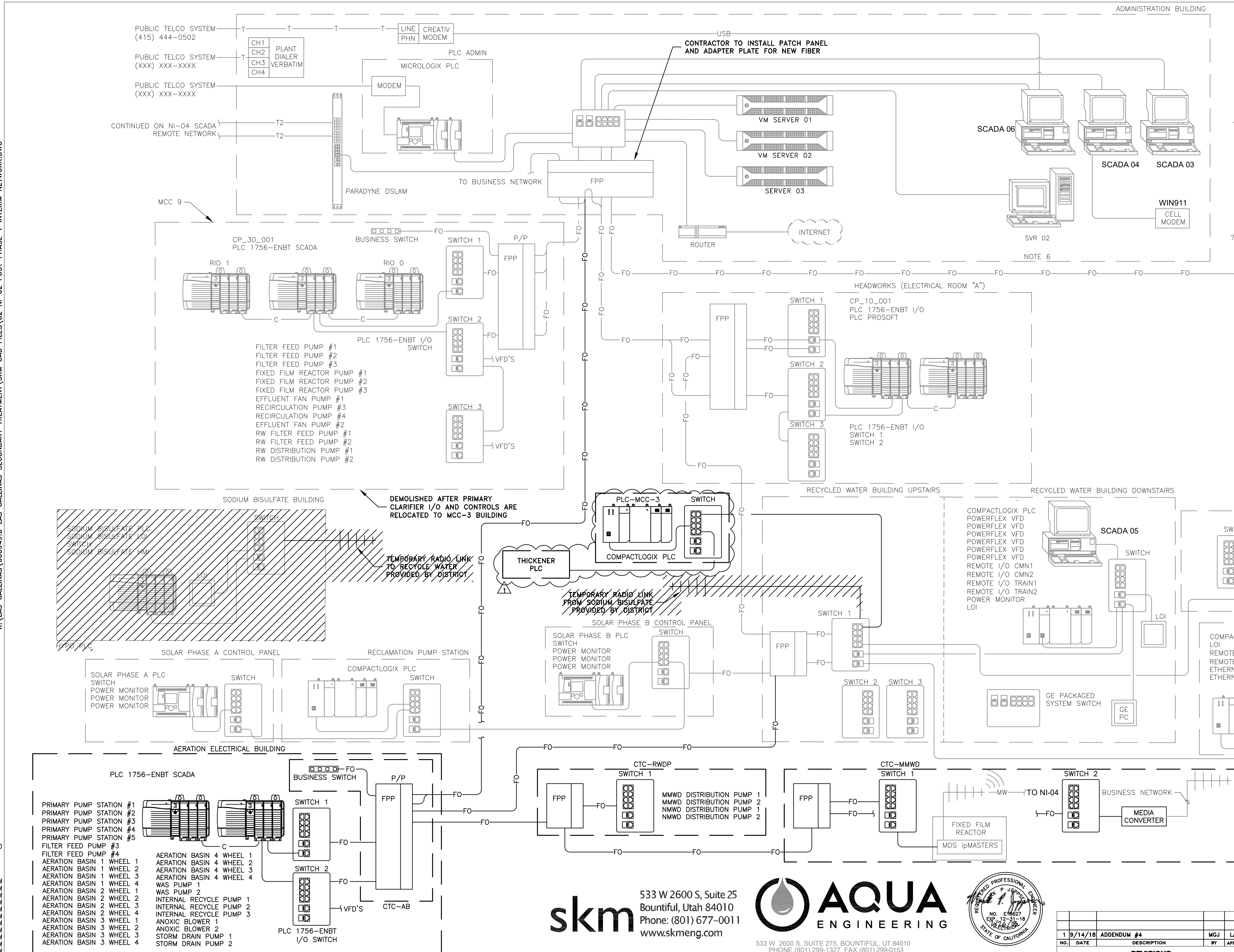
INSTRUMENTATION – P&IDS CHLORINE CONTACT BASIN

CHECKED	DRAWN	SCALE
MPJ	DCL	AS SHOWN
APPROVED	DESIGNED	DATE
MPJ	MPJ	07/26/18
GENERAL MANAGER	DISTRICT ENGINEER	
Chris DeGabriele	Michael P Cortez	RCE # 54039

SHEET	PLAN NO.	DRAWING NO.	REVISION NO.
30 OF 159		PI-26	B

ADDENDUM 4

K:\LAS GALLINAS\000949.D LAS GALLINAS SECONDARY TREATMENT\SKM CAD FILES\02 NI-02 POST PHASE 1 INTERIM NETWORK.DWG



JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT UPGRADE AND RECYCLED WATER EXPANSION

INSTRUMENTATION – NETWORK POST PHASE 1 INTERIM NETWORK

CHECKED	DRAWN	SCALE
MPJ	DCL	AS SHOWN
APPROVED	DESIGNED	DATE
MPJ	MPJ	07/26/18
GENERAL MANAGER	DISTRICT ENGINEER	
Chris DeGabriele	Michael P Cortez	
	RCE # 54039	

SHEET	PLAN NO.	DRAWING NO.	REVISION NO.
36 OF 159		NI–02	B

NO.	DATE	DESCRIPTION	BY	APPR'D
1	9/14/18	ADDENDUM #4	MGJ	LAR

REVISIONS

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AQUA ENGINEERING 533 W 2600 S, SUITE 275, BOUNTIFUL, UT 84010 PHONE (801) 299-1327 FAX (801) 299-0153

REGISTERED PROFESSIONAL ENGINEER MARK P JEPPSEN NO. E16627 EXP. 12-31-18 ELECTRICAL STATE OF CALIFORNIA

PLOTTED: 9/14/2018
SAVED: 9/14/2018

PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR:	No.
RED	0.70MM
YELLOW	0.20MM
GREEN	0.25MM
CYAN	0.40MM
BLUE	0.50MM
MAGENTA	0.20MM
WHITE	0.35MM
GRAY	0.15MM
9	0.15MM
10	1.00MM
100	0.70MM
210	0.60MM

LGVSD 1 FILE:
FD144793

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1

ADDENDUM 4

K:\LAS GALLINAS\000949.D LAS GALLINAS SECONDARY TREATMENT\SKM CAD FILES\02 NI-03 FINAL NETWORK.DWG

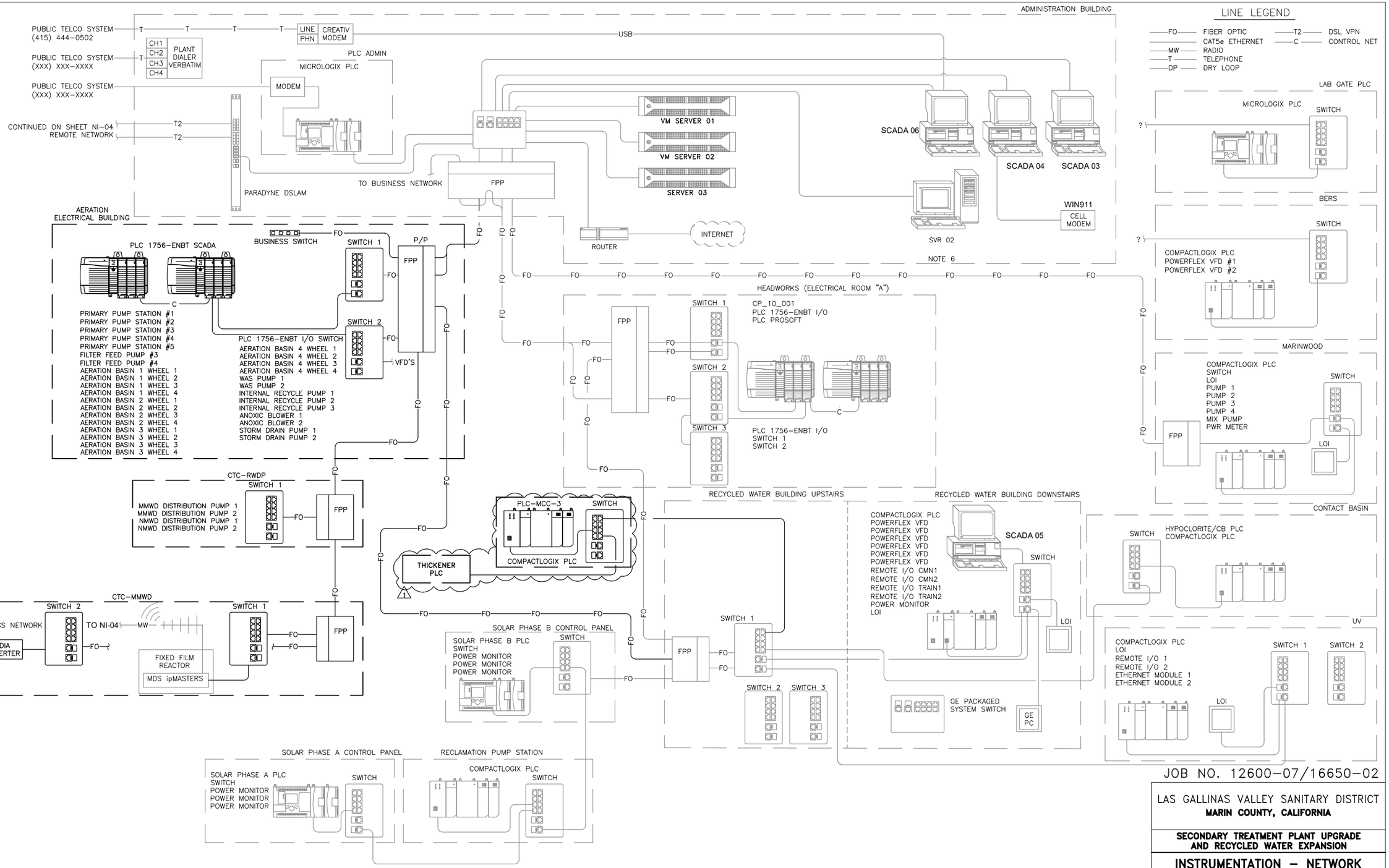
PLOTTED: 9/14/2018
SAVED: 7/25/2018

PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR: No.
RED 0.70MM
YELLOW 0.20MM
GREEN 0.25MM
CYAN 0.40MM
BLUE 0.50MM
MAGENTA 0.20MM
WHITE 0.35MM
GRAY 0.15MM
9 0.15MM
10 1.00MM
100 0.70MM
210 0.60MM

LGVSD 1 FILE: FD144793

ADDENDUM 4



JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT UPGRADE AND RECYCLED WATER EXPANSION

INSTRUMENTATION – NETWORK FINAL NETWORK

CHECKED	DRAWN	SCALE
MPJ	DCL	AS SHOWN
APPROVED	DESIGNED	DATE
MPJ	MPJ	07/26/18
GENERAL MANAGER: Chris DeGabriele	DISTRICT ENGINEER: Michael P Cortez, RCE # 54039	

NO.	DATE	DESCRIPTION	BY	APPR'D
1	9/14/18	ADDENDUM #4	MGJ	LAR

REVISIONS

SHEET	PLAN NO.	DRAWING NO.	REVISION NO.
37 OF 159		NI-03	B

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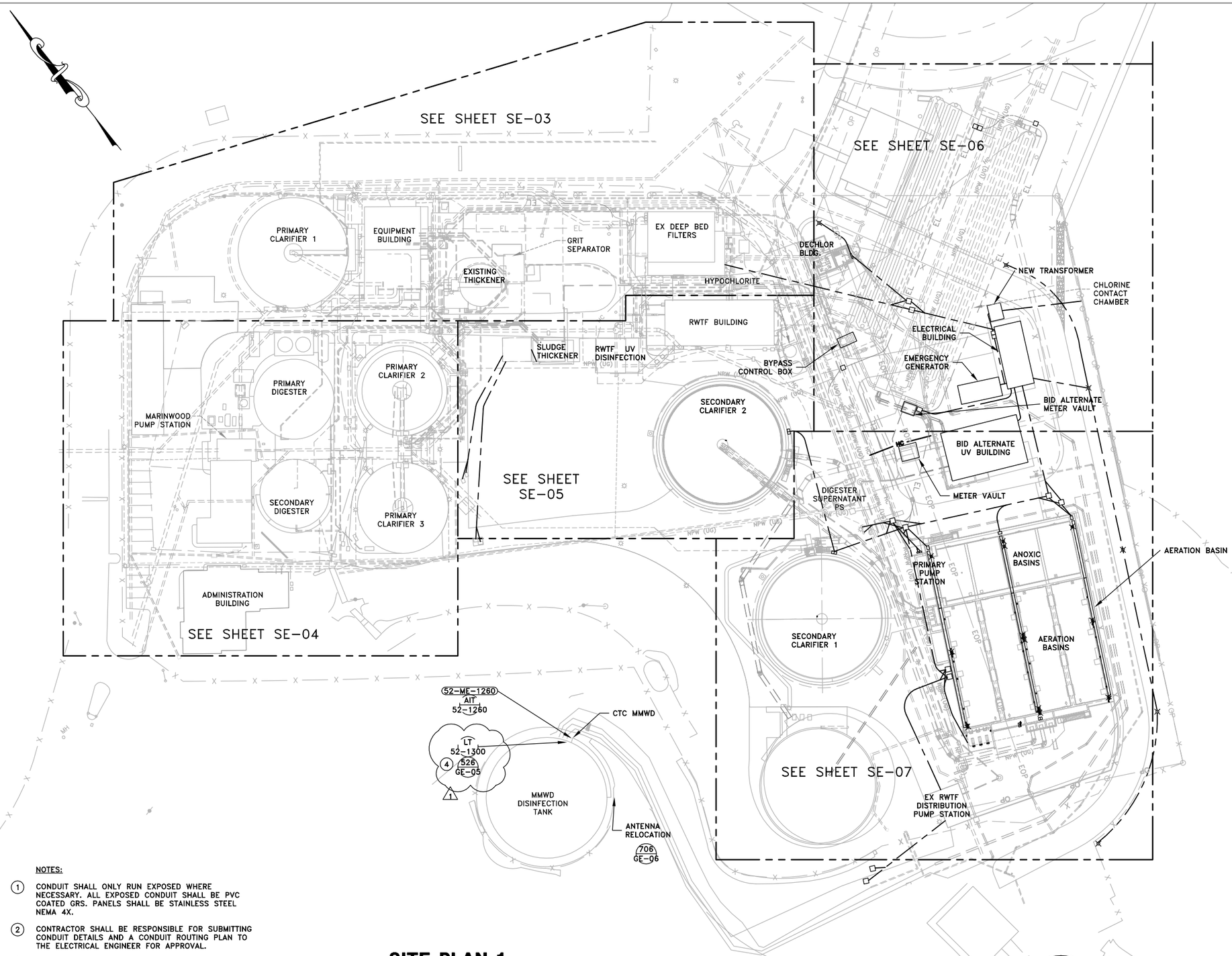
REGISTERED PROFESSIONAL ENGINEER — MICHAEL P CORTEZ — NO. E 16627 — EXP. 12-31-18 — STATE OF CALIFORNIA

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4



NOTES:

1. CONDUIT SHALL ONLY RUN EXPOSED WHERE NECESSARY. ALL EXPOSED CONDUIT SHALL BE PVC COATED GRS. PANELS SHALL BE STAINLESS STEEL NEMA 4X.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR SUBMITTING CONDUIT DETAILS AND A CONDUIT ROUTING PLAN TO THE ELECTRICAL ENGINEER FOR APPROVAL.
3. LIMIT EXPOSED CONDUITS, 90° BENDS, AND WALL PENETRATIONS. MAINTAIN SEPARATION BETWEEN SIGNAL AND POWER-CARRYING CONDUITS.
4. INSTALL LT-52-1300 USING EXISTING CONDUIT (1)

SITE PLAN 1

0 40 80
Scale In Feet

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REGISTERED PROFESSIONAL ENGINEER — MARK P. JORGENSEN — NO. E16627 EXP. 12-31-18 — ELECTRICAL — STATE OF CALIFORNIA — 10/16/18

NO.	DATE	DESCRIPTION	BY	APPR'D
1	9/14/18	ADDENDUM #4	MGJ	LAR

REVISIONS

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT UPGRADE AND RECYCLED WATER EXPANSION

ELECTRICAL – SITE SITE PLAN 1

CHECKED	DRAWN	SCALE
MPJ	DCL	AS SHOWN
APPROVED	DESIGNED	DATE
MPJ	MPJ	07/26/18
GENERAL MANAGER	DISTRICT ENGINEER	
Chris DeGabriele	Michael P Cortez	RCE # 54039

SHEET	PLAN NO.	DRAWING NO.	REVISION NO.
86 OF 159		SE-02	B

PLOTTED: 9/14/2018
SAVED: 9/14/2018

PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

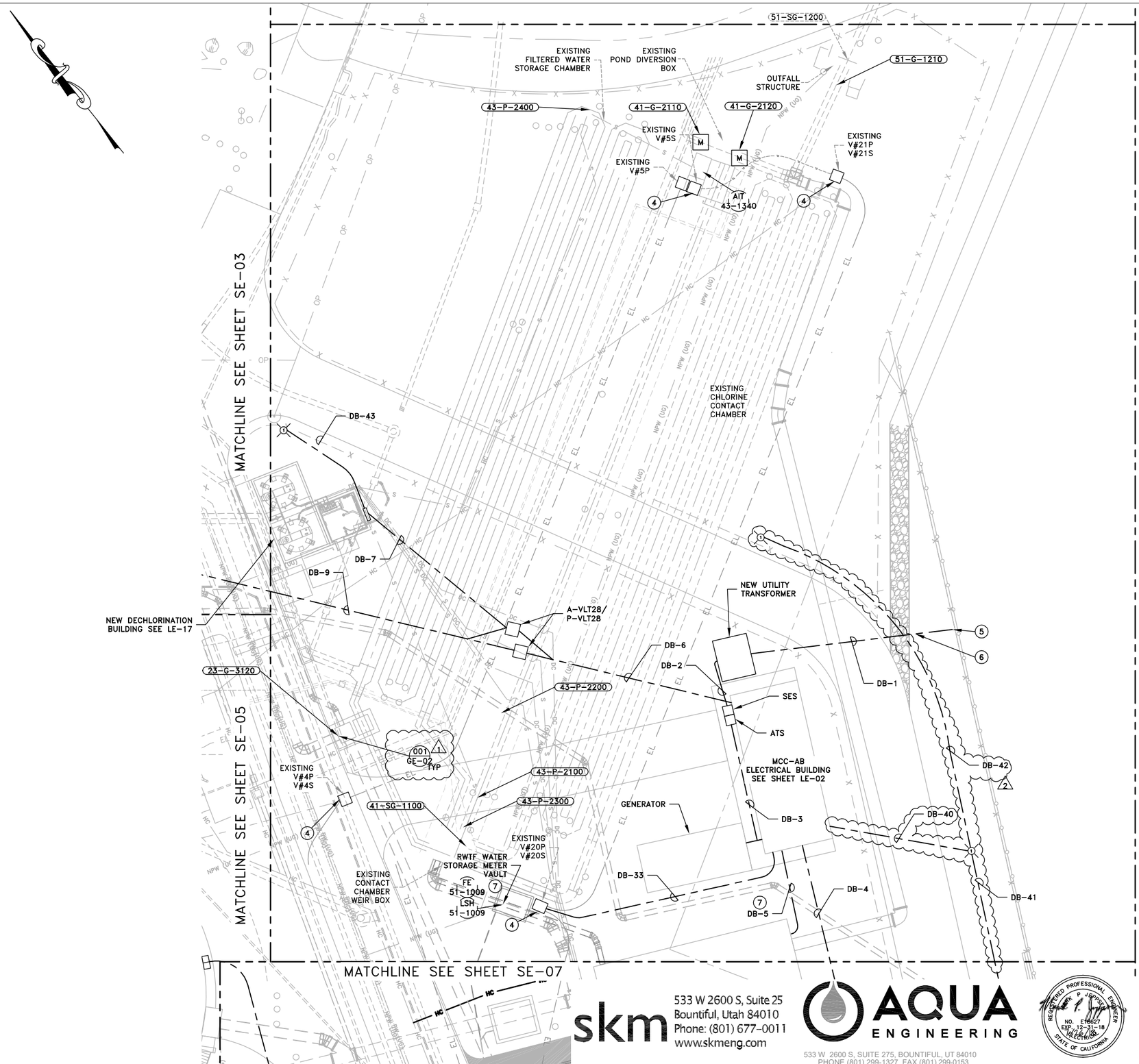
COLOR:	No.
RED	0.70MM
YELLOW	0.20MM
GREEN	0.25MM
CYAN	0.40MM
BLUE	0.50MM
MAGENTA	0.20MM
WHITE	0.35MM
GRAY	0.15MM
9	0.15MM
10	1.00MM
100	0.70MM
210	0.60MM

K:\LAS GALLINAS\000949.D LAS GALLINAS SECONDARY TREATMENT\SKM CAD FILES\12 SE-02 SITE PLAN 1.DWG

LGVSD 1 FILE: FD144793

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4

ADDENDUM 4



NOTES:

1. CONDUIT SHALL ONLY RUN EXPOSED WHERE NECESSARY. ALL EXPOSED CONDUIT SHALL BE PVC COATED GRS. PANELS SHALL BE STAINLESS STEEL NEMA 4X.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR SUBMITTING CONDUIT DETAILS AND A CONDUIT ROUTING PLAN TO THE ELECTRICAL ENGINEER FOR APPROVAL.
3. LIMIT EXPOSED CONDUITS, 90° BENDS, AND WALL PENETRATIONS. MAINTAIN SEPARATION BETWEEN SIGNAL AND POWER-CARRYING CONDUITS.
4. ALL EXISTING VAULTS ARE TO REMAIN ACCESSIBLE.
5. EXACT LOCATION OF POWER POLE TO BE DETERMINED BY PG&E.
6. DUCTBANK PER PG&E REQUIREMENTS.
7. PART OF UV BID ALTERNATE

ELECTRICAL LEGEND

EXISTING SITE LIGHT

NEW 15' SITE LIGHT. LUMEC MODEL LEN4-82LED63L6K-4-240-14-NP. 15' POLE IS LUMEC MODEL APR4F-15-LBC3-NP.

SITE PLAN 5

0 16 32
Scale in Feet

K:\LAS GALLINAS\000949.D LAS GALLINAS SECONDARY TREATMENT\SKM CAD FILES\12 SE-06 SITE PLAN 5.DWG

PLOTTED: 9/14/2018
SAVED: 9/13/2018

PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR:	No.
RED	0.70MM
YELLOW	0.20MM
GREEN	0.25MM
CYAN	0.40MM
BLUE	0.50MM
MAGENTA	0.20MM
WHITE	0.35MM
GRAY	0.15MM
9	0.15MM
10	1.00MM
100	0.70MM
210	0.60MM

LGVSD 1 FILE: FD144793

ADDENDUM 4

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REGISTERED PROFESSIONAL ENGINEER — MARK P. JORGENSEN — NO. E18627 EXP. 12-31-18 — ELECTRICAL — STATE OF CALIFORNIA

NO.	DATE	DESCRIPTION	BY	APPR'D
2	9/14/18	ADDENDUM #4	MGJ	LAR
1	9/7/18	ADDENDUM #3	MGJ	LAR

REVISIONS

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

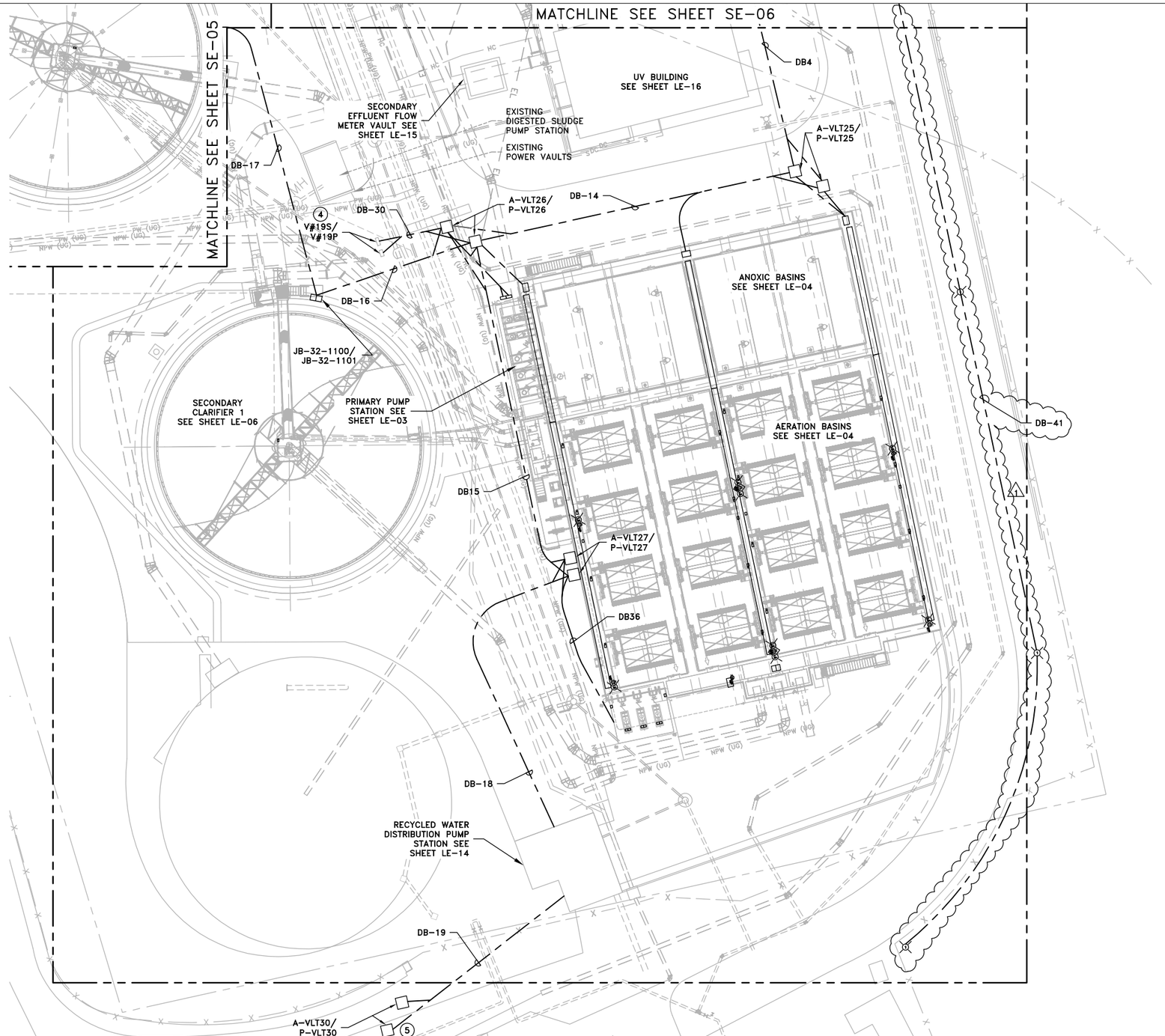
SECONDARY TREATMENT PLANT UPGRADE AND RECYCLED WATER EXPANSION

ELECTRICAL - SITE SITE PLAN 5

CHECKED	DRAWN	SCALE
MPJ	DCL	AS SHOWN
APPROVED	DESIGNED	DATE
MPJ	MPJ	07/26/18

GENERAL MANAGER: Chris DeGabriele
DISTRICT ENGINEER: Michael P Cortez, RCE # 54039

SHEET	PLAN NO.	DRAWING NO.	REVISION NO.
90 OF 159		SE-06	B



NOTES:

1. CONDUIT SHALL ONLY RUN EXPOSED WHERE NECESSARY. ALL EXPOSED CONDUIT SHALL BE PVC COATED GRS. PANELS SHALL BE STAINLESS STEEL NEMA 4X.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR SUBMITTING CONDUIT DETAILS AND A CONDUIT ROUTING PLAN TO THE ELECTRICAL ENGINEER FOR APPROVAL.
3. LIMIT EXPOSED CONDUITS, 90° BENDS, AND WALL PENETRATIONS. MAINTAIN SEPARATION BETWEEN SIGNAL AND POWER-CARRYING CONDUITS.
4. V#19P AND V#19S ARE TO REPLACE EXISTING ELECTRICAL VAULTS, KEEPING ALL EXISTING CONDUIT, DUCTBANKS, AND WIRING INTACT
5. P-VLT30 & A-VLT30 ARE TO REPLACE EXISTING ELECTRICAL VAULTS, KEEPING ALL EXISTING CONDUIT, DUCT BANKS, AND WIRING INTACT.

ELECTRICAL LEGEND

EXISTING SITE LIGHT

NEW 15' SITE LIGHT. LUMEC MODEL LEN4-82LED63L6K-4-240-14-NP. 15' POLE IS LUMEC MODEL APR4F-15-LBC3-NP.

SITE PLAN 6

0 20 40
Scale in Feet

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT UPGRADE AND RECYCLED WATER EXPANSION

ELECTRICAL - SITE
SITE PLAN 6

CHECKED MPJ	DRAWN DCL	SCALE AS SHOWN
APPROVED MPJ	DESIGNED MPJ	DATE 07/26/18
GENERAL MANAGER Chris DeGabriele	DISTRICT ENGINEER Michael P Cortez, RCE # 54039	

NO.	DATE	DESCRIPTION	BY	APPR'D
1	9/14/18	ADDENDUM #4	MGJ	LAR

REVISIONS

SHEET 91 OF 159 | PLAN NO. | DRAWING NO. SE-07 | REVISION NO. B

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REGISTERED PROFESSIONAL ENGINEER MICHAEL P CORTEZ NO. E16627 EXP. 12-31-18 ELECTRICAL STATE OF CALIFORNIA

K:\LAS GALLINAS\000949.D LAS GALLINAS SECONDARY TREATMENT\SKM CAD FILES\12 SE-07 SITE PLAN 6.DWG

PLOTTED: 9/13/2018
SAVED: 9/13/2018

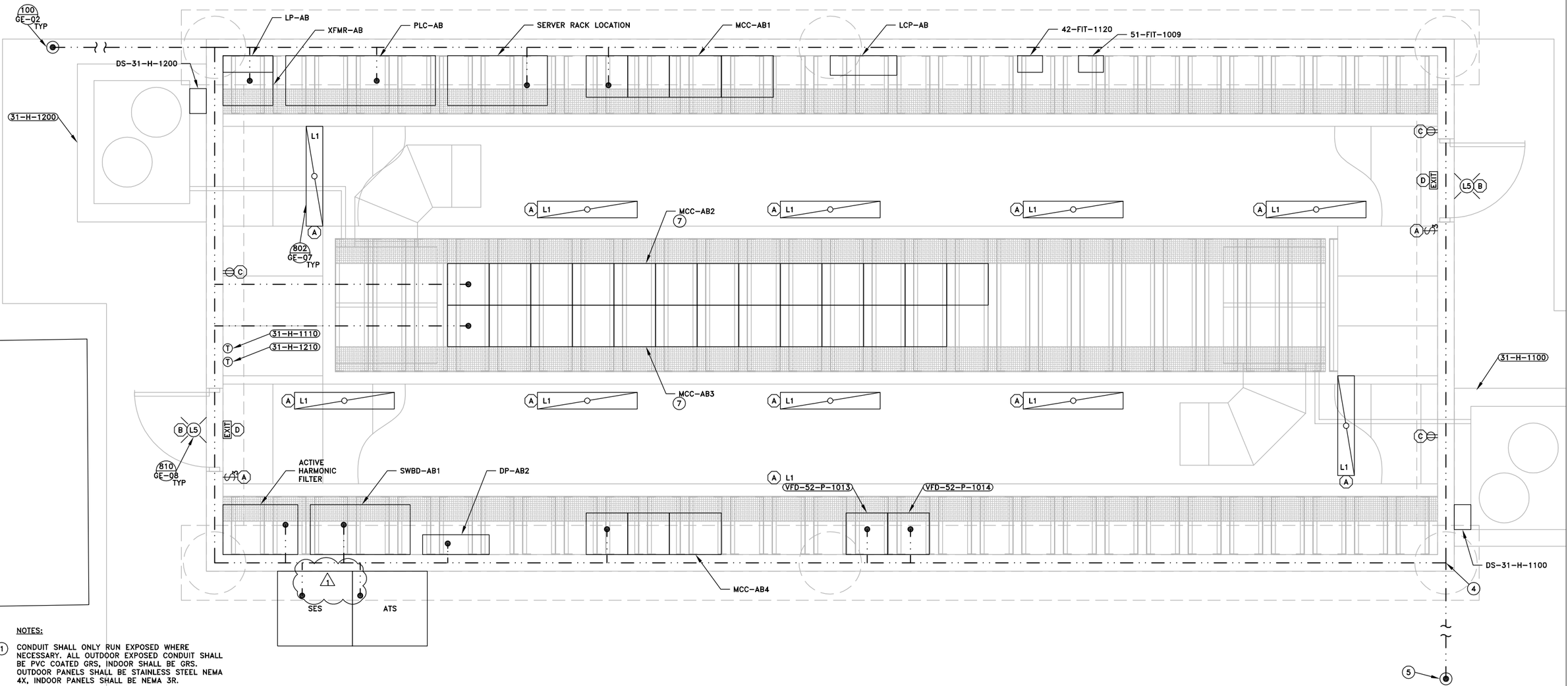
PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR:	No.
RED	0.70MM
YELLOW	0.20MM
GREEN	0.25MM
CYAN	0.40MM
BLUE	0.50MM
MAGENTA	0.20MM
WHITE	0.35MM
GRAY	0.15MM
9	0.15MM
10	1.00MM
100	0.70MM
210	0.60MM

LGVSD 1 FILE: FD144793

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4

ADDENDUM 4



K:\LAS GALLINAS\000949.D LAS GALLINAS SECONDARY TREATMENT\SKM CAD FILES\13 LE-02 MCC-AB ELECTRICAL BUILDING PLAN.DWG

PLOTTED: 9/14/2018
SAVED: 9/14/2018

PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR:	No.
RED	0.70MM
YELLOW	0.20MM
GREEN	0.25MM
CYAN	0.40MM
BLUE	0.50MM
MAGENTA	0.20MM
WHITE	0.35MM
GRAY	0.15MM
9	0.15MM
10	1.00MM
100	0.70MM
210	0.60MM

LGVSD 1 FILE:
FD144793

NOTES:

1. CONDUIT SHALL ONLY RUN EXPOSED WHERE NECESSARY. ALL OUTDOOR EXPOSED CONDUIT SHALL BE PVC COATED GRS, INDOOR SHALL BE GRS. OUTDOOR PANELS SHALL BE STAINLESS STEEL NEMA 4X, INDOOR PANELS SHALL BE NEMA 3R.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR SUBMITTING CONDUIT DETAILS AND A CONDUIT ROUTING PLAN TO THE ELECTRICAL ENGINEER FOR APPROVAL.
3. LIMIT EXPOSED CONDUITS, 90° BENDS, AND WALL PENETRATIONS. MAINTAIN SEPARATION BETWEEN SIGNAL AND POWER-CARRYING CONDUITS.
4. CONTRACTOR SHALL PROVIDE 2 CONCRETE ENCASED ELECTRODES IN FOOTINGS PER SPECIFICATIONS 60' PER CONDUCTOR.
5. CONTRACTOR SHALL INSTALL (2) 10'X3/4"ø COPPER GROUND RODS 10' MINIMUM SPACING AND 10' MINIMUM FROM BUILDING.
6. BOND ALL BUILDING STEEL TO GROUND PER NEC.
7. MCC-AB2 AND MCC-AB3 DO NOT SHARE A COMMON LUG.
8. MOUNT LIGHTS BELOW HVAC DUCT.
9. CONTRACTOR TO KEEP APPROPRIATE SEPERATION BETWEEN 480VAC, 120VAC, 50VDC, AND 24VDC IN ALL JUNCTION AND PULL BOXES
10. SEE SHEET E-18 FOR LIGHTING CONTROL PANEL WIRING.

MCC-AB ELECTRICAL BUILDING PLAN

0 2 4
Scale In Feet

ELECTRICAL LEGEND

L1	DAY-BRITE LED SURFACE LINEAR SUSPENDED 31W FIXTURE. MODEL LBX40L840-UNV OR APPROVED EQUAL.
L5	MAXLITE LED FULL CUTOFF 40W WALL LIGHT (WALL PACK) WITH PHOTO CELL CONTROL. MODEL MLLWP40LED50DSPC12 OR APPROVED EQUAL.
EXIT	DAY-BRITE VE SERIES EXIT SIGN. MODEL VEGW OR APPROVED EQUAL.
	DUPLEX OUTLET G: GFCI PROTECTED OUTLET WP: WEATHER-PROOF OUTLET GFCI PROTECTED.
A	DEVICES WITH SAME LETTER CODE (I.E. A,B,C) REPRESENT DEVICES ON SAME CIRCUIT.

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REGISTERED PROFESSIONAL ENGINEER — MICHAEL P CORTEZ — NO. E16627 — EXP. 12-31-18 — ELECTRICAL — STATE OF CALIFORNIA — 9/26/18

NO.	DATE	DESCRIPTION	BY	APPR'D
1	9/14/18	ADDENDUM #4	MGJ	LAR

REVISIONS

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT UPGRADE AND RECYCLED WATER EXPANSION

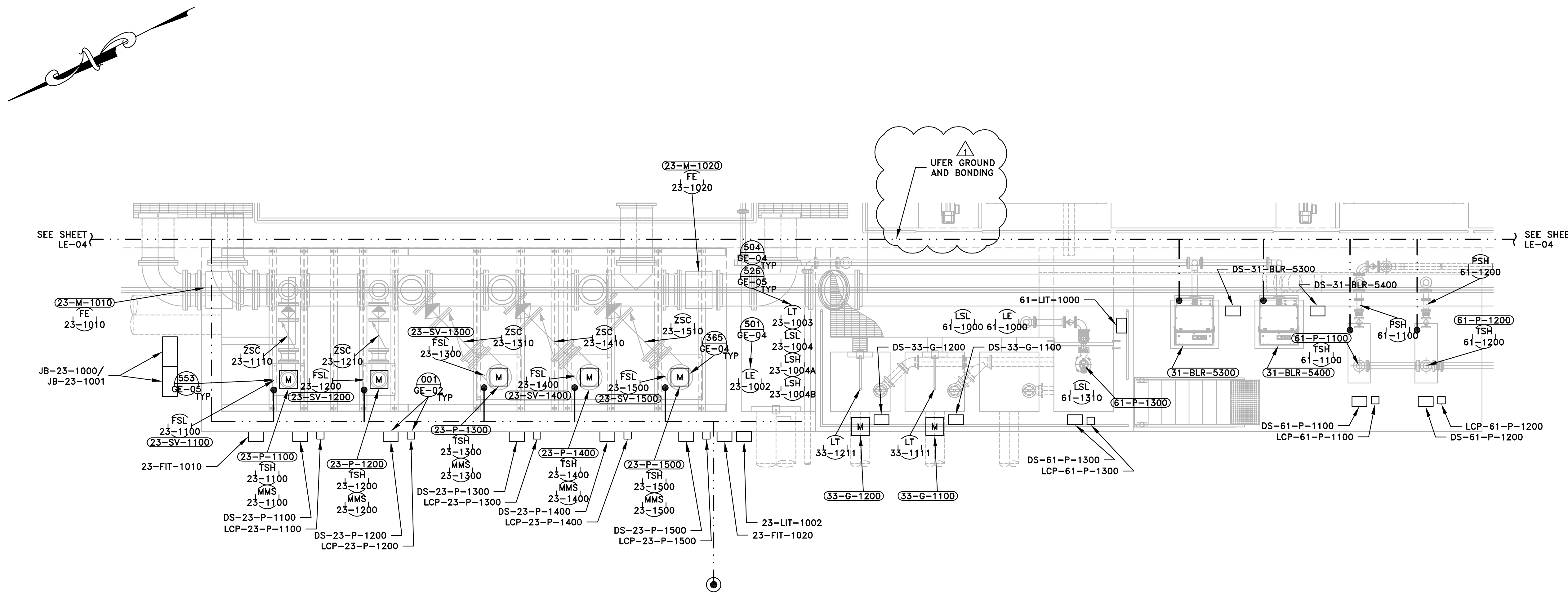
ELECTRICAL – LAYOUT
MCC-AB ELECTRICAL BUILDING PLAN

CHECKED	DRAWN	SCALE
MPJ	DCL	AS SHOWN
APPROVED	DESIGNED	DATE
MPJ	MPJ	07/26/18
GENERAL MANAGER: Chris DeGabriele	DISTRICT ENGINEER: Michael P Cortez, RCE # 54039	
SHEET: 94 OF 159	PLAN NO.	DRAWING NO.: LE-02
		REVISION NO.: B

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4

ADDENDUM 4

K:\LAS GALLINAS\000949.D LAS GALLINAS SECONDARY TREATMENT\SKM CAD FILES\13 LE-03 PRIMARY PUMP STATION PLAN.DWG



PRIMARY PUMP STATION PLAN

1/4" = 1'-0"

0 4 8

Scale in Feet

NOTES:

1. CONDUIT SHALL ONLY RUN EXPOSED WHERE NECESSARY. ALL EXPOSED CONDUIT SHALL BE PVC COATED. PANELS SHALL BE STAINLESS STEEL NEMA 4X.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR SUBMITTING CONDUIT DETAILS AND A CONDUIT ROUTING PLAN TO THE ELECTRICAL ENGINEER FOR APPROVAL.
3. LIMIT EXPOSED CONDUITS, 90° BENDS, AND WALL PENETRATIONS. MAINTAIN SEPARATION BETWEEN SIGNAL AND POWER-CARRYING CONDUITS.
4. MOUNT ALL LCP'S, JB'S AND PANELS AT LEAST 3' ABOVE THE HIGHEST LIQUID LEVEL.
5. DISCONNECTS, LCPs, JBs, AND OTHER PANELS ARE NOT DRAWN TO SCALE, CONTRACTOR TO PROVIDE APPROPRIATELY SIZED PANELS
6. CONTRACTOR TO KEEP APPROPRIATE SEPERATION BETWEEN 480VAC, 120VAC, 50VDC, AND 24VDC IN ALL JUNCTION AND PULL BOXES
7. ALL ELECTRONIC DISPLAYS SUBJECT TO OUTDOOR EXPOSURE SHALL BE PROTECTED AS PER DETAIL 901 ON SHEET GE-08. (901 GE-08 TYP)

PLOTTED: 9/14/2018
SAVED: 9/14/2018

PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR:	No.
RED	0.70MM
YELLOW	0.20MM
GREEN	0.25MM
CYAN	0.40MM
BLUE	0.50MM
MAGENTA	0.20MM
WHITE	0.35MM
GRAY	0.15MM
9	0.15MM
10	1.00MM
100	0.70MM
210	0.60MM

LGVSD 1 FILE:
FD144793

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REGISTERED PROFESSIONAL ENGINEER K. P. JEPPSEN NO. E16627 EXP. 12-31-18 ELECTRICAL STATE OF CALIFORNIA

NO.	DATE	DESCRIPTION	BY	APPR'D
1	9/14/18	ADDENDUM #4	MGJ	LAR

REVISIONS

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT UPGRADE AND RECYCLED WATER EXPANSION

ELECTRICAL – LAYOUT PRIMARY PUMP STATION PLAN

CHECKED MPJ	DRAWN DCL	SCALE AS SHOWN
APPROVED MPJ	DESIGNED MPJ	DATE 07/26/18
GENERAL MANAGER Chris DeGabriele	DISTRICT ENGINEER Michael P Cortez RCE # 54039	
SHEET 95 OF 159	PLAN NO.	DRAWING NO. LE-03	REVISION NO. B

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4

ADDENDUM 4

ELECTRICAL LEGEND

L6 — GARDCO STANCHION MOUNTED 69W LED LIGHT, 120V WITH PHOTO CELL CONTROL. MODEL FX164G2TAA33NA3EDMGSP1 OR APPROVED EQUAL.

WP — WEATHER-PROOF OUTLET GFCI PROTECTED

NOTES:

1. MOUNT ALL LCP'S, JB'S AND PANELS AT LEAST 3' ABOVE THE HIGHEST LIQUID LEVEL.
2. ALL EQUIPMENT AND INSTRUMENTATION TO BE INSTALLED BY CONTRACTOR.
3. CONDUIT SHALL ONLY RUN EXPOSED WHERE NECESSARY. ALL EXPOSED CONDUIT SHALL BE PVC COATED GRS. PANELS SHALL BE STAINLESS STEEL NEMA 4X.
4. CONTRACTOR SHALL BE RESPONSIBLE FOR SUBMITTING CONDUIT DETAILS AND A CONDUIT ROUTING PLAN TO THE ELECTRICAL ENGINEER FOR APPROVAL.
5. LIMIT EXPOSED CONDUITS, 90° BENDS, AND WALL PENETRATIONS. MAINTAIN SEPARATION BETWEEN SIGNAL AND POWER-CARRYING CONDUITS.
6. CONTRACTOR TO KEEP APPROPRIATE SEPERATION BETWEEN 480VAC, 120VAC, 50VDC, AND 24VDC IN ALL JUNCTION AND PULL BOXES
7. ALL ELECTRONIC DISPLAYS SUBJECT TO OUTDOOR EXPOSURE SHALL BE PROTECTED AS PER DETAIL 901 ON SHEET GE-08. (901 GE-08 TYP)
8. LIGHT SWITCH FOR STANCHION LIGHTS TO BE MOUNTED NEXT TO RAILING. SWITCH TO BE WIRED IN SERIES WITH LIGHTS.
9. RELOCATED FLOW METER AND TRANSMITTER. SEE DE-04 FOR PREVIOUS LOCATION.

ANOXIC BASIN 1
ANOXIC BASIN 2
ANOXIC BASIN 3
ANOXIC BASIN 4
UFER GROUND AND BONDING
CABLE TRAY 31-1000
CABLE TRAY 31-1001
CABLE TRAY 31-2001
CABLE TRAY 31-2000
CABLE TRAY 31-4001
JB-31-1000/ JB-31-1001
JB-31-2000/ JB-31-2001
JB-31-4000/ JB-31-4001
JB-31-5500/ JB-31-5501
DS-31-ME-1100 LCP-31-ME-1100
DS-31-ME-1200 LCP-31-ME-1200
DS-31-ME-1300 LCP-31-ME-1300
DS-31-ME-1400 LCP-31-ME-1400
DS-31-ME-2100 LCP-31-ME-2100
DS-31-ME-2200 LCP-31-ME-2200
DS-31-ME-2300 LCP-31-ME-2300
DS-31-ME-2400 LCP-31-ME-2400
DS-31-ME-3100 LCP-31-ME-3100
DS-31-ME-3200 LCP-31-ME-3200
DS-31-ME-3300 LCP-31-ME-3300
DS-31-ME-3400 LCP-31-ME-3400
DS-31-ME-4100 LCP-31-ME-4100
DS-31-ME-4200 LCP-31-ME-4200
DS-31-ME-4300 LCP-31-ME-4300
DS-31-ME-4400 LCP-31-ME-4400
DS-31-G-4550
DS-31-G-4560
DS-36-V-1410
DS-36-P-1300
DS-36-P-1200
DS-36-P-1100
LCP-36-P-1300
LCP-36-P-1200
LCP-36-P-1100
36-V-1400
36-SV-1300
36-SV-1200
36-SV-1100
36-V-1410
36-P-1300
36-P-1200
36-P-1100
FSL 36-1300
FSL 36-1200
FSL 36-1100
FIT 36-1000
FE 36-1000
DEDICATED FOR FUTURE METHANOL FEED PUMP
FUTURE METHANOL FEED PUMP
SEE SHEET LE-03

AERATION AND ANOXIC BASINS PLAN

0 8 16
Scale in Feet

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REGISTERED PROFESSIONAL ENGINEER — MICHAEL P CORTEZ — NO. E14627 — EXP. 12-31-18 — CIVIL — STATE OF CALIFORNIA

NO.	DATE	DESCRIPTION	BY	APPR'D
1	9/14/18	ADDENDUM #4	MGJ	LAR

REVISIONS

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT UPGRADE AND RECYCLED WATER EXPANSION

ELECTRICAL – LAYOUT
AERATION AND ANOXIC BASINS PLAN

CHECKED: MPJ	DRAWN: DCL	SCALE: AS SHOWN
APPROVED: MPJ	DESIGNED: MPJ	DATE: 07/26/18
GENERAL MANAGER: Chris DeGabriele	DISTRICT ENGINEER: Michael P Cortez, RCE # 54039	
SHEET: 96 OF 159	PLAN NO.	DRAWING NO.: LE-04
		REVISION NO.: B

PLOTTED: 9/14/2018
SAVED: 9/14/2018

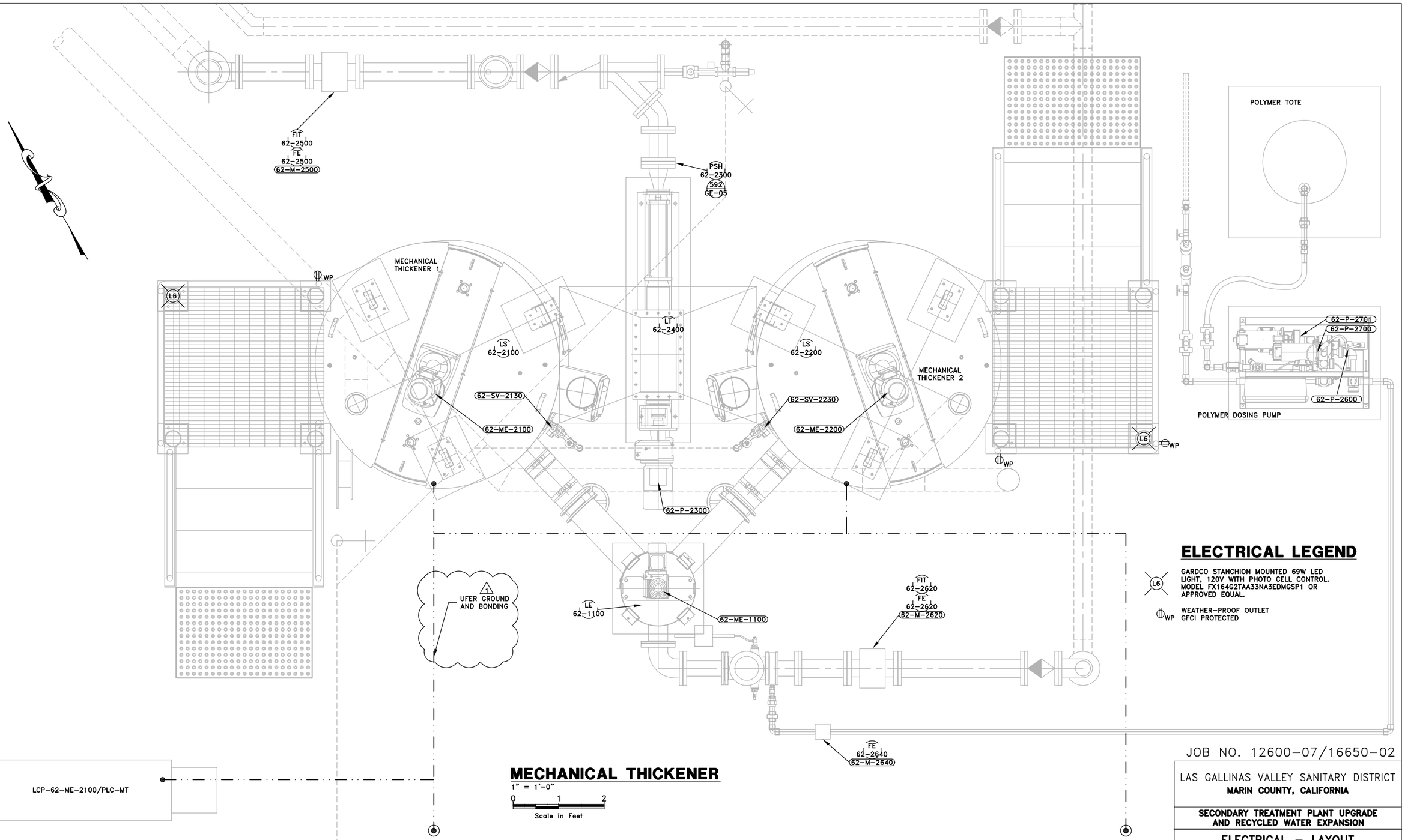
K:\LAS GALLINAS\000949.D LAS GALLINAS SECONDARY TREATMENT\SKM CAD FILES\13 LE-04 AERATION AND ANOXIC BASINS PLAN.DWG

PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR:	No.
RED	0.70MM
YELLOW	0.20MM
GREEN	0.25MM
CYAN	0.40MM
BLUE	0.50MM
MAGENTA	0.20MM
WHITE	0.35MM
GRAY	0.15MM
9	0.15MM
10	1.00MM
100	0.70MM
210	0.60MM

LGVSD 1 FILE: FD144793

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4



ELECTRICAL LEGEND

L6 — GARDCO STANCHION MOUNTED 69W LED LIGHT, 120V WITH PHOTO CELL CONTROL. MODEL FX164G2TAA33NA3EDMGSP1 OR APPROVED EQUAL.

WP — WEATHER-PROOF OUTLET GFCI PROTECTED

MECHANICAL THICKENER

1" = 1'-0"

0 1 2

Scale in Feet

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT UPGRADE AND RECYCLED WATER EXPANSION

ELECTRICAL – LAYOUT MECHANICAL THICKENER

CHECKED	DRAWN	SCALE
MPJ	DCL	AS SHOWN
APPROVED	DESIGNED	DATE
MPJ	MPJ	07/26/18
GENERAL MANAGER: Chris DeGabriele	DISTRICT ENGINEER: Michael P Cortez, RCE # 54039	

NO.	DATE	DESCRIPTION	BY	APPR'D
1	9/14/18	ADDENDUM #4	MGJ	LAR

REVISIONS

SHEET	PLAN NO.	DRAWING NO.	REVISION NO.
102 OF 159		LE-10	B

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REGISTERED PROFESSIONAL ENGINEER — MARK P USPENSKY — NO. E16627 EXP. 12-31-18 — ELECTRICAL — STATE OF CALIFORNIA

K:\LAS GALLINAS\000949.D LAS GALLINAS SECONDARY TREATMENT\SKM CAD FILES\13 LE-10 MECHANICAL THICKENER.DWG

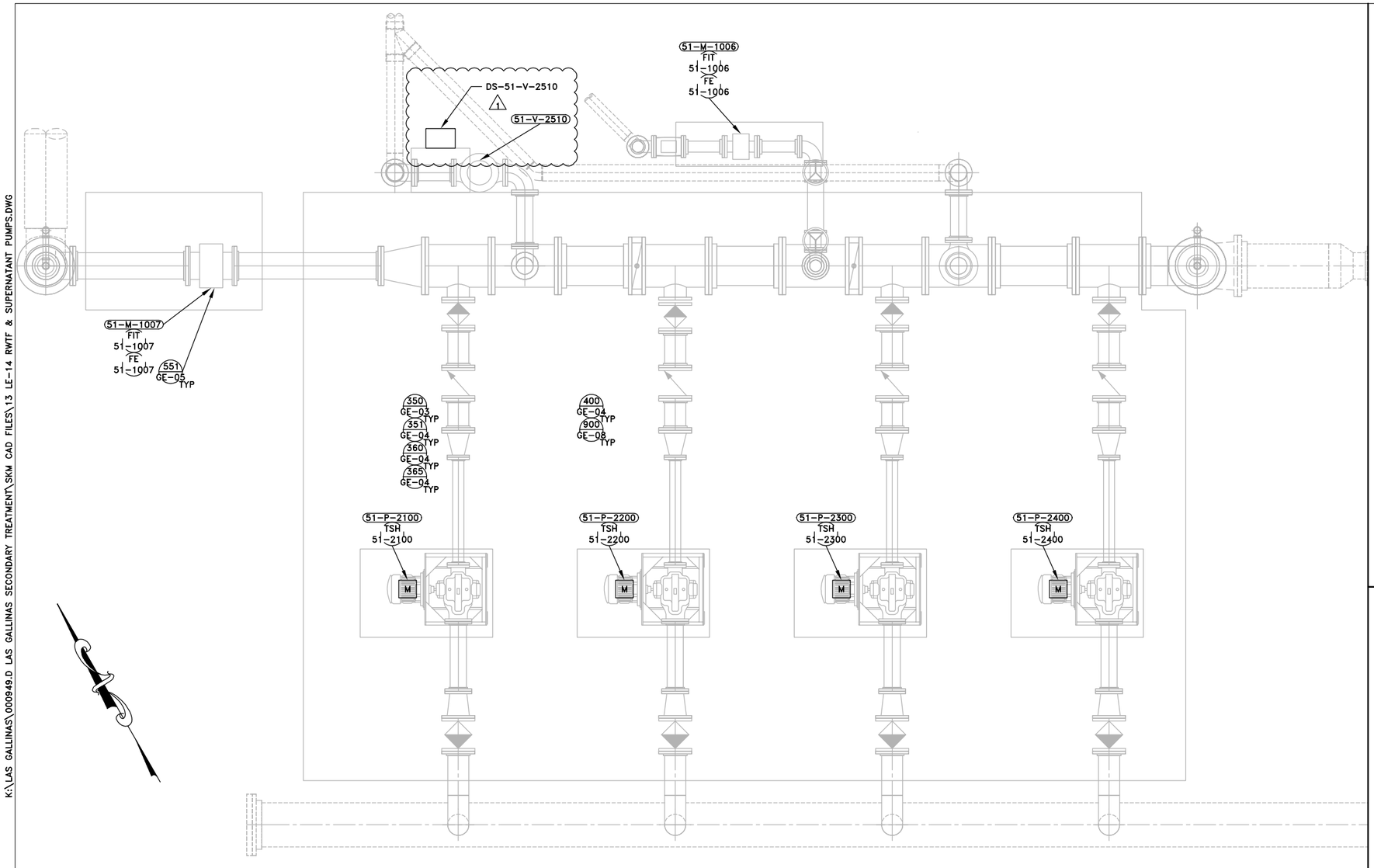
PLOTTED: 9/14/2018
SAVED: 9/14/2018

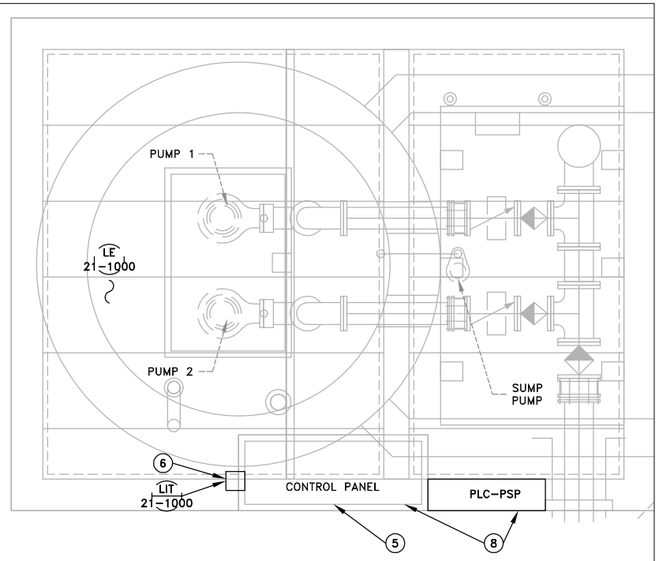
PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR:	No.
RED	0.70MM
YELLOW	0.20MM
GREEN	0.25MM
CYAN	0.40MM
BLUE	0.50MM
MAGENTA	0.20MM
WHITE	0.35MM
GRAY	0.15MM
9	0.15MM
10	1.00MM
100	0.70MM
210	0.60MM

LGVSD 1 FILE: FD144793

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4



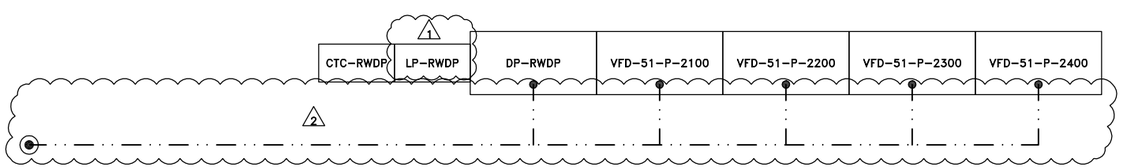


POND SUPERNATANT PUMP STATION PLAN

0 2 4
Scale in Feet

NOTES:

1. CONDUIT SHALL ONLY RUN EXPOSED WHERE NECESSARY. ALL EXPOSED CONDUIT SHALL BE PVC COATED GRS. PANELS SHALL BE STAINLESS STEEL NEMA 4X.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR SUBMITTING CONDUIT DETAILS AND A CONDUIT ROUTING PLAN TO THE ELECTRICAL ENGINEER FOR APPROVAL.
3. LIMIT EXPOSED CONDUITS, 90° BENDS, AND WALL PENETRATIONS. MAINTAIN SEPARATION BETWEEN SIGNAL AND POWER-CARRYING CONDUITS.
4. CONTRACTOR TO KEEP APPROPRIATE SEPERATION BETWEEN 480VAC, 120VAC, 50VDC, AND 24VDC IN ALL JUNCTION AND PULL BOXES.
5. REINSTALLED CONTROL PANEL. SEE SHEET DE-12 FOR PREVIOUS LOCATION. SEE SCHEMATIC ON E-16 FOR MODIFICATIONS.
6. LIT-21-1100 IS TO BE POWERED OUT OF PANELBOARD 1LA THAT IS LOCATED IN THE CONTROL PANEL.
7. ALL ELECTRONIC DISPLAYS SUBJECT TO OUTDOOR EXPOSURE SHALL BE PROTECTED AS PER DETAIL 901 ON SHEET GE-08. (901 GE-08 TYP)
8. MODIFY EXISTING CONTROL PANEL TO ALLOW REMOTE CONTROL OF PUMPS. ROUTE WIRING TO PLC-PSP.



RECYCLED WATER DISTRIBUTION PUMP STATION PLAN

0 2 4
Scale in Feet

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REGISTERED PROFESSIONAL ENGINEER — MARK P JORGENSEN — NO. E16627 — EXP 12-31-18 — ELECTRICAL — STATE OF CALIFORNIA

NO.	DATE	DESCRIPTION	BY	APPR'D
2	9/14/48	ADDENDUM #4	MGJ	LAR
1	9/7/18	ADDENDUM #3	MGJ	LAR

REVISIONS

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT UPGRADE AND RECYCLED WATER EXPANSION

ELECTRICAL – LAYOUT RWTF & SUPERNATANT PUMPS

CHECKED	DRAWN	SCALE
MPJ	DCL	AS SHOWN
APPROVED	DESIGNED	DATE
MPJ	MPJ	07/26/18
GENERAL MANAGER	DISTRICT ENGINEER	
Chris DeGabriele	Michael P Cortez	RCE # 54038

SHEET	PLAN NO.	DRAWING NO.	REVISION NO.
106 OF 159		LE-14	B

PLOTTED: 9/14/2018
SAVED: 9/14/2018

PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR:	No.
RED	0.70MM
YELLOW	0.20MM
GREEN	0.25MM
CYAN	0.40MM
BLUE	0.50MM
MAGENTA	0.20MM
WHITE	0.35MM
GRAY	0.15MM
9	0.15MM
10	1.00MM
100	0.70MM
210	0.60MM

LGVSD 1 FILE: FD144793

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4

ADDENDUM 4

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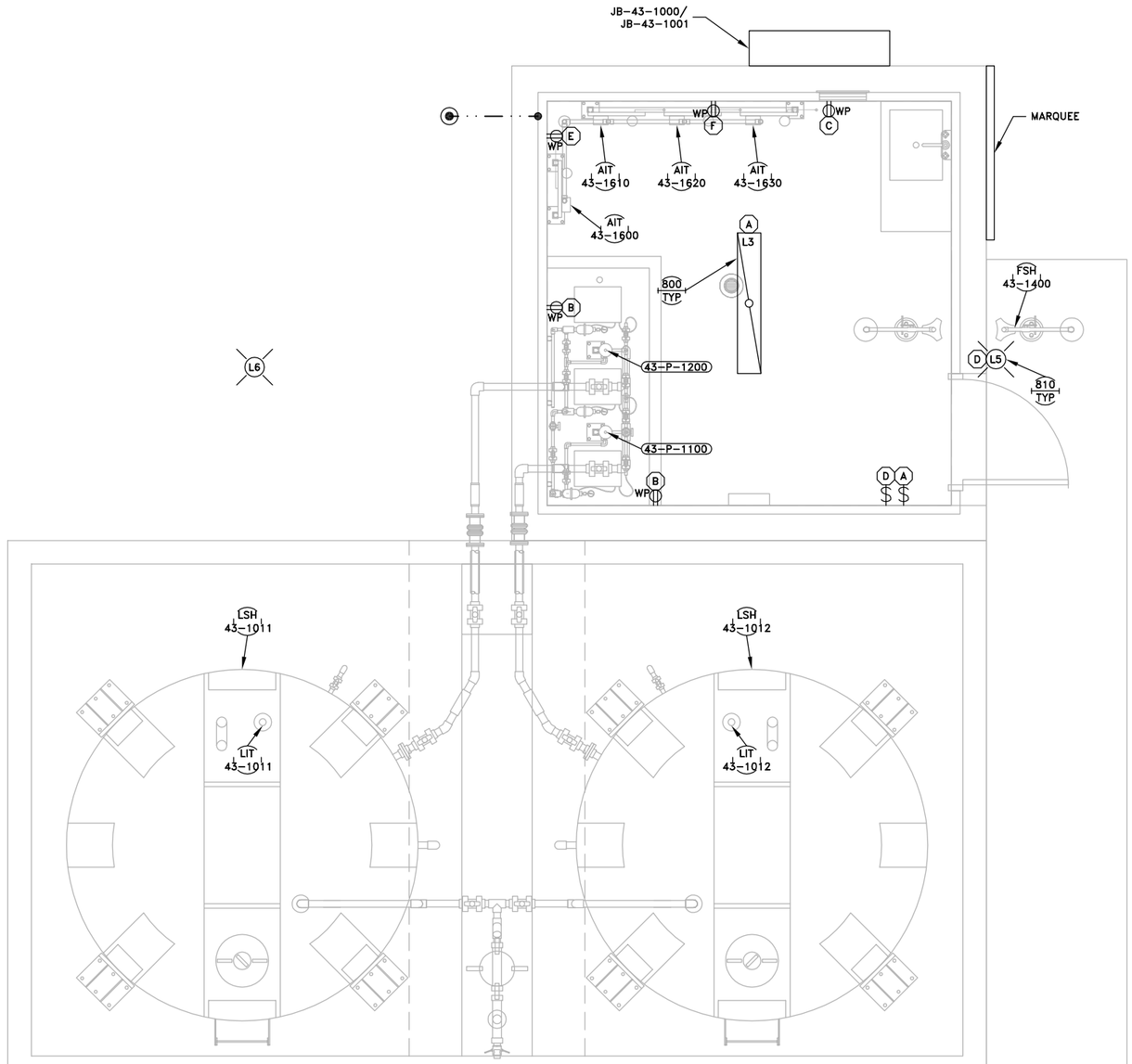

ELECTRICAL LEGEND

L3 — CREE 4' LED SURFACE MOUNT 22W FIXTURE MODEL CR-LE-22L-40K OR APPROVED EQUAL.

L5 — MAXLITE LED FULL CUTOFF 40W WALL LIGHT (WALL PACK) WITH PHOTO CELL CONTROL. MODEL MLLWP40LED50DSPC12 OR APPROVED EQUAL.

L6 — GARDCO STANCHION MOUNTED 69W LED LIGHT, 120V WITH PHOTO CELL CONTROL. MODEL FX164G2TAA33NA3EDMGSP1 OR APPROVED EQUAL.

WP — DUPLEX OUTLET
WP: WEATHER-PROOF OUTLET GFCI PROTECTED.

A — DEVICES WITH SAME LETTER CODE (I.E. A,B,C) REPRESENT DEVICES ON SAME CIRCUIT.

L6

DECHLORINATION STORAGE BUILDING PLAN

0 2 4
Scale In Feet

NOTES:

1. CONDUIT SHALL ONLY RUN EXPOSED WHERE NECESSARY. ALL EXPOSED CONDUIT SHALL BE PVC COATED GRS. PANELS SHALL BE STAINLESS STEEL NEMA 4X.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR SUBMITTING CONDUIT DETAILS AND A CONDUIT ROUTING PLAN TO THE ELECTRICAL ENGINEER FOR APPROVAL.
3. LIMIT EXPOSED CONDUITS, 90° BENDS, AND WALL PENETRATIONS. MAINTAIN SEPARATION BETWEEN SIGNAL AND POWER-CARRYING CONDUITS.
4. CONTRACTOR TO KEEP APPROPRIATE SEPERATION BETWEEN 480VAC, 120VAC, 50VDC, AND 24VDC IN ALL JUNCTION AND PULL BOXES

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REGISTERED PROFESSIONAL ENGINEER — MARK P USPENSKI — NO. E16627 EXP. 12-31-18 — ELECTRICAL — STATE OF CALIFORNIA

NO.	DATE	DESCRIPTION	BY	APPR'D
		REVISIONS		

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT UPGRADE AND RECYCLED WATER EXPANSION

ELECTRICAL - LAYOUT
DECHLORINATION STORAGE BUILDING

CHECKED	DRAWN	SCALE
MPJ	DCL	AS SHOWN
APPROVED	DESIGNED	DATE
MPJ	MPJ	07/26/18
GENERAL MANAGER: Chris DeGabriele	DISTRICT ENGINEER: Michael P Cortez, RCE # 54039	
SHEET: 109 OF 159	PLAN NO.	DRAWING NO.: LE-17
		REVISION NO.: B

K:\LAS GALLINAS\000949.D LAS GALLINAS SECONDARY TREATMENT\SKM CAD FILES\13 LE-17 DECHLORINATION STORAGE BUILDING.DWG
PLOTTED: 9/14/2018
SAVED: 9/14/2018
PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34
COLOR: No.
RED 0.70MM
YELLOW 0.20MM
GREEN 0.25MM
CYAN 0.40MM
BLUE 0.50MM
MAGENTA 0.20MM
WHITE 0.35MM
GRAY 0.15MM
9 0.15MM
10 1.00MM
100 0.70MM
210 0.60MM
LGVSD 1 FILE:
FD144793
FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4

ADDENDUM 4

PANEL: LP-AB		VOLTAGE:	120/240	MAIN CB:	225 AMP	BUS AMPS:	225 AMP		
CB TYPE: BOLT-ON		MOUNTING:	SURFACE	BUS BRACING:	22KA	BKR AIC:	22KA		
CIRCUIT DESCRIPTION	BKR	CIRCUIT	LINE 1	LINE 2	CIRCUIT	BKR	CIRCUIT DESCRIPTION		
ELECTRICAL BLDG. LIGHTS (8, A)	20/1	1	288						
			60		2	20/1	ELECTRICAL BLDG. OUTDOOR LIGHTS (2, B)		
ELECTRICAL BLDG. OUTLETS (3, C)	20/1	3		540					
				100	4	20/1	LIGHTING CONTROL PANEL (LCP-AB)		
CTC-AB	20/1	5	1000						
			816		6	20/1	EQ/ANOXIC BASINS LIGHTS/OUTLETS (4,3)		
AEROTOR BASINS LIGHTS/OUTLETS (4,3)	20/1	7		816					
				500	8	20/1	43-P-1100		
AEROTOR BASINS LIGHTS/OUTLETS (4,3)	20/1	9	816						
			0		10	20/1	43-P-1200		
PLC-AB	20/1	11		500					
				100	12	20/1	43-AIT-1620		
43-AIT-1630	20/1	13	100						
			100		14	20/1	23-FIT-1010		
51-FIT-1009	20/1	15		100					
				1500	16	20/1	POND RETURN SUMP		
23-FIT-1020	20/1	17	100						
			100		18	20/1	31-AIT-1010		
44-FIT-1000	20/1	19		100					
				100	20	20/1	31-AIT-4010		
31-AIT-2010	20/1	21	100						
			100		22	20/1	31-AIT-2001		
31-AIT-1001	20/1	23		100					
				100	24	20/1	31-AIT-4001		
DECLOR HEAT TRACE	20/1	25	1600						
			100		26	20/1	43-AIT-1600		
31-AIT-3001	20/1	27		100					
				100	28	20/1	43-AIT-1610		
36-FIT-1000	20/1	29	100						
			100		30	20/1	42-FIT-1120		
SC 1 LIGHTS AND OUTLET	20/1	31		316					
				567	32	20/1	SC 2 LIGHTS AND OUTLET		
SC 3 LIGHTS AND OUTLET (FUTURE)	20/1	33	316						
			240		34	20/1	31-H-1110		
31-H-1210	20/1	35		240					
				400	36	20/1	EXISTING 21-LIT-1101, 21-LIT-1204B, 21-LIT-1304B, 21-LIT-1305B		
EXISTING 21-LIT-1204A, 21-LIT-1205A, 21-LIT-1304A, 21-LIT-1305A	20/1	37	400						
			100		38	20/1	EXISTING 51-LIT-1101		
		39		350					
EXISTING SITE LIGHTING L1, L2, L3, L4, L5, L6, L8, L9	20/2			100	40	20/1	43-LIT-1010		
		41	350						
			100		42	20/1	43-LIT-1020		
51-LIT-1000	20/1	43		100					
				100	44	20/1	23-LIT-1002		
MCC-AB2 LOW LEVEL RELAY SECTION (MCC-AB2 SECTION 12)	20/1	45	100						
			100		46	20/1	MCC-AB3 LOW LEVEL RELAY SECTION (MCC-AB3 SECTION 12)		
FUTURE EQ BASIN CHEM PUMP AND ANALYZER	20/1	47		1000					
				360	48	20/1	LOCAL YARD RECEPTACLES		
FUTURE METHANOL PUMP EAST OF ANOXIC BASIN 3	20/1	49	1000						
			360		50	20/1	RECEPTACLE AT CONSOLES		
CHLORINATION STRUCTURE EXHAUST/LIGHTS	20/1	51		200					
				100	52	20/1	36-FIT-1000		
EXISTING EFFLUENT PIT LIGHTING	20/1	53	200						
			1000		54	20/2			
EXISTING EFFLUENT PIT RECEPTACLE	20/1	55		600			DECLOR HEATER		
				1000	56	20/2			
SUMP RECEPTCLE (42-P-1120)	20/1	57	1500						
			1500		58	20/1	SAMPLING PUMP (43-P-2300)		
SAMPLING PUMP (43-P-2100)	20/1	59		1500					
				18	60	20/1	UV DISINFECTION DAMPER 1 (44-H-1611)		
SAMPLING PUMP (43-P-2200)	20/1	61	1500						
			18		62	20/1	UV DISINFECTION DAMPER 2 (44-H-1621)		
43-P-1300	20/1	63		1500					
				18	64	20/1	UV DISINFECTION DAMPER 3 (44-H-1631)		
43-AIT-1340	20/1	65	500						
			1500		66	20/1	SAMPLING PUMP (43-P-2400)		
SITE LIGHTS (DECHLORINATION) 1	20/2	67		80					
				400	68	20/2	SITE LIGHTS (ALONG BASIN) 1		
	20/2	69	80						
			400		70	20/2			
SPARE	20/1	71							
					72	20/1	SPARE		
SPARE	20/1	73							
					74	20/1	SPARE		
SPARE	20/1	75							
					76	20/1	SPARE		
SPARE	20/1	77							
					78	20/1	SPARE		
SPARE	20/1	79							
					80	20/1	SPARE		
SPARE	20/1	81							
					82	20/1	SPARE		
SPARE	20/1	83							
					84	20/1	SPARE		
CONNECTED VA PER PHASE			16766.0	13707.0	NOTES:				
CONNECTED AMPS PER PHASE			139.7	114.2					
25% OF CONTINUOUS & LIGHTING LOAD (VA)			887.5	741.5					
LARGEST MOTOR (25%)			375.0	260.0					
CODE VA PER PHASE			18028.5	14698.5					
CODE AMPS PER PHASE			150.2	122.5					

LP-AB SCHEDULE

PANEL: LP-RW		VOLTAGE:	120/208	MAIN CB:	200 AMP	BUS AMPS:	200 AMP	
CB TYPE: BOLT-ON		MOUNTING:	SURFACE	BUS A.I.C.	10KA	BKR AIC:	10KA	
CIRCUIT DESCRIPTION	BKR	CIRCUIT	PHASE A	PHASE B	PHASE C	CIRCUIT	BKR	CIRCUIT DESCRIPTION
MAIN FLOOR LIGHTS (10, A)	20/1	1	490					
			392			2	20/1	MAIN FLOOR LIGHTS (8, B)
MAIN FLOOR LIGHTS (8, C)	20/1	3		392				
				120		4	20/1	OUTDOOR LIGHTS (2, E)
MAIN FLOOR LIGHTS (10, D)	20/1	5			490			
					120	6	20/1	OUTDOOR LIGHTS (2, F)
MAIN FLOOR RECEPTACLES (3, G)	20/1	7	540					
			540			8	20/1	MAIN FLOOR RECEPTACLES (3, H)
MAIN FLOOR RECEPTACLES (3, I)	20/1	9		540				
				539		10	20/1	MEZZANINE LIGHTS (11, J)
MEZZANINE LIGHTS (12, K)	20/1	11			588			
					540	12	20/1	MEZZANINE RECEPTACLES (3, L)
MEZZANINE RECEPTACLES (3, M)	20/1	13	540					
			147			14	20/1	ELECTRICAL ROOM LIGHTS (3, N)
ELECTRICAL ROOM RECEPTACLES (2, O)	20/1	15		360				
				360		16	20/1	OUTDOOR RECEPTACLES (2, P)
EMERGENCY LIGHTS (3, Q)	20/1	17			10			
					1176	18	20/1	AC-M-4 AIR DRYER
MBH-AC-1	20/1	19	56					
			56			20	20/1	MBH-AC-4
SPARE	20/1	21						
				1176		22	20/1	CI-P-1 METERING PUMP
LCP-52-1001	20/1	23			900			
					1200	24	20/1	MB1-M-1 PROCESS SKID 1
MB2-M-1 PROCESS SKID 2	20/1	25	1200					
			1200			26	20/1	MB3-M-1 PROCESS SKID 3
PLC-RW	20/1	27		100				
				100		28	20/1	MBH-D-1 DAMPER
MB4-M-1 PROCESS SKID 4	20/1	29			1200			
					100	30	20/1	MBH-D-2 DAMPER
MBH-EF-1 EXHAUST FAN	20/1	31	1176					
			100			32	20/1	MBH-D-3 DAMPER
MBH-EF-2 EXHAUST FAN	20/1	33		1176				
				100		34	20/1	MBH-D-4 DAMPER
MBH-EF-3 EXHAUST FAN	20/1	35			1176			
					500	36	20/1	ROLL-UP DOOR OPENERS(2,R)
MBH-AC-2	30/2	37	2600					
			200			38	20/1	CTC-RW
		39		2600				
				2600		40		
MBH-T-1	20/1	41			100		30/2	MBH-AC-5
					2600	42		
MBH-T-2	20/1	43	100					
			1200			44	20/1	**MF3-M-1 PROCESS SKID 3**
MF4-M-1 PROCESS SKID 4	20/1	45		1200				
				50		46	20/1	**52-AIT-1200**
FLOC TANK LEAK DETECTOR	20/1	47			100			
					500	48	20/1	**52-AIT-1250**
SPARE	20/1	49						
			1800			50		
SPARE	20/1	51						
				1000		52	100/3	LP-UV
SPARE	20/1	53						
					881	54		
CONNECTED VA PER PHASE			12337.0	12413.0	11580.6	NOTES:		
CONNECTED AMPS PER PHASE			102.8	103.4	96.5			
25% OF CONTINUOUS & LIGHTING LOAD (VA)			172.5	98.0	122.5			
LARGEST MOTOR (25%)			122.5	98.0	122.5			
CODE VA PER PHASE			12632.0	12609.0	11825.6			
CODE AMPS PER PHASE			105.3	105.1	98.6			

EXISTING LP-RW SCHEDULE

K:\LAS GALLINAS\000949.D LAS GALLINAS SECONDARY TREATMENT\SKM CAD FILES\14 E-12 LIGHTING PANEL CALCULATIONS 2.DWG

PLOTTED: 9/13/2018
SAVED: 9/13/2018

PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR: No,
RED 0.70MM
YELLOW 0.20MM
GREEN 0.25MM
CYAN 0.40MM
BLUE 0.50MM
MAGENTA 0.20MM
WHITE 0.35MM
GRAY 0.15MM
9 0.15MM
10 1.00MM
100 0.70MM
210 0.60MM

LGVSD 1 FILE:
FD144793

ADDENDUM 4

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533 W 2600 S, Suite 25
Bountiful, Utah 84010
Phone: (801) 677-0011
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PHONE (801) 299-1327 FAX (801) 299-0153

REGISTERED PROFESSIONAL ENGINEER — JOSEPH P. CORTEZ — NO. E16627 — EXP. 12-31-18 — ELECTRICAL — STATE OF CALIFORNIA

NO.	DATE	DESCRIPTION	BY	APPR'D
1	9/14/18	ADDENDUM #4	MGJ	LAR

REVISIONS

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

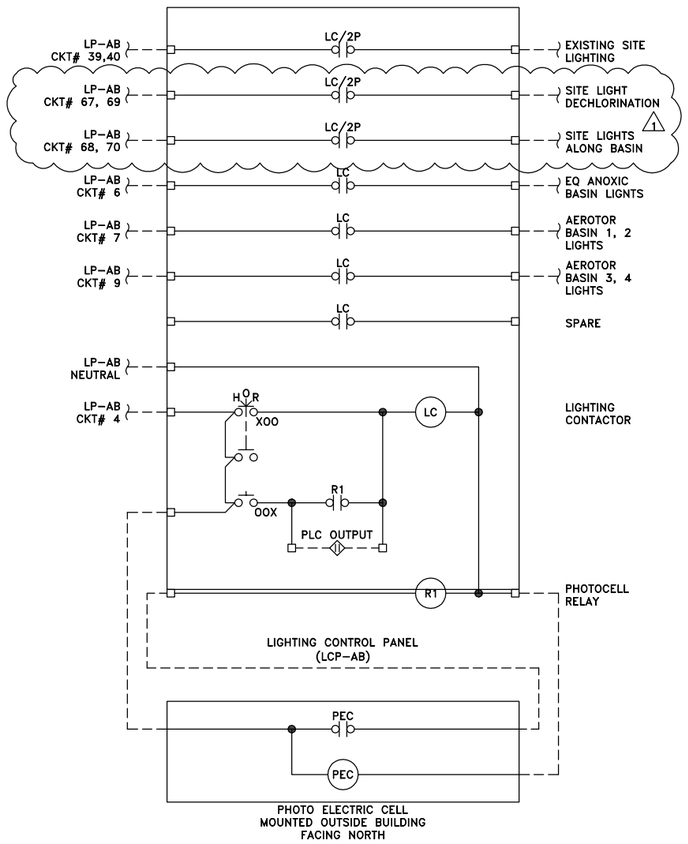
SECONDARY TREATMENT PLANT UPGRADE AND RECYCLED WATER EXPANSION

ELECTRICAL - POWER DISTRIBUTION LIGHTING PANEL CALCULATIONS 2

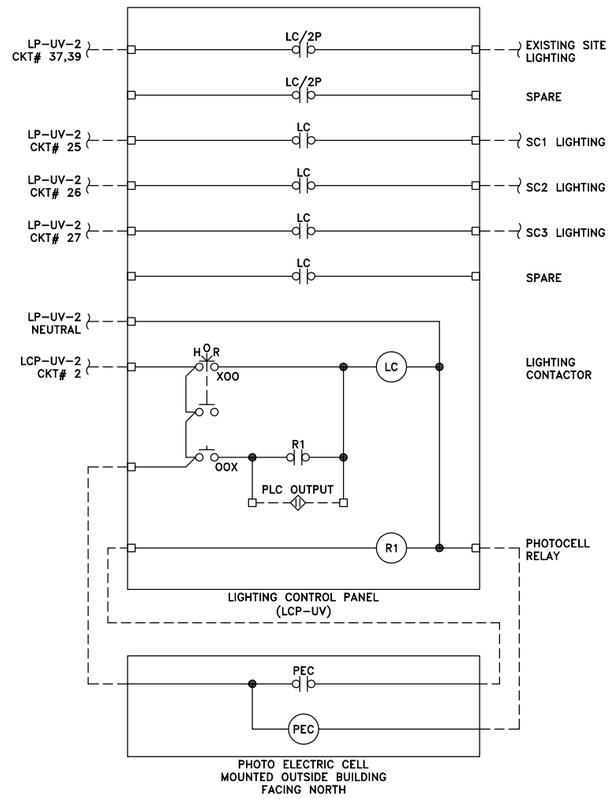
CHECKED	DRAWN	SCALE
MPJ	DCL	AS SHOWN
APPROVED	DESIGNED	DATE
MPJ	MPJ	07/26/18
GENERAL MANAGER	DISTRICT ENGINEER	
Chris DeGabriele	Michael P Cortez	
	RCE # 54039	

SHEET	PLAN NO.	DRAWING NO.	REVISION NO.
121 OF 159		E-12	B

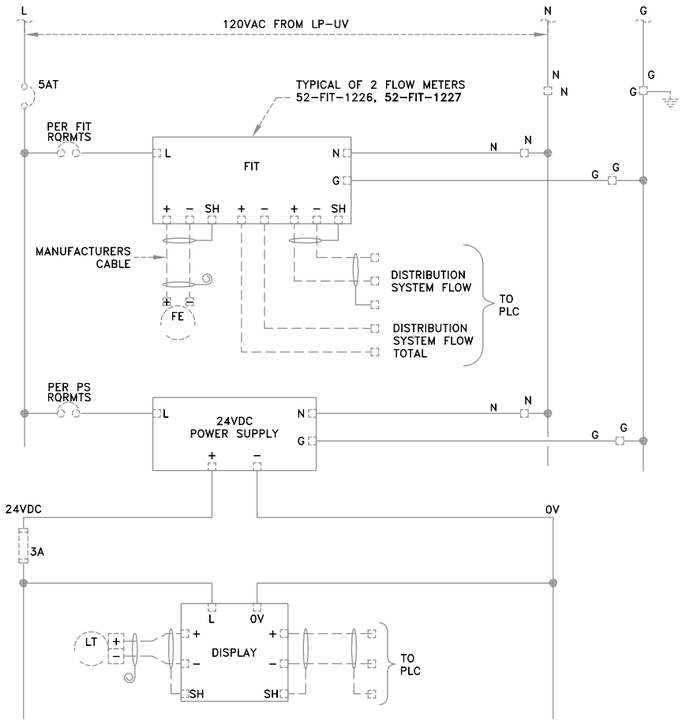
FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4



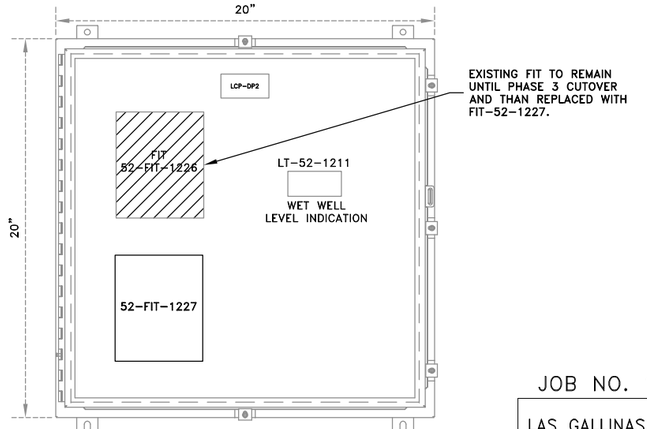
ELECTRICAL BUILDING LIGHTING CONTROL PANEL



UV BUILDING LIGHTING CONTROL PANEL



LCP-52-1211



LCP-52-1211

NOTES:

1. TYPICAL SCHEMATIC DIAGRAMS ARE INTENDED TO REFLECT THE GENERAL CONTROL STRATEGY. ACTUAL CIRCUITRY MAY VARY FOR SPECIFIC EQUIPMENT SUPPLIED. THE NUMBER AND TYPE OF DEVICES SHALL BE FURNISHED AS REQUIRED FOR PROPER OPERATION OF THE EQUIPMENT.
2. CONTROL POWER TRANSFORMERS (CPT) SHALL BE ADEQUATELY SIZED AND SHALL BE PROVIDED WITH PROPERLY SIZED FUSES FOR BOTH THE PRIMARY AND SECONDARY WINDINGS.
3. FUSES SHALL BE ADEQUATELY SIZED PER THE EQUIPMENT MANUFACTURER'S RECOMMENDATIONS.
4. ADJUST TIME DELAY RELAYS PRIOR TO STARTUP. STAGGER TIMER SETTINGS FOR POWER ON-DELAY RELAYS.
5. CONTROL SWITCHES SHALL BE DOOR MOUNTED ON THEIR RESPECTIVE PANELS. DEVICES SHALL BE RATED FOR LINE VOLTAGE AND 125% OF LOAD CURRENT.
6. LOCAL CONTROLS SHALL BE INSTALLED ACCORDING TO SITE PLAN AND NOT NECESSARILY AS SHOWN ON SCHEMATICS. SEE LCP SCHEMATICS AND CONDUIT SCHEDULE FOR EXACT WIRING.

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AQUA ENGINEERING
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REGISTERED PROFESSIONAL ENGINEER — CHRIS DEGABRIELE — NO. E 16627 — EXP. 12-31-18 — CIVIL — STATE OF CALIFORNIA

NO.	DATE	DESCRIPTION	BY	APPR'D
1	9/14/18	ADDENDUM #4	MGJ	LAR

REVISIONS

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT UPGRADE AND RECYCLED WATER EXPANSION

ELECTRICAL - POWER DISTRIBUTION
LCP SCHEMATIC DIAGRAM

CHECKED	DRAWN	SCALE
MPJ	DCL	AS SHOWN
APPROVED	DESIGNED	DATE
MPJ	MPJ	07/26/18
GENERAL MANAGER	DISTRICT ENGINEER	
Chris DeGabriele	Michael P Cortez	RCE # 54039

SHEET	PLAN NO.	DRAWING NO.	REVISION NO.
128 OF 159		E-19	B

K:\LAS GALLINAS\000949.D LAS GALLINAS SECONDARY TREATMENT\SKM CAD FILES\14 E-19 LCP SCHEMATIC DIAGRAM.DWG

PLOTTED: 9/14/2018
SAVED: 9/14/2018

PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR:	No.
RED	0.70MM
YELLOW	0.20MM
GREEN	0.25MM
CYAN	0.40MM
BLUE	0.50MM
MAGENTA	0.20MM
WHITE	0.35MM
GRAY	0.15MM
9	0.15MM
10	1.00MM
100	0.70MM
210	0.60MM

LGVSD 1 FILE: FD144793

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4

ADDENDUM 4

SHEET	TAG	DESCRIPTION	MAKE	MODEL	SUPPLY	RANGE	COMMENTS
PI-27	21-LIT-1000	POND SUPERNATANT LEVEL TRANSMITTER	SIEMENS	HYDRORANGER 200	120VAC		TRANSMITTER; OR APPROVED EQUAL
PI-27	21-LE-1000	POND SUPERNATANT LEVEL SENSOR	SIEMENS	ECHOMAX XPS-15	XMTR		PROVIDE WITH APPROPRIATE CABLE LENGTH; OR APPROVED EQUAL
PI-09	23-LIT-1002	PRIMARY PUMP STATION TRANSMITTER	SIEMENS	HYDRORANGER 200	120VAC		TRANSMITTER; OR APPROVED EQUAL
PI-09	23-LE-1002	PRIMARY PUMP STATION SENSOR	SIEMENS	ECHOMAX XPS-15	XMTR		PROVIDE WITH APPROPRIATE CABLE LENGTH; OR APPROVED EQUAL
PI-09	23-LT-1003	PRIMARY PUMP STATION LEVEL	KPSI	750	24VDC		LARGE HEAD; OR APPROVED EQUAL
PI-09	23-LSL-1004	PRIMARY PUMP STATION LEVEL LOW SWITCH	USA BLUEBOOK	48233	NO CONTACT		AVOCADO STYLE FLOAT SWITCH NORMALLY OPEN WITH APPROPRIATE LENGTH CABLE, NO MERCURY; OR APPROVED EQUAL
PI-09	23-LSH-1004A	PRIMARY PUMP STATION LEVEL LOW RESET SWITCH	USA BLUEBOOK	48233	NO CONTACT		AVOCADO STYLE FLOAT SWITCH NORMALLY OPEN WITH APPROPRIATE LENGTH CABLE, NO MERCURY; OR APPROVED EQUAL
PI-09	23-LSH-1004B	PRIMARY PUMP STATION LEVEL HIGH SWITCH	USA BLUEBOOK	48233	NO CONTACT		AVOCADO STYLE FLOAT SWITCH NORMALLY OPEN WITH APPROPRIATE LENGTH CABLE, NO MERCURY; OR APPROVED EQUAL
PI-09	23-PI-1100	PRIMARY PUMP 1 SEAL WATER PRESSURE GAUGE	ASHCROFT	1279 SERIES			OR APPROVED EQUAL
PI-09	23-FSL-1100	PRIMARY PUMP 1 SEAL WATER LOW FLOW SWITCH	DWYER	LOW FLOW MODEL V6			OR APPROVED EQUAL
PI-09	23-FE-1100	PRIMARY PUMP 1 SEAL WATER ROTAMETER	KROHNE	VA40 SERIES			OR APPROVED EQUAL
PI-09	23-PI-1200	PRIMARY PUMP 2 SEAL WATER PRESSURE GAUGE	ASHCROFT	1279 SERIES			OR APPROVED EQUAL
PI-09	23-FSL-1200	PRIMARY PUMP 2 SEAL WATER LOW FLOW SWITCH	DWYER	LOW FLOW MODEL V6			OR APPROVED EQUAL
PI-09	23-FE-1200	PRIMARY PUMP 2 SEAL WATER ROTAMETER	KROHNE	VA40 SERIES			OR APPROVED EQUAL
PI-09	23-PI-1300	PRIMARY PUMP 3 SEAL WATER PRESSURE GAUGE	ASHCROFT	1279 SERIES			OR APPROVED EQUAL
PI-09	23-FSL-1300	PRIMARY PUMP 3 SEAL WATER LOW FLOW SWITCH	DWYER	LOW FLOW MODEL V6			OR APPROVED EQUAL
PI-09	23-FE-1300	PRIMARY PUMP 3 SEAL WATER ROTAMETER	KROHNE	VA40 SERIES			OR APPROVED EQUAL
PI-09	23-PI-1400	PRIMARY PUMP 4 SEAL WATER PRESSURE GAUGE	ASHCROFT	1279 SERIES			OR APPROVED EQUAL
PI-09	23-FSL-1400	PRIMARY PUMP 4 SEAL WATER LOW FLOW SWITCH	DWYER	LOW FLOW MODEL V6			OR APPROVED EQUAL
PI-09	23-FE-1400	PRIMARY PUMP 4 SEAL WATER ROTAMETER	KROHNE	VA40 SERIES			OR APPROVED EQUAL
PI-09	23-PI-1500	PRIMARY PUMP 5 SEAL WATER PRESSURE GAUGE	ASHCROFT	1279 SERIES			OR APPROVED EQUAL
PI-09	23-FSL-1500	PRIMARY PUMP 5 SEAL WATER LOW FLOW SWITCH	DWYER	LOW FLOW MODEL V6			OR APPROVED EQUAL
PI-09	23-FE-1500	PRIMARY PUMP 5 SEAL WATER ROTAMETER	KROHNE	VA40 SERIES			OR APPROVED EQUAL
PI-11	23-FE/FIT-1010	ANOXIC BASIN INFLUENT CHANNEL FLOW SENSOR/TRANSMITTER	SIEMENS	MAG 6000, 5100W	120VAC		24"; 6000 IS THE TRANSMITTER, 5100W IS THE FLOWMETER; OR APPROVED EQUAL
PI-11	23-FE/FIT-1020	AERATION BASIN INFLUENT CHANNEL FLOW SENSOR/TRANSMITTER	SIEMENS	MAG 6000, 5100W	120VAC		24"; 6000 IS THE TRANSMITTER, 5100W IS THE FLOWMETER; OR APPROVED EQUAL
PI-10	31-AIT-1010	ANOXIC BASIN 1 ORP TRANSMITTER	HACH	SC200	120VAC		OR APPROVED EQUAL
PI-10	31-AE-1010	ANOXIC BASIN 1 ORP SENSOR	HACH	pHD			PROVIDE ORP SENSOR WITH APPROPRIATE CABLE LENGTH & HANDRAIL MOUNTING KIT; OR APPROVED EQUAL
PI-10	31-AIT-2010	ANOXIC BASIN 2 ORP TRANSMITTER	HACH	SC200	120VAC		OR APPROVED EQUAL
PI-10	31-AE-2010	ANOXIC BASIN 2 ORP SENSOR	HACH	pHD			PROVIDE ORP SENSOR WITH APPROPRIATE CABLE LENGTH & HANDRAIL MOUNTING KIT; OR APPROVED EQUAL
PI-10	31-AIT-1001	AERATION BASIN 1 DISSOLVED OXYGEN 1/2 TRANSMITTER	HACH	SC200	120VAC		OR APPROVED EQUAL
PI-10	31-AE-1001	AERATION BASIN 1 DISSOLVED OXYGEN 1 SENSOR	HACH	LDO PROBE 2			PROVIDE ORP SENSOR WITH APPROPRIATE CABLE LENGTH & HANDRAIL MOUNTING KIT; OR APPROVED EQUAL
PI-10	31-AE-1002	AERATION BASIN 1 DISSOLVED OXYGEN 2 SENSOR	HACH	LDO PROBE 2			PROVIDE ORP SENSOR WITH APPROPRIATE CABLE LENGTH & HANDRAIL MOUNTING KIT; OR APPROVED EQUAL
PI-10	31-AIT-2001	AERATION BASIN 2 DISSOLVED OXYGEN 1/2 TRANSMITTER	HACH	SC200	120VAC		OR APPROVED EQUAL
PI-10	31-AE-2001	AERATION BASIN 2 DISSOLVED OXYGEN 1 SENSOR	HACH	LDO PROBE 2			PROVIDE ORP SENSOR WITH APPROPRIATE CABLE LENGTH & HANDRAIL MOUNTING KIT; OR APPROVED EQUAL
PI-10	31-AE-2002	AERATION BASIN 2 DISSOLVED OXYGEN 2 SENSOR	HACH	LDO PROBE 2			PROVIDE ORP SENSOR WITH APPROPRIATE CABLE LENGTH & HANDRAIL MOUNTING KIT; OR APPROVED EQUAL
PI-11	31-AIT-4010	ANOXIC BASIN 4 ORP TRANSMITTER	HACH	SC200	120VAC		OR APPROVED EQUAL
PI-11	31-AE-4010	ANOXIC BASIN 4 ORP SENSOR	HACH	pHD			PROVIDE ORP SENSOR WITH APPROPRIATE CABLE LENGTH & HANDRAIL MOUNTING KIT; OR APPROVED EQUAL
PI-11	31-AE-3010	ANOXIC BASIN 3 ORP SENSOR	HACH	pHD			PROVIDE ORP SENSOR WITH APPROPRIATE CABLE LENGTH & HANDRAIL MOUNTING KIT; OR APPROVED EQUAL
PI-11	31-AIT-3001	AERATION BASIN 3 DISSOLVED OXYGEN 1/2 TRANSMITTER	HACH	SC200	120VAC		OR APPROVED EQUAL
PI-11	31-AE-3001	AERATION BASIN 3 DISSOLVED OXYGEN 1 SENSOR	HACH	LDO PROBE 2			PROVIDE ORP SENSOR WITH APPROPRIATE CABLE LENGTH & HANDRAIL MOUNTING KIT; OR APPROVED EQUAL
PI-11	31-AE-3002	AERATION BASIN 3 DISSOLVED OXYGEN 2 SENOSR	HACH	LDO PROBE 2			PROVIDE ORP SENSOR WITH APPROPRIATE CABLE LENGTH & HANDRAIL MOUNTING KIT; OR APPROVED EQUAL
PI-11	31-AIT-4001	AERATION BASIN 4 DISSOLVED OXYGEN 1/2 TRANSMITTER	HACH	SC200	120VAC		OR APPROVED EQUAL
PI-11	31-AE-4001	AERATION BASIN 4 DISSOLVED OXYGEN 1 SENSOR	HACH	LDO PROBE 2			PROVIDE ORP SENSOR WITH APPROPRIATE CABLE LENGTH & HANDRAIL MOUNTING KIT; OR APPROVED EQUAL
PI-11	31-AE-4002	AERATION BASIN 4 DISSOLVED OXYGEN 2 SENSOR	HACH	LDO PROBE 2			PROVIDE ORP SENSOR WITH APPROPRIATE CABLE LENGTH & HANDRAIL MOUNTING KIT; OR APPROVED EQUAL
PI-12	31-PIT 5000	ANOXIC BLOWER HEADER PRESSURE TRANSMITTER	ROSEMOUNT	3051 SERIES	24VDC		OR APPROVED EQUAL
PI-12	36-FE/FIT-1000	INTERNAL RECYCLE PUMP FLOW SENSOR/TRANSMITTER	SIEMENS	MAG 6000, 5100W	120VAC		24"; 6000 IS THE TRANSMITTER, 5100W IS THE FLOWMETER; OR APPROVED EQUAL
PI-12	36-PI-1100	INTERNAL RECYCLE PUMP 1 SEAL WATER PRESSURE GAUGE	ASHCROFT	1279 SERIES			OR APPROVED EQUAL
PI-12	36-FSL-1100	INTERNAL RECYCLE PUMP 1 SEAL WATER LOW FLOW SWITCH	DWYER	LOW FLOW MODEL V6			OR APPROVED EQUAL
PI-12	36-FE-1100	INTERNAL RECYCLE PUMP 1 SEAL WATER ROTAMETER	KROHNE	VA40 SERIES			OR APPROVED EQUAL
PI-12	36-PI-1200	INTERNAL RECYCLE PUMP 2 SEAL WATER PRESSURE GAUGE	ASHCROFT	1279 SERIES			OR APPROVED EQUAL
PI-12	36-FSL-1200	INTERNAL RECYCLE PUMP 2 SEAL WATER LOW FLOW SWITCH	DWYER	LOW FLOW MODEL V6			OR APPROVED EQUAL
PI-12	36-FE-1200	INTERNAL RECYCLE PUMP 2 SEAL WATER ROTAMETER	KROHNE	VA40 SERIES			OR APPROVED EQUAL
PI-12	36-PI-1300	INTERNAL RECYCLE PUMP 3 SEAL WATER PRESSURE GAUGE	ASHCROFT	1279 SERIES			OR APPROVED EQUAL
PI-12	36-FSL-1300	INTERNAL RECYCLE PUMP 3 SEAL WATER LOW FLOW SWITCH	DWYER	LOW FLOW MODEL V6			OR APPROVED EQUAL
PI-12	36-FE-1300	INTERNAL RECYCLE PUMP 3 SEAL WATER ROTAMETER	KROHNE	VA40 SERIES			OR APPROVED EQUAL
PI-09	33-LT-1111	SECONDARY CLARIFIER RAS SPLITTER BOX 1 LEVEL	SIEMENS	SITRANS PROBE LU	24VDC		OR APPROVED EQUAL
PI-09	33-LT-1211	SECONDARY CLARIFIER RAS SPLITTER BOX 2 LEVEL	SIEMENS	SITRANS PROBE LU	24VDC		OR APPROVED EQUAL
PI-14	23-LT-1020	STORM DRAIN STORAGE LEVEL	KPSI	750	24VDC		LARGE HEAD; OR APPROVED EQUAL
PI-14	23-LSL-1020	STORM DRAIN STORAGE LEVEL STOP SWITCH	USA BLUEBOOK	48233	NO CONTACT		AVOCADO STYLE FLOAT SWITCH NORMALLY OPEN WITH APPROPRIATE LENGTH CABLE, NO MERCURY; OR APPROVED EQUAL
PI-14	23-LSH-1020A	STORM DRAIN STORAGE LEVEL LEAD START SWITCH	USA BLUEBOOK	48233	NO CONTACT		AVOCADO STYLE FLOAT SWITCH NORMALLY OPEN WITH APPROPRIATE LENGTH CABLE, NO MERCURY; OR APPROVED EQUAL
PI-14	23-LSH-1020B	STORM DRAIN STORAGE LEVEL LAG START SWITCH	USA BLUEBOOK	48233	NO CONTACT		AVOCADO STYLE FLOAT SWITCH NORMALLY OPEN WITH APPROPRIATE LENGTH CABLE, NO MERCURY; OR APPROVED EQUAL
PI-16	51-FE/FIT-1009	UV BYPASS FLOW SENSOR/TRANSMITTER	SIEMENS	MAG 6000, 5100W	120VAC		18"; 6000 IS THE TRANSMITTER, 5100W IS THE FLOWMETER; OR APPROVED EQUAL
PI-16	51-LSH-1010	SECONDARY CLARIFIER EFFLUENT BOX VAULT FLOOD SWITCH	GEMS	LS-74780	NO CONTACT		OR APPROVED EQUAL
PI-09	42-FE/FIT-1120	POND RETURN FLOW SENSOR/TRANSMITTER	SIEMENS	MAG 6000, 5100W	120VAC		16"; 6000 IS THE TRANSMITTER, 5100W IS THE FLOWMETER; OR APPROVED EQUAL
PI-16	43-AE-1600	SECONDARY EFFLUENT CHLORINE RESIDUAL VERIFICATION	HACH	CL10	120VAC		
PI-16	43-AE-1610	BYPASS CHLORINE RESIDUAL	HACH	CL10	120VAC		
PI-16	43-AE-1620	SODIUM BISULFATE DOSING CHLORINE RESIDUAL	HACH	CL10	120VAC		
PI-16	43-AE-1630	FINAL EFFLUENT CHLORINE RESIDUAL	HACH	CL10	120VAC		
PI-17	62-FE/FIT-2620	THICKENER INFLUENT FLOW SENSOR/TRANSMITTER	SIEMENS	MAG 6000, 5100W	120VAC		4"; 6000 IS THE TRANSMITTER, 5100W IS THE FLOWMETER; OR APPROVED EQUAL
PI-17	62-FE/FIT-2500	SLUDGE FLOW SENSOR/TRANSMITTER	SIEMENS	MAG 6000, 5100W	120VAC		4"; 6000 IS THE TRANSMITTER, 5100W IS THE FLOWMETER; OR APPROVED EQUAL
PI-17	62-FE/FIT-2640	POLYMER THICKENER FLOW SENSOR/TRANSMITTER	SIEMENS	MAG 6000, 5100W	120VAC		1"; 6000 IS THE TRANSMITTER, 5100W IS THE FLOWMETER; OR APPROVED EQUAL
PI-17	62-PSH-2300	THICKCENER SLUDGE PUMP 1 DISCHARGE PRESSURE SWITCH	ASHCROFT	SERIES B	120VAC		OR APPROVED EQUAL
PI-17	62-PI-2300	THICKCENER SLUDGE PUMP 1 DISCHARGE PRESSURE GAUGE	ASHCROFT	1279 SERIES			OR APPROVED EQUAL
PI-24	52-AIT-1200	RECYCLED WATER CFE TURBIDITY	HACH	TU5300	120VAC		WITH SC200 DISPLAY OR APPROVED EQUAL
PI-25	52-FE/FIT-1227	MMWD TANK FEED FLOW SENSOR/TRANSMITTER	SIEMENS	MAG 6000, 5100W	120VAC		18"; 6000 IS THE TRANSMITTER, 5100W IS THE FLOWMETER; OR APPROVED EQUAL
PI-26	52-AIT-1250	MMWD TANK LINE CHLORINE RESIDUAL	HACH	CL10	120VAC		OR APPROVED EQUAL
PI-26	52-AIT-1260	MMWD TANK WIER CHLORINE RESIDUAL	HACH	CL10	120VAC		OR APPROVED EQUAL
PI-26	52-LT-1300	MMWD TANK LEVEL	KPSI	750	120VAC		LARGE HEAD; OR APPROVED EQUAL
PI-26	43-AIT-1650	SODIUM BISULFATE DOSING CHLORINE RESIDUAL	HACH	CL10	120VAC		PART OF ALTERNATE BID OR APPROVED EQUAL
PI-26	43-AIT-1660	FINAL EFFLUENT CHLORINE RESIDUAL	HACH	CL10	120VAC		PART OF ALTERNATE BID OR APPROVED EQUAL
PI-27	51-FE/FIT-1007	RECYCLED WATER NMWD DISTRIBUTION SYSTEM FLOW SENSOR/TRANSMITTER	SIEMENS	MAG 6000, 5100W	120VAC		16"; 6000 IS THE TRANSMITTER, 5100W IS THE FLOWMETER; OR APPROVED EQUAL
PI-27	51-FE/FIT-1006	RECYCLED WATER TO NON-POTABLE WATER FLOW SENSOR/TRANSMITTER	SIEMENS	MAG 6000, 5100W	120VAC		4"; 6000 IS THE TRANSMITTER, 5100W IS THE FLOWMETER; OR APPROVED EQUAL
PI-27	51-PIT-1009	NMWD DISTRIBUTION HEADER PRESSURE	ROSEMOUNT	3051 SERIES	24VDC		OR APPROVED EQUAL
PI-27	51-PIT-1010	MMWD DISTRIBUTION HEADER PRESSURE	ROSEMOUNT	3051 SERIES	24VDC		OR APPROVED EQUAL
PI-27	51-PI-2100	NMWD DISTRIBUTION PUMP 1 DISCHARGE PRESSURE GAUGE	ASHCROFT	1279 SERIES			OR APPROVED EQUAL
PI-27	51-PI-2200	NMWD DISTRIBUTION PUMP 2 DISCHARGE PRESSURE GAUGE	ASHCROFT	1279 SERIES			OR APPROVED EQUAL
PI-27	51-PI-2300	MMWD DISTRIBUTION PUMP 1 DISCHARGE PRESSURE GAUGE	ASHCROFT	1279 SERIES			OR APPROVED EQUAL
PI-27	51-PI-2400	MMWD DISTRIBUTION PUMP 2 DISCHARGE PRESSURE GAUGE	ASHCROFT	1279 SERIES			OR APPROVED EQUAL
PI-13	44-FE/FIT-1000	SECONDARY CLARIFIER EFFLUENT FLOW SENSOR/TRANSMITTER	SIEMENS	MAG 6000, 5100W	120VAC		20"; 6000 IS THE TRANSMITTER, 5100W IS THE FLOWMETER; OR APPROVED EQUAL
PI-13	44-LSH-1010	SC EFFLUENT VAULT FLOOD SWITCH	GEMS	LS-74780	NO CONTACT		OR APPROVED EQUAL
PI-29	44-TE-1530	UV BUILDING INSIDE TEMPERATURE	ROSEMOUNT	SERIES 78 & 3144P	24VDC		PROVIDE WITH 316SS THERMOWELL; OR APPROVED EQUAL
PI-29	44-AE-1540	UV BUILDING INSIDE HUMIDITY	GE	GEH2-S	24VDC		OR APPROVED EQUAL
PI-29	44-TE-1550	UV BUILDING OUTSIDE TEMPERATURE	ROSEMOUNT	SERIES 78 & 3144P	24VDC		PROVIDE WITH 316SS THERMOWELL; OR APPROVED EQUAL
PI-29	44-AE-1560	UV BUILDING OUTSIDE HUMIDITY	GE	GEH2-S	24VDC		OR APPROVED EQUAL
PI-28	44-FSH-1500	UV BIOASSAY ROOM EYEWASH FLOW SWITCH	DWYER	LOW FLOW MODEL V6	NO/NC CONTACT		OR APPROVED EQUAL
PI-09	61-LIT-1000	RAS BOX LEVEL TRANSMITTER	SIEMENS	HYDRORANGER 200	120VAC		TRANSMITTER; OR APPROVED EQUAL
PI-09	61-LE-1000	RAS BOX LEVEL SENSOR	SIEMENS	ECHOMAX XPS-15	XMTR		PROVIDE WITH APPROPRIATE CABLE LENGTH; OR APPROVED EQUAL
PI-09	61-LSL-1000	RAS BOX LEVEL LOW SWITCH	USA BLUEBOOK	48233	NO CONTACT		AVOCADO STYLE FLOAT SWITCH NORMALLY OPEN WITH APPROPRIATE LENGTH CABLE, NO MERCURY; OR APPROVED EQUAL
PI-09	61-LSL-1310	DRAIN BOX LEVEL LOW SWITCH	USA BLUEBOOK	48233	NO CONTACT		AVOCADO STYLE FLOAT SWITCH NORMALLY OPEN WITH APPROPRIATE LENGTH CABLE, NO MERCURY; OR APPROVED EQUAL

K:\LAS GALLINAS\000949.D LAS GALLINAS SECONDARY TREATMENT\SKM CAD FILES\14 E-20 INSTRUMENT SCHEDULE.DWG

PLOTTED: 9/13/2018
SAVED: 9/13/2018

PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR: No.
RED 0.70MM
YELLOW 0.20MM
GREEN 0.25MM
CYAN 0.40MM
BLUE 0.50MM
MAGENTA 0.20MM
WHITE 0.35MM
GRAY 0.15MM
9 0.15MM
10 1.00MM
100 0.70MM
210 0.60MM

LGVSD 1 FILE: FD144793

ADDENDUM 4

INSTRUMENT SCHEDULE

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REGISTERED PROFESSIONAL ENGINEER — MICHAEL P CORTEZ — NO. E16627 — EXP. 12-31-18 — CIVIL — STATE OF CALIFORNIA

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4

1

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT UPGRADE AND RECYCLED WATER EXPANSION

ELECTRICAL – POWER DISTRIBUTION INSTRUMENT SCHEDULE

CHECKED	DRAWN	SCALE
MPJ	DCL	AS SHOWN
APPROVED	DESIGNED	DATE
MPJ	MPJ	07/26/18
GENERAL MANAGER	DISTRICT ENGINEER	
Chris DeGabriele	Michael P Cortez	
	RCE # 54039	

NO.	DATE	DESCRIPTION	BY	APPR'D
1	9/14/18	ADDENDUM #4	MGJ	LAR

REVISIONS

SHEET	PLAN NO.	DRAWING NO.	REVISION NO.
129 OF 159		E-20	B

POWER CONDUIT

SHEET	CONDUIT	SIZE	CONDUCTORS	SERVICE	AG MATERIAL	UG MATERIAL	FROM	TO	DUCTBANKS	NOTES
E-36	P000	*N/A*	*BY UTILITY*	*N/A*	PVC GRS	PVC 40	UTILITY	MAIN TRANSFORMER		COORDINATE NUMBER OF CONDUITS AND SIZES WITH UTILITY
E-36	P001A	8 - 4"	7 SETS OF (3 - 500 MCM W/ 3/0 NEUT AND 350 MCM GND)	480VAC	PVC GRS	PVC 40	MAIN TRANSFORMER	MAIN SES	DB-1	ONE SPARE CONDUIT WITH PULLCORD
E-36	P001B	8 - 4"	7 SETS OF (3 - 500 MCM W/ 3/0 NEUT AND 350 MCM GND)	480VAC	PVC GRS	PVC 40	MAIN SES	MAIN ATS	DB-2	ONE SPARE CONDUIT WITH PULLCORD
E-36	P002A	6 - 3"	6 SETS OF (3 - 400 MCM W/ 3/0 NEUT AND 350 MCM GND)	480VAC	GRS	PVC 40	MAIN ATS	MAIN GENERATOR	DB-3	ONE SPARE CONDUIT WITH PULLCORD
E-36	P002B	1"	2 #10 W/ #10 GND	120VAC	PVC GRS	PVC 40	LP-AB	MAIN GENERATOR CHARGER	DB-3	SERVES GENERATOR CHARGER
			3 #10 W/ #10 GND	240VAC				MAIN GENERATOR HEATER		SERVERS GENERATOR HEATER
E-36	P003	7 - 4"	6 SETS OF (3 - 500 MCM W/ 3/0 NEUT AND 350 MCM GND)	480VAC	GRS	PVC 40	MAIN ATS	SWBD-1		
E-39	P006A	1"	3 #8 W/ #10 GND	480VAC	GRS	PVC 40	SWBD-AB1	LP-AB TRANSFORMER		
E-39	P006B	1.5"	4 #3 W/ #8 GND	120VAC	GRS	PVC 40	LP-AB TRANSFORMER	LP-AB		
E-39	P007	3/4"	2 #12 W/ #12 GND	120VAC	GRS	PVC 40	LP-AB	PLC-AB		
E-36	P010	2 -3"	2 SETS OF 3 - 350 MCM W/ #1 GND	480VAC	GRS	PVC 40	SWBD-AB1	MCC-AB2		VIA WIRE TRENCH
E-38	P015	3/4"	2 #12 W/ #12 GND	120VAC	GRS	PVC 40	LP-AB	31-H-1100		
E-38	P019	3/4"	2 #12 W/ #12 GND	120VAC	GRS	PVC 40	LP-AB	31-H-1110		
E-37	P016	3/4"	2 #12	120VAC	GRS	PVC 40	LP-AB	MCC-AB2		SERVES MCC-AB2 LOW LEVEL RELAY SECTION
			2 #12					MCC-AB3		SERVES MCC-AB3 LOW LEVEL RELAY SECTION
E-38	P017A	1"	3 #8 W/ #10 GND	480VAC	PVC GRS	PVC 40	SWBD-AB1	DS-31-H-1100		
E-38	P017B	1"	3 #8 W/ #10 GND	480VAC	PVC GRS	PVC 40	DS-31-H-1100	31-H-1100		
E-38	P018A	1"	3 #8 W/ #10 GND	480VAC	PVC GRS	PVC 40	SWBD-AB1	DS-31-H-1200		
E-38	P018B	1"	3 #8 W/ #10 GND	480VAC	PVC GRS	PVC 40	DS-31-H-1200	31-H-1200		
E-37	P019	3/4"	2 #12 W/ #12 GND	120VAC	GRS	PVC 40	LP-AB	31-H-1210		
E-38	P020	2-3"	2 SETS OF 3 - 350 MCM W/ #1 GND	480VAC	GRS	PVC 40	SWBD-AB1	MCC-AB3		
E-40	P030	2-3"	2 SETS OF 3 - 4/0 MCM W/ #2 GND	480VAC	GRS	PVC 40	SWBD-AB1	MCC-AB1		
E-40	P040	2-3"	2 SETS OF 3 - 350 MCM W/ #1 GND	480VAC	GRS	PVC 40	SWBD-AB1	MCC-AB4		
E-37	P050	1.5"	4 #3 W/ #8 GND	480VAC	GRS	PVC 40	SWBD-AB1	DP-AB2		
E-41	P051	1"	3 #8 W/ #10 GND	480VAC	PVC GRS	PVC 40	DP-AB2	P-VLT25	DB-4	SERVES EXISTING DIGESTED SLUDGE PUMP AND VALVES PANEL
E-41	P052	1"	3 #8 W/ #10 GND	480VAC	PVC GRS	PVC 40	P-VLT25	P-VLT26	DB-14	SERVES EXISTING DIGESTED SLUDGE PUMP AND VALVES PANEL
E-41	P053	1"	3 #8 W/ #10 GND	480VAC	PVC GRS	PVC 40	P-VLT26	P#19	DB-30	
E-41	P054	1"	3 #8 W/ #10 GND	480VAC	PVC GRS	PVC 40	P#19	EXISTING DIGESTED SLUDGE PUMP AND VALVES PANEL	EXISTING	
E-42	P066	1"	2 #12 W/ #12 GND	120VAC	PVC GRS	PVC 40	LP-AB	P-VLT28	DB-6	
E-39	P067	1"	2 #12 W/ #12 GND	120VAC	PVC GRS	PVC 40	P-VLT28	FUEL TANK CONTROLLER	DB-7	
E-37	P71	1"	2 #10 W/ #10 GND	120VAC	PVC GRS	PVC 40	LP-MCC3	THICKENER AREA SITE LIGHTS	DB-25	
E-39	P082	1"	3 #12 W/ #12 GND	240VAC	PVC GRS	PVC 40	LP-AB	SITE LIGHTING 1		SERVES SITE LIGHTING - 3 LIGHTS
E-39	P083	1"	3 #12 W/ #12 GND	240VAC	PVC GRS	PVC 40	LP-AB	SITE LIGHTING 2		SERVES SITE LIGHTING - 4 LIGHTS
E-41	P105A	2"	4 1/0 W/ #6 GND	480VAC	GRS	PVC 40	DP-AB2	DS-PSU-UV-1 TXFR	DB-5	
E-41	P105B	2"	4 1/0 W/ #6 GND	480VAC	GRS	PVC 40	DS-PSU-UV-1 TXFR	PSU-UV-1 TXFR		
E-41	P105C	*BY MFG*	*BY MFG*	*BY MFG*	GRS	PVC 40	PSU-UV-1 TXFR	PSU-UV-1		
E-41	P106A	2"	4 1/0 W/ #6 GND	480VAC	GRS	PVC 40	DP-AB2	DS-PSU-UV-2 TXFR	DB-5	
E-41	P106B	2"	4 1/0 W/ #6 GND	480VAC	GRS	PVC 40	DS-PSU-UV-2 TXFR	PSU-UV-2 TXFR		
E-41	P106C	*BY MFG*	*BY MFG*	*BY MFG*	GRS	PVC 40	PSU-UV-2 TXFR	PSU-UV-2		
E-41	P107	3/4"	2 #12 W/ #12 GND	120VAC	GRS	PVC 40	LP-UV-2	MCP-UV		
E-41	P108A	3/4"	3 #10 W/ #10 GND	480VAC	GRS	PVC 40	DP-AB2	LP-UV-2 TXFR	DB-5	
E-41	P108B	3"	4 3/0 W/ #6 GND	120VAC	GRS	PVC 40	LP-UV-22 TXFR	LP-UV-2		
E-41	P110	1.5"	2 #12 W/ #12 GND	120VAC	GRS	PVC 40	LP-UV-2	PLC-AB	DB-5	FOR 44-H-1611 CONTROL
			2 #12 W/ #12 GND							FOR 44-H-1621 CONTROL
			2 #12 W/ #12 GND							FOR 44-H-1631 CONTROL
E-41	P112A	1"	3 #8 W/ #10 GND	480VAC	PVC GRS	PVC 40	SWBD-AB1	P-VLT25	DB-4	SERVES EXISTING DIGESTER SUPERNATANT STATION
E-41	P112B	1"	3 #8 W/ #10 GND	480VAC	PVC GRS	PVC 40	P-VLT25	P-VLT26	DB-14	SERVES EXISTING DIGESTER SUPERNATANT STATION
E-41	P112C	1"	3 #8 W/ #10 GND	480VAC	PVC GRS	PVC 40	P-VLT26	V#19P	DB-30	SERVES EXISTING DIGESTER SUPERNATANT STATION
E-42	P112D	1"	3 #8 W/ #10 GND	480VAC	PVC GRS	PVC 40	V#19P	EXISTING POWER VAULT	EXISTING	CONTRACTOR TO INTERCEPT EXISITNG WIRE ROUTE AND PULL NEW WIRE FROM SWBD-1 TO DIGESTER SUPERNATANT STATION
E-41	P120	2"	3 #6/ W #10 GND	240VAC	PVC GRS	PVC 40	LP-RWDP	P-VLT30	DB-19	CONTRACTOR TO PULL NEW WIRE THROUGH P-VLT30 UP THE HILL TO FINAL TERMINATION POINT REPLACING EXISTING WIRE
E-41	P121	2"	2 #10 W/ #10 GND	120VAC	PVC GRS	PVC 40	LP-RWDP	P-VLT30	DB-19	CONTRACTOR TO PULL NEW WIRE THROUGH P-VLT30 UP THE HILL TO FINAL TERMINATION POINT REPLACING EXISTING WIRE
E-41	P122	1"	PULL CORD	240VAC	PVC GRS	PVC 40	LP-RWDP	P-VLT30	DB-19	
E-41	P123	1"	PULL CORD	240VAC	PVC GRS	PVC 40	LP-RWDP	P-VLT30	DB-19	
E-37	P200	1.5"	3 #3 W/ #8 GND	480VAC	PVC GRS	PVC 40	MCC-3	DP-MCC3		
E-42	P300	1"	2 #12 W/ #12 GND	120VAC	PVC GRS	PVC 40	EX CONTROL PANEL	PLC-PSP		
E-42	P400	1"	2 #12 W/ #12 GND	120VAC	PVC GRS	PVC 40	EX MCC	PLC PRP		
E-39	P500	1"	2 #12 W/ #12 GND	240VAC	PVC GRS	PVC 40	LP-AB	SITE LIGHT	DB-40	
E-39	P501	1"	2 #12 W/ #12 GND	240VAC	PVC GRS	PVC 40	SITE LIGHT	SITE LIGHTS	DB-41	
E-39	P502	1"	2 #12 W/ #12 GND	240VAC	PVC GRS	PVC 40	SITE LIGHT	SITE LIGHT	DB-42	
E-39	P503A	1"	2 #12 W/ #12 GND	240VAC	PVC GRS	PVC 40	LP-AB	P-VLT28	DB-6	
E-39	P503B	1"	2 #12 W/ #12 GND	240VAC	PVC GRS	PVC 40	P-VLT28	JB-43-1000	DB-7	
E-39	P503C	1"	2 #12 W/ #12 GND	240VAC	PVC GRS	PVC 40	JB-43-1000	SITE LIGHT	DB-43	
E-42	P21-1000	1"	2 #12 W/ #12 GND	120VAC	PVC GRS	PVC 40	PLC-PSP	21-LIT-1000		
E-37	P21-1200A	2"	3 #12 W/ #12 GND	480VAC						
			5 #14	CONTROL	PVC GRS	PVC 40	MCC-3	P-VLT1	DB-10	SERVES 21-ME-1200 (POWER, HOA, JSH, JSHH, DISCONNECT AUX); CONTRACTOR TO MATCH EXISTING WIRE SIZES
			3 #10 W/ #10 GND	480VAC						SERVES 22-P-1200; CONTRACTOR TO MATCH EXISTING WIRE SIZES
			3 #8 W/ #10 GND							SERVES 22-P-2200; CONTRACTOR TO MATCH EXISTING WIRE SIZES
E-37	P21-1200B	2"	3 #12 W/ #12 GND	480VAC						
			5 #14	CONTROL	PVC GRS	PVC 40	P-VLT1	JBOX-2	EXISTING	SERVES 21-ME-1200 (POWER, HOA, JSH, JSHH, DISCONNECT AUX); CONTRACTOR TO MATCH EXISTING WIRE SIZES
			3 #10 W/ #10 GND	480VAC						SERVES 22-P-1200; CONTRACTOR TO MATCH EXISTING WIRE SIZES
			3 #8 W/ #10 GND							SERVES 22-P-2200; CONTRACTOR TO MATCH EXISTING WIRE SIZES
E-37	P21-1200C	2"	3 #12 W/ #12 GND	480VAC						
			5 #14	CONTROL	PVC GRS	PVC 40	JBOX-2	P-VLT4	EXISTING	SERVES 21-ME-1200 (POWER, HOA, JSH, JSHH, DISCONNECT AUX); CONTRACTOR TO MATCH EXISTING WIRE SIZES
			3 #10 W/ #10 GND	480VAC						SERVES 22-P-1200; CONTRACTOR TO MATCH EXISTING WIRE SIZES
			3 #8 W/ #10 GND							SERVES 22-P-2200; CONTRACTOR TO MATCH EXISTING WIRE SIZES
E-37	P21-1200D	2"	3 #12 W/ #12 GND	480VAC						
			5 #14	CONTROL	PVC GRS	PVC 40	P-VLT4	JBOX-3	EXISTING	SERVES 21-ME-1200 (POWER, HOA, JSH, JSHH, DISCONNECT AUX); CONTRACTOR TO MATCH EXISTING WIRE SIZES
			3 #10 W/ #10 GND	480VAC						SERVES 22-P-1200; CONTRACTOR TO MATCH EXISTING WIRE SIZES
			3 #8 W/ #10 GND							SERVES 22-P-2200; CONTRACTOR TO MATCH EXISTING WIRE SIZES
E-37	P21-1200E	1"	3 #12 W/ #12 GND	480VAC	PVC GRS	PVC 40	JBOX-3	DS-21-ME-1200		CONTRACTOR TO PULL NEW WIRE TO DISCONNECT MATCHING EXISTING WIRE SIZES; RE-USE EXISTING CONDUIT (EXISTING CONDUIT PC-7)
			5 #14	CONTROL						
E-37	P21-1204A	2"	2 #12 W/ #12 GND	120VAC	PVC GRS	PVC 40	LP-MCC3	P-VLT1	DB-10	SERVES 21-LIT-1101 (LIT-1), 21-LIT-1204B (LIT-4), 21-LIT-1304B (LIT-7), 21-LIT-1305B (LIT-8)
			2 #12 W/ #12 GND							SERVES 21-LIT-1204A (LIT-2), 21-LIT-1205A (LIT-3), 21-LIT-1304A (LIT-5), 21-LIT-1305A (LIT-6)
			2 #12 W/ #12 GND							SERVES 51-LIT-1101
			2 #10 W/ #10 GND							SERVES POSSIBLE L1, L2, L3, L4, L5, L6, L8, L9; POWER TO BE ROUTED THROUGH THE LIGHTING CONTROL PANEL (LCP-AB); CONTRACTOR TO DETERMINE WHICH LIGHTS ARE POWERED HERE
			2 #12 W/ #12 GND							SERVES 96-ME-1100 (EXISTING FLARE)
			2 #12 W/ #12 GND							SERVES 96-FIT-1000
			2 #14	CONTROL			PLC-MCC-3			SERVES 96-ME-1100 (EXISTING FLARE)
E-37	P21-1204B	2"	2 #12 W/ #12 GND	120VAC	PVC GRS	PVC 40	P-VLT1	JBOX2	EXISTING	SERVES 21-LIT-1101 (LIT-1), 21-LIT-1204B (LIT-4), 21-LIT-1304B (LIT-7), 21-LIT-1305B (LIT-8)
			2 #12 W/ #12 GND							SERVES 21-LIT-1204A (LIT-2), 21-LIT-1205A (LIT-3), 21-LIT-1304A (LIT-5), 21-LIT-1305A (LIT-6)
			2 #12 W/ #12 GND							SERVES 51-LIT-1101
			2 #10 W/ #10 GND							SERVES POSSIBLE L1, L2, L3, L4, L5, L6, L8, L9; POWER TO BE ROUTED THROUGH THE LIGHTING CONTROL PANEL (LCP-AB); CONTRACTOR TO DETERMINE WHICH LIGHTS ARE POWERED HERE
			2 #12 W/ #12 GND							SERVES 96-ME-1100 (EXISTING FLARE)
			2 #12 W/ #12 GND							SERVES 96-FIT-1000
			2 #14	CONTROL						SERVES 96-ME-1100 (EXISTING FLARE)

1

NOTES:

1. CONDUIT DEVELOPMENT IS NOT ALL INCLUSIVE. CONTRACTOR SHALL PROVIDE CONDUIT AND WIRE TO PROVIDE A FULLY FUNCTIONAL FACILITY. INTERCONNECTION OF LOW VOLTAGE DEVICES MAY NOT BE SHOWN. CONDUIT AND CONDUCTORS TO LIGHTS AND RECEPTACLES ARE NOT INCLUDED IN THE CONDUIT DEVELOPMENT.

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PLOTTED: 9/13/2018
SAVED: 9/13/2018

PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR: No,
RED 0.70MM
YELLOW 0.20MM
GREEN 0.25MM
CYAN 0.40MM
BLUE 0.50MM
MAGENTA 0.20MM
WHITE 0.35MM
GRAY 0.15MM
9 0.15MM
10 1.00MM
100 0.70MM
210 0.60MM

LGVSD 1 FILE:
FD144793

ADDENDUM 4

CONDUIT SCHEDULE

skm
533 W 2600 S, Suite 25
Bountiful, Utah 84010
Phone: (801) 677-0011
www.skmeng.com

AQUA ENGINEERING
533 W 2600 S, SUITE 275, BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

REGISTERED PROFESSIONAL ENGINEER — JAMES P. JENSEN — NO. E16627 — EXP 12-31-18 — ELECTRICAL — STATE OF CALIFORNIA

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4

NO.	DATE	DESCRIPTION	BY	APPR'D
1	9/14/18	ADDENDUM #4	MGJ	LAR

REVISIONS

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT UPGRADE AND RECYCLED WATER EXPANSION

ELECTRICAL – POWER DISTRIBUTION
CONDUIT SCHEDULE 1

CHECKED	DRAWN	SCALE
MPJ	DCL	AS SHOWN
APPROVED	DESIGNED	DATE
MPJ	MPJ	07/26/18
GENERAL MANAGER	DISTRICT ENGINEER	
Chris DeGabriele	Michael P Cortez	RCE # 54039

SHEET	PLAN NO.	DRAWING NO.	REVISION NO.
130 OF 159		E-21	B

K:\LAS GALLINAS\000949.D LAS GALLINAS SECONDARY TREATMENT\SKM CAD FILES\14 E-22 CONDUIT SCHEDULE 2.DWG

PLOTTED: 9/13/2018
SAVED: 9/13/2018

POWER CONDUIT

SHEET	CONDUIT	SIZE	CONDUCTORS	SERVICE	AG MATERIAL	UG MATERIAL	FROM	TO	DUCTBANKS	NOTES
E-37	P21-1204C	2"	2 #12 W/ #12 GND 2 #12 W/ #12 GND 2 #12 W/ #12 GND 2 #10 W/ #10 GND 2 #12 W/ #12 GND 2 #12 W/ #12 GND 2 #14	120VAC CONTROL	PVC GRS	PVC 40	JBOX2	P-VLT4	EXISTING	SERVES 21-LIT-1101 (LIT-1), 21-LIT-1204B (LIT-4), 21-LIT-1304B (LIT-7), 21-LIT-1305B (LIT-8) SERVES 21-LIT-1204A (LIT-2), 21-LIT-1205A (LIT-3), 21-LIT-1304A (LIT-5), 21-LIT-1305A (LIT-6) SERVES 51-LIT-1101 SERVES POSSIBLE L1, L2, L3, L4, L5, L6, L8, L9; POWER TO BE ROUTED THROUGH THE LIGHTING CONTROL PANEL (LCP-AB); CONTRACTOR TO DETERMINE WHICH LIGHTS ARE POWERED HERE SERVES 96-ME-1100 (EXISTING FLARE) SERVES 96-FIT-1000 SERVES 96-ME-1100 (EXISTING FLARE)
E-37	P21-1204D	2"	2 #12 W/ #12 GND 2 #12 W/ #12 GND 2 #12 W/ #12 GND 2 #10 W/ #10 GND 2 #12 W/ #12 GND 2 #12 W/ #12 GND 2 #14	120VAC CONTROL	PVC GRS	PVC 40	P-VLT4	J-BOX4	EXISTING	CONTRACTOR TO PULL NEW WIRE TO J-BOX4, INSTALL TERMINAL BLOCKS AND INTERCEPT EXISTING WIRE SERVES 21-LIT-1101 (LIT-1), 21-LIT-1204B (LIT-4), 21-LIT-1304B (LIT-7), 21-LIT-1305B (LIT-8) (EXISTING SERVES 21-LIT-1204A (LIT-2), 21-LIT-1205A (LIT-3), 21-LIT-1304A (LIT-5), 21-LIT-1305A (LIT-6) (EXISTING SERVES POSSIBLE L1, L2, L3, L4, L5, L6, L8, L9 (EXISTING CONDUIT PC-31); CONTRACTOR TO DETERMINE WHICH LIGHTS ARE POWERED HERE SERVES 51-LIT-1101 SERVES 96-ME-1100 (EXISTING FLARE) SERVES 96-FIT-1000 SERVES 96-ME-1100 (EXISTING FLARE)
E-37	P21-1204E	2"	2 #10 W/ #10 GND 2 #12 W/ #12 GND 2 #12 W/ #12 GND	120VAC	PVC GRS	PVC 40	J-BOX4	P-VLT3	EXISTING	SERVES 51-LIT-1101 SERVES 96-ME-1100 (EXISTING FLARE) SERVES 96-FIT-1000
E-37	P21-1204F	2"	2 #10 W/ #10 GND	120VAC	PVC GRS	PVC 40	P-VLT3	P-VLT2	EXISTING	SERVES 51-LIT-1101
E-37	P21-1210A	2"	3 #10 W/ #10 GND 3 #10 W/ #10 GND 3 #10 W/ #10 GND 3 #10 W/ #10 GND 3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	DP-MCC3	P-VLT1	DB-10	SERVES 21-FCV-1210; CONTRACTOR TO MATCH EXISTING WIRE SIZES SERVES 21-FCV-1310; CONTRACTOR TO MATCH EXISTING WIRE SIZES SERVES 21-FCV-1410; CONTRACTOR TO MATCH EXISTING WIRE SIZES SERVES 22-FCV-2301; CONTRACTOR TO MATCH EXISTING WIRE SIZES SERVES 22-FCV-2302; CONTRACTOR TO MATCH EXISTING WIRE SIZES
E-37	P21-1210B	2"	3 #10 W/ #10 GND 3 #10 W/ #10 GND 3 #10 W/ #10 GND 3 #10 W/ #10 GND 3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	P-VLT1	JBOX2	EXISTING	SERVES 21-FCV-1210; CONTRACTOR TO MATCH EXISTING WIRE SIZES SERVES 21-FCV-1310; CONTRACTOR TO MATCH EXISTING WIRE SIZES SERVES 21-FCV-1410; CONTRACTOR TO MATCH EXISTING WIRE SIZES SERVES 22-FCV-2301; CONTRACTOR TO MATCH EXISTING WIRE SIZES SERVES 22-FCV-2302; CONTRACTOR TO MATCH EXISTING WIRE SIZES
E-37	P21-1210C	2"	3 #10 W/ #10 GND 3 #10 W/ #10 GND 3 #10 W/ #10 GND 3 #10 W/ #10 GND 3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	JBOX2	P-VLT4	EXISTING	SERVES 21-FCV-1210; CONTRACTOR TO MATCH EXISTING WIRE SIZES SERVES 21-FCV-1310; CONTRACTOR TO MATCH EXISTING WIRE SIZES SERVES 21-FCV-1410; CONTRACTOR TO MATCH EXISTING WIRE SIZES SERVES 22-FCV-2301; CONTRACTOR TO MATCH EXISTING WIRE SIZES SERVES 22-FCV-2302; CONTRACTOR TO MATCH EXISTING WIRE SIZES
E-37	P21-1210D	2"	3 #10 W/ #10 GND 3 #10 W/ #10 GND 3 #10 W/ #10 GND 3 #10 W/ #10 GND 3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	P-VLT4	J-BOX4	EXISTING	SERVES 21-FCV-1210; CONTRACTOR TO MATCH EXISTING WIRE SIZES SERVES 21-FCV-1310; CONTRACTOR TO MATCH EXISTING WIRE SIZES SERVES 21-FCV-1410; CONTRACTOR TO MATCH EXISTING WIRE SIZES SERVES 22-FCV-2301; CONTRACTOR TO MATCH EXISTING WIRE SIZES SERVES 22-FCV-2302; CONTRACTOR TO MATCH EXISTING WIRE SIZES
E-37	P21-1210E	1"	3 #10 W/ #10 GND 3 #10 W/ #10 GND 3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	J-BOX4	DS-21-FCV-1210 (BV5 DISC)		CONTRACTOR TO PULL NEW WIRE TO DISCONNECT MATCHING EXISTING SIZES; RE-USE EXISTING CONDUIT (EXISTING CONDUIT PC-13) SERVES 21-FCV-1210 SERVES 21-FCV-1310 SERVES 21-FCV-1410
E-37	P21-1300A	2"	3 #12 W/ #12 GND 5 #14 3 #10 W/ #10 GND 3 #8 W/ #10 GND	480VAC CONTROL 480VAC	PVC GRS	PVC 40	MCC-3	P-VLT1	DB-10	SERVES 21-ME-1300 (POWER, HOA, JSH, JSHH, DISCONNECT AUX); CONTRACTOR TO MATCH EXISTING WIRE SIZES SERVES 22-P-1300; CONTRACTOR TO MATCH EXISTING WIRE SIZES SERVES 22-P-2300; CONTRACTOR TO MATCH EXISTING WIRE SIZES
E-37	P21-1300B	2"	3 #12 W/ #12 GND 5 #14 3 #10 W/ #10 GND 3 #8 W/ #10 GND	480VAC CONTROL 480VAC	PVC GRS	PVC 40	P-VLT1	J-BOX2	EXISTING	SERVES 21-ME-1300 (POWER, HOA, JSH, JSHH, DISCONNECT AUX); CONTRACTOR TO MATCH EXISTING WIRE SIZES SERVES 22-P-1300; CONTRACTOR TO MATCH EXISTING WIRE SIZES SERVES 22-P-2300; CONTRACTOR TO MATCH EXISTING WIRE SIZES
E-37	P21-1300C	2"	3 #12 W/ #12 GND 5 #14 3 #10 W/ #10 GND 3 #8 W/ #10 GND	480VAC CONTROL 480VAC	PVC GRS	PVC 40	J-BOX2	P-VLT4	EXISTING	SERVES 21-ME-1300 (POWER, HOA, JSH, JSHH, DISCONNECT AUX); CONTRACTOR TO MATCH EXISTING WIRE SIZES SERVES 22-P-1300; CONTRACTOR TO MATCH EXISTING WIRE SIZES SERVES 22-P-2300; CONTRACTOR TO MATCH EXISTING WIRE SIZES
E-37	P21-1300D	2"	3 #12 W/ #12 GND 5 #14 3 #10 W/ #10 GND 3 #8 W/ #10 GND	480VAC CONTROL 480VAC	PVC GRS	PVC 40	P-VLT4	J-BOX4	EXISTING	SERVES 21-ME-1300 (POWER, HOA, JSH, JSHH, DISCONNECT AUX); CONTRACTOR TO MATCH EXISTING WIRE SIZES SERVES 22-P-1300; CONTRACTOR TO MATCH EXISTING WIRE SIZES SERVES 22-P-2300; CONTRACTOR TO MATCH EXISTING WIRE SIZES
E-37	P21-1300E	1"	3 #12 W/ #12 GND 5 #14	480VAC CONTROL	PVC GRS	PVC 40	J-BOX4	DS-21-ME-1300		CONTRACTOR TO PULL NEW WIRE TO DISCONNECT MATCHING EXISTING SIZES; RE-USE EXISTING CONDUIT (EXISTING CONDUIT PC-12)
E-37	P21-1305	1"	2 #12 W/ #12 GND	120VAC	PVC GRS	PVC 40	J-BOX4	21-LIT-1305B		POWERED BY SAME CIRCUITS FOUND IN P21-1204C
E-37	P21-1310	1"	3 #10 W/ #10 GND 3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	DS-21-FCV-1210 (BV5 DISC)	DS-21-FCV-1310 (BV6 DISC)		CONTRACTOR TO PULL NEW WIRE TO DISCONNECT MATCHING EXISTING SIZES; RE-USE EXISTING CONDUIT (EXISTING CONDUIT PC-13) SERVES 21-FCV-1310 SERVES 21-FCV-1410
E-37	P21-1410	1"	3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	DS-21-FCV-1310 (BV6 DISC)	DS-21-FCV-1410 (BV7 DISC)		CONTRACTOR TO PULL NEW WIRE TO DISCONNECT MATCHING EXISTING SIZES ; RE-USE EXISTING CONDUIT (EXISTING CONDUIT PC-13)
E-37	P22-1200	1"	3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	J-BOX3	DS-22-P-1200 (SP1 DISC)		CONTRACTOR TO PULL NEW WIRE TO DISCONNECT MATCHING EXISTING SIZES; RE-USE EXISTING CONDUIT (EXISTING CONDUIT PC-6)
E-37	P22-1204A	2"	2 #10 W/ #10 GND	120VAC	PVC GRS	PVC 40	LP-MCC3	P-VLT1	DB-10	SERVES POSSIBLE L1, L2, L3, L4, L5, L6, L8, L9; CONTRACTOR TO DETERMINE WHICH LIGHTS ARE POWERED HERE
E-37	P22-1204B	2"	2 #10 W/ #10 GND	120VAC	PVC GRS	PVC 40	P-VLT1	J-BOX2	EXISTING	SERVES POSSIBLE L1, L2, L3, L4, L5, L6, L8, L9; CONTRACTOR TO DETERMINE WHICH LIGHTS ARE POWERED HERE
E-37	P22-1204C	2"	2 #10 W/ #10 GND	120VAC	PVC GRS	PVC 40	J-BOX2	P-VLT4	EXISTING	SERVES POSSIBLE L1, L2, L3, L4, L5, L6, L8, L9; CONTRACTOR TO DETERMINE WHICH LIGHTS ARE POWERED HERE
E-37	P22-1204D	2"	2 #10 W/ #10 GND	120VAC	PVC GRS	PVC 40	P-VLT3	J-BOX3	EXISTING	CONTRACTOR TO PULL NEW WIRE TO J-BOX4 MATCHING EXISTING SIZES, INSTALL TERMINAL BLOCKS AND INTERCEPT EXISTING WIRE; SERVES POSSIBLE L1, L2, L3, L4, L5, L6, L8, L9 (EXISTING CONDUIT PC-30); CONTRACTOR TO DETERMINE WHICH LIGHTS ARE POWERED HERE
E-37	P22-1300	1"	3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	J-BOX4	DS-22-P-1300 (SP2 DISC)		CONTRACTOR TO PULL NEW WIRE TO DISCONNECT MATCHING EXISTING SIZES; RE-USE EXISTING CONDUIT (EXISTING CONDUIT PC-11)
E-37	P22-2200	1"	3 #8 W/ #10 GND	480VAC	PVC GRS	PVC 40	J-BOX3	DS-22-P-2200 (SCP1 DISC)		CONTRACTOR TO PULL NEW WIRE TO DISCONNECT MATCHING EXISTING SIZES; RE-USE EXISTING CONDUIT (EXISTING CONDUIT PC-5)
E-37	P22-2201A	2"	3 #10 W/ #10 GND 3 #10 W/ #10 GND 3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	DP-MCC3	P-VLT1	DB-10	SERVES 22-FCV-2201 SERVES 22-FCV-2202 SERVES 51-G-1101
E-37	P22-2201B	2"	3 #10 W/ #10 GND 3 #10 W/ #10 GND 3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	P-VLT1	J-BOX2	EXISTING	SERVES 22-FCV-2201 SERVES 22-FCV-2202 SERVES 51-G-1101
E-37	P22-2201C	2"	3 #10 W/ #10 GND 3 #10 W/ #10 GND 3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	J-BOX2	P-VLT4	EXISTING	SERVES 22-FCV-2201 SERVES 22-FCV-2202 SERVES 51-G-1101
E-37	P22-2201D	2"	3 #10 W/ #10 GND 3 #10 W/ #10 GND 3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	P-VLT4	J-BOX3	EXISTING	SERVES 22-FCV-2201 SERVES 22-FCV-2202 SERVES 51-G-1101
E-37	P22-2201E	2"	3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	J-BOX3	P-VLT3	EXISTING	SERVES 51-G-1101
E-37	P22-2201F	2"	3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	P-VLT3	P-VLT2	EXISTING	SERVES 51-G-1101
E-37	P22-2201G	1"	3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	J-BOX3	DC-22-FCV-2201 (PV1 DISC)		CONTRACTOR TO PULL NEW WIRE TO DISCONNECT MATCHING EXISTING SIZES; RE-USE EXISTING CONDUIT (EXISTING CONDUIT PC-3)
E-37	P22-2202	1"	3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	J-BOX3	DC-22-FCV-2202 (PV2 DISC)		CONTRACTOR TO PULL NEW WIRE TO DISCONNECT MATCHING EXISTING SIZES; RE-USE EXISTING CONDUIT (EXISTING CONDUIT PC-4)
E-37	P22-2300	1"	3 #8 W/ #10 GND	480VAC	PVC GRS	PVC 40	J-BOX4	DS-22-P-2300 (SCP2 DISC)		CONTRACTOR TO PULL NEW WIRE TO DISCONNECT MATCHING EXISTING SIZES; RE-USE EXISTING CONDUIT (EXISTING CONDUIT PC-10)
E-37	P22-2301	1"	3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	J-BOX4	DS-22-FCV-2301 (PV3 DISC)		CONTRACTOR TO PULL NEW WIRE TO DISCONNECT MATCHING EXISTING SIZES; RE-USE EXISTING CONDUIT (EXISTING CONDUIT PC-8)
E-37	P22-2302	1"	3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	J-BOX4	DS-22-FCV-2302 (PV4 DISC)		CONTRACTOR TO PULL NEW WIRE TO DISCONNECT MATCING EXISTING SIZES; RE-USE EXISTING CONDUIT (EXISTING CONDUIT PC-9)
E-39	P23-1000A	1.25"	2 #12 W/ #12 GND 2 #12 W/ #12 GND 2 #12 W/ #12 GND 2 #12 W/ #12 GND	120VAC	PVC GRS	PVC 40	LP-AB	P-VLT25	DB-4	SERVES 23-FIT-1010 SERVES 23-FIT-1020 SERVES 23-LIT-1002 SERVES 61-LIT-1000
E-39	P23-1000B	1.25"	2 #12 W/ #12 GND 2 #12 W/ #12 GND 2 #12 W/ #12 GND 2 #12 W/ #12 GND	120VAC	PVC GRS	PVC 40	P-VLT25	P-VLT26	DB-14	SERVES 23-FIT-1010 SERVES 23-FIT-1020 SERVES 23-LIT-1002 SERVES 61-LIT-1000

NOTES:

1. CONDUIT DEVELOPMENT IS NOT ALL INCLUSIVE. CONTRACTOR SHALL PROVIDE CONDUIT AND WIRE TO PROVIDE A FULLY FUNCTIONAL FACILITY. INTERCONNECTION OF LOW VOLTAGE DEVICES MAY NOT BE SHOWN. CONDUIT AND CONDUCTORS TO LIGHTS AND RECEPTACLES ARE NOT INCLUDED IN THE CONDUIT DEVELOPMENT.

CONDUIT SCHEDULE

skm
533 W 2600 S, Suite 25
Bountiful, Utah 84010
Phone: (801) 677-0011
www.skmeng.com

AQUA ENGINEERING
533 W. 2600 S, SUITE 275, BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

NO.	DATE	DESCRIPTION	BY	APPR'D

REVISIONS

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT UPGRADE AND RECYCLED WATER EXPANSION

ELECTRICAL – POWER DISTRIBUTION CONDUIT SCHEDULE 2

CHECKED	DRAWN	SCALE
MPJ	DCL	NONE
APPROVED	DESIGNED	DATE
MPJ	MPJ	07/26/18
GENERAL MANAGER	DISTRICT ENGINEER	
Chris DeGabriele	Michael P Cortez RCE # 54039	

SHEET	PLAN NO.	DRAWING NO.	REVISION NO.
131 OF 159		E-22	B

PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR: No.
RED 0.70MM
YELLOW 0.20MM
GREEN 0.25MM
CYAN 0.40MM
BLUE 0.50MM
MAGENTA 0.20MM
WHITE 0.35MM
GRAY 0.15MM
9 0.15MM
10 1.00MM
100 0.70MM
210 0.60MM

LGVSD 1 FILE:
FD144793

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4

POWER CONDUIT

SHEET	CONDUIT	SIZE	CONDUCTORS	SERVICE	AG MATERIAL	UG MATERIAL	FROM	TO	DUCTBANKS	NOTES
E-39	P23-1000C	1.25"	2 #12 W/ #12 GND 2 #12 W/ #12 GND 2 #12 W/ #12 GND 2 #12 W/ #12 GND	120VAC	PVC GRS	PVC 40	P-VLT26	JB-23-1000	DB-15	SERVES 23-FIT-1010 SERVES 23-FIT-1020 SERVES 23-LIT-1002 SERVES 61-LIT-1000
E-39	P23-1002	3/4"	2 #12 W/ #12 GND	120VAC	PVC GRS	PVC 40	JB-23-1000	23-LIT-1002		
E-39	P23-1010	3/4"	2 #12 W/ #12 GND	120VAC	PVC GRS	PVC 40	JB-23-1000	23-FIT-1010		
E-39	P23-1020	3/4"	2 #12 W/ #12 GND	120VAC	PVC GRS	PVC 40	JB-23-1000	23-FIT-1020		
E-40	P23-1100A	1"	3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	MCC-AB1	P-VLT25	DB-4	
E-40	P23-1100B	1"	3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	P-VLT25	P-VLT26	DB-14	
E-40	P23-1100C	1"	3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	P-VLT26	DS-23-P-1100	DB-15	
E-40	P23-1100D	3/4"	3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	DS-23-P-1100	23-P-1100		
E-40	P23-1200A	1"	3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	MCC-AB4	P-VLT25	DB-4	
E-40	P23-1200B	1"	3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	P-VLT25	P-VLT26	DB-14	
E-40	P23-1200C	1"	3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	P-VLT26	DS-23-P-1200	DB-15	
E-40	P23-1200D	3/4"	3 #10 W/ #10 GND	480VAC	PVC GRS	PVC 40	DS-23-P-1200	23-P-1200		
E-40	P23-1300A	1.5"	3 #3 W/ #8 GND	480VAC	PVC GRS	PVC 40	MCC-AB1	P-VLT25	DB-4	
E-40	P23-1300B	1.5"	3 #3 W/ #8 GND	480VAC	PVC GRS	PVC 40	P-VLT25	P-VLT26	DB-14	
E-40	P23-1300C	1.5"	3 #3 W/ #8 GND	480VAC	PVC GRS	PVC 40	P-VLT26	DS-23-P-1300	DB-15	
E-40	P23-1300D	1.5"	3 #3 W/ #8 GND	480VAC	PVC GRS	PVC 40	DS-23-P-1300	23-P-1300		
E-40	P23-1400A	1.5"	3 #3 W/ #8 GND	480VAC	PVC GRS	PVC 40	MCC-AB1	P-VLT25	DB-4	
E-40	P23-1400B	1.5"	3 #3 W/ #8 GND	480VAC	PVC GRS	PVC 40	P-VLT25	P-VLT26	DB-14	
E-40	P23-1400C	1.5"	3 #3 W/ #8 GND	480VAC	PVC GRS	PVC 40	P-VLT26	DS-23-P-1400	DB-15	
E-40	P23-1400D	1.5"	3 #3 W/ #8 GND	480VAC	PVC GRS	PVC 40	DS-23-P-1400	23-P-1400		
E-40	P23-1500A	1.5"	3 #3 W/ #8 GND	480VAC	PVC GRS	PVC 40	MCC-AB4	P-VLT25	DB-4	
E-40	P23-1500B	1.5"	3 #3 W/ #8 GND	480VAC	PVC GRS	PVC 40	P-VLT25	P-VLT26	DB-14	
E-40	P23-1500C	1.5"	3 #3 W/ #8 GND	480VAC	PVC GRS	PVC 40	P-VLT26	DS-23-P-1500	DB-15	
E-40	P23-1500D	1.5"	3 #3 W/ #8 GND	480VAC	PVC GRS	PVC 40	DS-23-P-1500	23-P-1500		
E-36	P23-2100A	1"	3#12 W/#12 GND	480VAC	PVC GRS	PVC 40	MCC-AB2	P-VLT28	DB-6	
E-42	P23-2100B	1"	3#12 W/#12 GND	480VAC	PVC GRS	PVC 40	P-VLT28	JB-23-2000	DB-9	
E-42	P23-2100C	1"	3#12 W/#12 GND	480VAC	PVC GRS	PVC 41	JB-23-2000	DS-23-2100		
E-36	P23-2200A	1"	3#12 W/#12 GND	480VAC	PVC GRS	PVC 40	MCC-AB2	P-VLT28	DB-6	
E-42	P23-2200B	1"	3#12 W/#12 GND	480VAC	PVC GRS	PVC 40	P-VLT28	JB-23-2000	DB-9	
E-42	P23-2200C	1"	3#12 W/#12 GND	480VAC	PVC GRS	PVC 41	JB-23-2000	DS-23-2200		
E-38	P23-2300A	1"	3#12 W/#12 GND	480VAC	PVC GRS	PVC 40	MCC-AB3	P-VLT28	DB-6	
E-42	P23-2300B	1"	3#12 W/#12 GND	480VAC	PVC GRS	PVC 40	P-VLT28	JB-23-2000	DB-9	
E-42	P23-2300C	1"	3#12 W/#12 GND	480VAC	PVC GRS	PVC 41	JB-23-2000	DS-23-2300		
E-42	P23-3120A	1"	3#12 W/#12 GND	480VAC	PVC GRS	PVC 41	DB-AB2	V#20P		
E-42	P23-3120B	1"	3#12 W/#12 GND	480VAC	PVC GRS	PVC 41	V#20P	DS-23-G-3120		
E-42	P23-3120C	1"	3#12 W/#12 GND	480VAC	PVC GRS	PVC 41	DS-23-G-3120	23-G-3120		
E-39	P31-1001A	2"	1 - #12 3C TC	120VAC	PVC GRS	PVC 40	LP-AB	P-VLT25	DB-4	SERVES 31-AIT-1001/31-AIT-1002
E-39	P31-1001B	2"	1 - #12 3C TC 1 - #12 3C TC 1 - #12 3C TC	120VAC	PVC GRS	PVC 40	P-VLT25	JB-31-1000		SERVES 31-AIT-1010 SERVES 31-AIT-1001/31-AIT-1002 SERVES 31-AIT-1010
E-39	P31-1001C	3/4"	1 - #12 3C TC	120VAC	PVC GRS	PVC 40	JB-31-1000	31-AIT-1001/31-AIT-1002		VIA CABLE TRAY 31-1000
E-39	P31-1010	3/4"	1 - #12 3C TC	120VAC	PVC GRS	PVC 40	JB-31-1000	31-AIT-1010		VIA CABLE TRAY 31-1001
E-36	P31-1100A	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	MCC-AB2	P-VLT25	DB-4	
E-36	P31-1100B	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	P-VLT25	JB-31-1000		
E-36	P31-1100C	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	JB-31-1000	DS-31-ME-1100		VIA CABLE TRAY 31-1000
E-36	P31-1100D	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	DS-31-ME-1100	31-ME-1100		
E-36	P31-1200A	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	MCC-AB2	P-VLT25	DB-4	
E-36	P31-1200B	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	P-VLT25	JB-31-1000		
E-36	P31-1200C	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	JB-31-1000	DS-31-ME-1200		VIA CABLE TRAY 31-1000
E-36	P31-1200D	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	DS-31-ME-1200	31-ME-1200		
E-36	P31-1300A	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	MCC-AB2	P-VLT25	DB-4	
E-36	P31-1300B	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	P-VLT25	JB-31-1000		
E-36	P31-1300C	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	JB-31-1000	DS-31-ME-1300		VIA CABLE TRAY 31-1000
E-36	P31-1300D	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	DS-31-ME-1300	31-ME-1300		
E-36	P31-1400A	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	MCC-AB2	P-VLT25	DB-4	
E-36	P31-1400B	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	P-VLT25	JB-31-1000		
E-36	P31-1400C	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	JB-31-1000	DS-31-ME-1400		VIA CABLE TRAY 31-1000
E-36	P31-1400D	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	DS-31-ME-1400	31-ME-1400		
E-39	P31-2001A	2"	1 - #12 3C TC	120VAC	PVC GRS	PVC 40	LP-AB	P-VLT25	DB-4	SERVES 31-AIT-2001/31-AIT-2002
E-39	P31-2001B	2"	1 - #12 3C TC 1 - #12 3C TC 1 - #12 3C TC	120VAC	PVC GRS	PVC 40	P-VLT25	JB-31-2000		SERVES 31-AIT-2010/31-AIT-3010 SERVES 31-AIT-3001/31-AIT-3002 SERVES 31-AIT-2001/31-AIT-2002 SERVES 31-AIT-2010/31-AIT-3010 SERVES 31-AIT-3001/31-AIT-3002
E-39	P31-2001C	3/4"	1 - #12 3C TC	120VAC	PVC GRS	PVC 40	JB-31-2000	31-AIT-2001, 31-AIT-2002		VIA CABLE TRAY 31-2000
E-39	P31-2010	3/4"	1 - #12 3C TC	120VAC	PVC GRS	PVC 40	JB-31-2000	31-AIT-2010, 31-AIT-3010		VIA CABLE TRAY 31-2001
E-36	P31-2100A	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	MCC-AB2	P-VLT25	DB-4	
E-36	P31-2100B	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	P-VLT25	JB-31-2000	DB-14	
E-36	P31-2100C	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	JB-31-2000	DS-31-ME-2100		VIA CABLE TRAY 31-2000
E-36	P31-2100D	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	DS-31-ME-2100	31-ME-2100		
E-36	P31-2200A	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	MCC-AB2	P-VLT25	DB-4	
E-36	P31-2200B	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	P-VLT25	JB-31-2000	DB-14	
E-36	P31-2200C	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	JB-31-2000	DS-31-ME-2200		VIA CABLE TRAY 31-2000
E-36	P31-2200D	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	DS-31-ME-2200	31-ME-2200		
E-36	P31-2300A	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	MCC-AB2	P-VLT25	DB-4	
E-36	P31-2300B	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	P-VLT25	JB-31-2000	DB-14	
E-36	P31-2300C	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	JB-31-2000	DS-31-ME-2300		VIA CABLE TRAY 31-2000
E-36	P31-2300D	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	DS-31-ME-2300	31-ME-2300		
E-36	P31-2400A	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	MCC-AB2	P-VLT25	DB-4	
E-36	P31-2400B	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	P-VLT25	JB-31-2000	DB-14	
E-36	P31-2400C	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	JB-31-2000	DS-31-ME-2400		VIA CABLE TRAY 31-2000
E-36	P31-2400D	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	DS-31-ME-2400	31-ME-2400		
E-39	P31-3001	3/4"	1 - #12 3C TC	120VAC	PVC GRS	PVC 40	JB-31-2000	31-AIT-3001, 31-AIT-3002		VIA CABLE TRAY 31-2000
E-38	P31-3100A	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	MCC-AB3	P-VLT25	DB-4	
E-38	P31-3100B	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	P-VLT25	JB-31-2000	DB-14	
E-38	P31-3100C	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	JB-31-2000	DS-31-ME-3100		VIA CABLE TRAY 31-2000
E-38	P31-3100D	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	DS-31-ME-3100	31-ME-3100		
E-38	P31-3200A	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	MCC-AB3	P-VLT25	DB-4	
E-38	P31-3200B	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	P-VLT25	JB-31-2000	DB-14	
E-38	P31-3200C	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	JB-31-2000	DS-31-ME-3200		VIA CABLE TRAY 31-2000
E-38	P31-3200D	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	DS-31-ME-3200	31-ME-3200		
E-38	P31-3300A	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	MCC-AB3	P-VLT25	DB-4	
E-38	P31-3300B	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	P-VLT25	JB-31-2000	DB-14	
E-38	P31-3300C	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	JB-31-2000	DS-31-ME-3300		VIA CABLE TRAY 31-2000
E-38	P31-3300D	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	DS-31-ME-3300	31-ME-3300		
E-38	P31-3400A	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	MCC-AB3	P-VLT25	DB-4	
E-38	P31-3400B	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	P-VLT25	JB-31-2000	DB-14	
E-38	P31-3400C	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	JB-31-2000	DS-31-ME-3400		VIA CABLE TRAY 31-2000
E-38	P31-3400D	1"	VFD RATED TRAY CABLE (3 #10 W/ #10 GND)	480VAC	PVC GRS	PVC 40	DS-31-ME-3400	31-ME-3400		

1

NOTES:

1. CONDUIT DEVELOPMENT IS NOT ALL INCLUSIVE. CONTRACTOR SHALL PROVIDE CONDUIT AND WIRE TO PROVIDE A FULLY FUNCTIONAL FACILITY. INTERCONNECTION OF LOW VOLTAGE DEVICES MAY NOT BE SHOWN. CONDUIT AND CONDUCTORS TO LIGHTS AND RECEPTACLES ARE NOT INCLUDED IN THE CONDUIT DEVELOPMENT.

K:\LAS GALLINAS\000949.D LAS GALLINAS SECONDARY TREATMENT\SKM CAD FILES\14 E-23 CONDUIT SCHEDULE 3.DWG

PLOTTED: 9/13/2018
SAVED: 9/13/2018

PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR: No.
RED 0.70MM
YELLOW 0.20MM
GREEN 0.25MM
CYAN 0.40MM
BLUE 0.50MM
MAGENTA 0.20MM
WHITE 0.35MM
GRAY 0.15MM
9 0.15MM
10 1.00MM
100 0.70MM
210 0.60MM

LGVSD 1 FILE: FD144793

ADDENDUM 4

CONDUIT SCHEDULE

skm
533 W 2600 S, Suite 25
Bountiful, Utah 84010
Phone: (801) 677-0011
www.skmeng.com

AQUA ENGINEERING
533 W 2600 S, SUITE 275, BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

REGISTERED PROFESSIONAL ENGINEER — MARK P VERGARA — NO. E16627 — EXP. 12-31-18 — ELECTRICAL — STATE OF CALIFORNIA

NO.	DATE	DESCRIPTION	BY	APPR'D
1	9/7/18	ADDENDUM #3	MGJ	LAR

REVISIONS

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

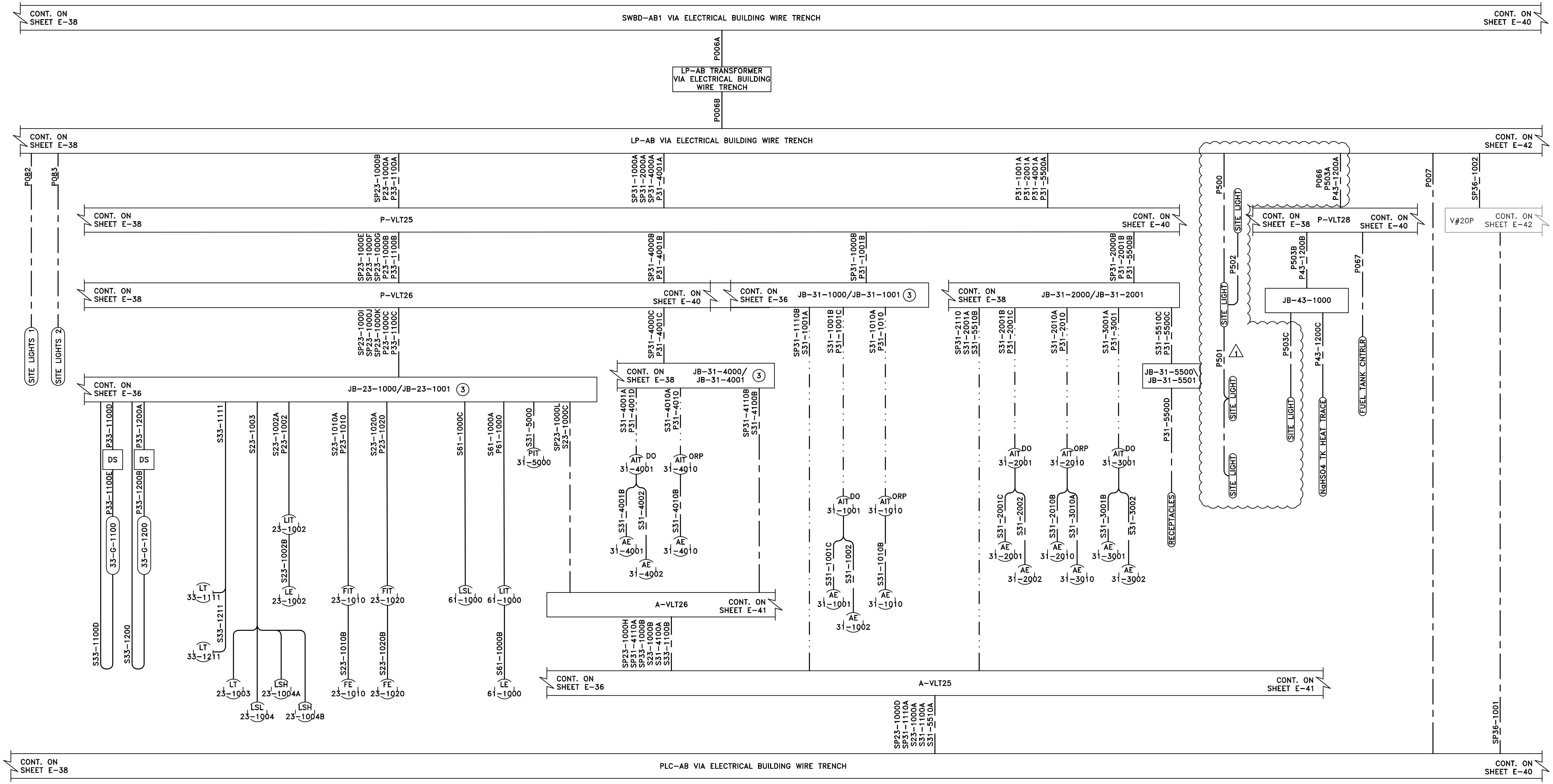
SECONDARY TREATMENT PLANT UPGRADE AND RECYCLED WATER EXPANSION

ELECTRICAL – POWER DISTRIBUTION
CONDUIT SCHEDULE 3

CHECKED	DRAWN	SCALE
MPJ	DCL	AS SHOWN
APPROVED	DESIGNED	DATE
MPJ	MPJ	07/26/18
GENERAL MANAGER: Chris DeGabriele	DISTRICT ENGINEER: Michael P Cortez, RCE # 54039	
SHEET: 132 OF 159	PLAN NO.	DRAWING NO.: E-23
		REVISION NO.: B

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4

K:\LAS GALLINAS\000949.D LAS GALLINAS SECONDARY TREATMENT\SKM CAD FILES\14 E-39 CONDUIT DEVELOPMENT 4.DWG



JOB NO. 12600-07/16650-02

NOTES:

1. CONDUIT DEVELOPMENT IS NOT ALL INCLUSIVE. CONTRACTOR SHALL PROVIDE CONDUIT AND WIRE TO PROVIDE A FULLY FUNCTIONAL FACILITY. INTERCONNECTION OF LOW VOLTAGE DEVICES MAY NOT BE SHOWN. CONDUIT AND CONDUCTORS TO LIGHTS AND RECEPTACLES ARE NOT INCLUDED IN THE CONDUIT DEVELOPMENT.
2. CONDUIT DEVELOPMENT AND SCHEDULE DOES NOT SHOW ALL CONDUIT INTERCONNECTS FOR EXISTING SERVICE, ONLY THOSE THAT ARE MODIFIED.
3. A JUNCTION BOX TAG ENDING WITH A ZERO, (I.E. JB-61-1000) INDICATES A POWER JUNCTION BOX TAG. WHEREAS A JUNCTION BOX TAG ENDING WITH A ONE, (I.E. JB-61-1001) INDICATES SIGNAL JUNCTION BOX TAG.

ABOVE GROUND CONDUIT
BELOW GROUND CONDUIT
CABLE TRAY

PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR:	No.
RED	0.70MM
YELLOW	0.20MM
GREEN	0.25MM
CYAN	0.40MM
BLUE	0.50MM
MAGENTA	0.20MM
WHITE	0.35MM
GRAY	0.15MM
9	0.15MM
10	1.00MM
100	0.70MM
210	0.60MM

PLOTTED: 9/13/2018
SAVED: 9/13/2018

LGVSD 1 FILE: FD144793

skm 533 W 2600 S, Suite 25 Bountiful, Utah 84010 Phone: (801) 677-0011 www.skmeng.com

AQUA ENGINEERING
533 W 2600 S, SUITE 275, BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

REGISTERED PROFESSIONAL ENGINEER P. JEPPSEN NO. E16627 EXP. 12-31-18 ELECTRICAL STATE OF CALIFORNIA

NO.	DATE	DESCRIPTION	BY	APPR'D
1	9/14/18	ADDENDUM #4	MGJ	LAR

REVISIONS

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT UPGRADE AND RECYCLED WATER EXPANSION

ELECTRICAL - POWER DISTRIBUTION CONDUIT DEVELOPMENT 4

CHECKED	DRAWN	SCALE
MPJ	DCL	AS SHOWN
APPROVED	DESIGNED	DATE
MPJ	MPJ	07/26/18

GENERAL MANAGER: Chris DeGabriele
DISTRICT ENGINEER: Michael P Cortez
RCE # 54039

SHEET 148 OF 159 | DRAWING NO. E-39 | REVISION NO. B

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 4

DUCTBANK	CONDUIT	SERVICE	FROM	TO	CONDUITS	NOTES
DB-1	8-4"	480VAC	NEW TRANSFORMER	MAIN SES	P001A	
DB-2	8-4"	480VAC	MAIN SES	MAIN ATS	P001B	
DB-3	6-3"	480VAC	NEW GENERATOR	MAIN ATS	P002A	
	1"	120VAC	NEW GENERATOR	EB TRENCH	P002C	
	1"	CONTROL	NEW GENERATOR	EB TRENCH	C002B	
	1"	SIGNAL	NEW GENERATOR	EB TRENCH	S002A	
DB-4	1"	480VAC	DP-AB2	P-VLT25	P051	
	1"		SWBD-AB1		P112A	
	1"		SWBD-AB1		P121	
	1"		MCC-AB1		P23-1100A	
	1"		MCC-AB1		P23-1200A	
	1"		MCC-AB4		P23-1300A	
	1"		MCC-AB1		P23-1400A	
	1"		MCC-AB4		P23-1500A	
	1"		MCC-AB2		P31-1100A	
	1"		MCC-AB2		P31-1200A	
	1"		MCC-AB2		P31-1300A	
	1"		MCC-AB2		P31-1400A	
	1"		MCC-AB2		P31-2100A	
	1"		MCC-AB2		P31-2200A	
	1"		MCC-AB2		P31-2300A	
	1"		MCC-AB2		P31-2400A	
	1"		MCC-AB3		P31-3100A	
	1"		MCC-AB3		P31-3200A	
	1"		MCC-AB3		P31-3300A	
	1"		MCC-AB3		P31-3400A	
	1"		MCC-AB3		P31-4100A	
	1"		MCC-AB3		P31-4200A	
	1"		MCC-AB3		P31-4300A	
	1"		MCC-AB3		P31-4400A	
	2"		DP-AB2		P31-3540A	
	2"		DP-AB2		P31-4550A	
	1"		MCC-AB2		P31-5300A	
	1"		MCC-AB3		P31-5400A	
	1"		MCC-AB3		P32-1100A	
	1"		MCC-AB2		P32-1200A	
	1"		MCC-AB3		P32-1300A	
	2"		DP-AB2		P33-1100A	
	1"		MCC-AB2		P36-1100A	
	1"		MCC-AB2		P36-1200A	
	1"		MCC-AB3		P36-1300A	
	1"		DP-AB2		P36-1400A	
	4-4"		SWBD-AB1		P51A	
	1"		MCC-AB2		P61-1100A	
	1"		MCC-AB3		P61-1200A	
	1"		MCC-AB2		P61-1300A	
	1"		DP-AB2		SP23-1000A	
	1"		MCC-AB		SP23-1000C	
	2"		MCC-AB		SP31-1100A	
	2"		MCC-AB		SP31-2100A	
	2"		MCC-AB		SP31-4100A	
	1"		MCC-AB		SP31-5300A	
	1.25"	120VAC	LP-AB		P23-1000A	
	1"		LP-AB		SP23-1000B	
	2"		LP-AB		P31-1001A	
	2"		LP-AB		P31-2001A	
	1"		LP-AB		P31-5500A	
	1"		LP-AB		P32-1101A	
	1"		LP-AB		P36-1000A	
	1"		LP-AB		SP31-1000A	
	1"		LP-AB		SP31-2000A	
	1"		LP-AB		SP31-4000A	
	1.5"		DP-AB2		SP32-1100A	
	1.5"		DP-AB2		SP32-1200A	
	1"	CONTROL	MCC-AB1		C23-1100A	
	1"		MCC-AB4		C23-1200A	
	1"		MCC-AB1		C23-1300A	
	1"		MCC-AB1		C23-1400A	
	1"		MCC-AB4		C23-1500A	
	2"		MCC-AB2		C31-1100A	
	2"		MCC-AB2		C31-2100A	
	2"		MCC_AB3		C31-3100A	
	2"		MCC-AB3		C31-4100A	
	1"		MCC-AB2		C31-5300A	
	1.5"		MCC-AB2/MCC-AB3		C32-1100A	
	1.5"		PLC-AB		C36-1400A	
	1"		MCC-AB2		C61-1100A	
	1"		MCC-AB3		C61-1200A	
	1"		MCC-AB2		C61-1300A	
	2"		PLC-AB/MCC-AB2/MCC-AB3		SP31-1101A	
	1.5	SIGNAL	PLC-AB	A-VLT25	S121A	
	3"		PLC-AB		S23-1000A	
	2"		MCC-AB1/MCC-AB4		S23-1100A	
	2"		MCC-AB2/MCC-AB3		C31-1100E	
	3"		PLC-AB/MCC-AB1/MCC-AB4		S31-1100A	
	1"		PLC-AB		S31-5510A	
	2"		PLC-AB		SP31-1110A	
	2"	COMM	CTC-AB		F001	
	2"		CTC-AB		F010	

DUCTBANK	CONDUIT	SERVICE	FROM	TO	CONDUITS	NOTES
DB-5	2"	480VAC	DP-AB2	LP-UV-2 TXFR	P108A	
	2"		DP-AB2	DS-PSU-UV-1	P105A	
	2"		DP-AB2	DS-PSU-UV-2	P106A	
	1"		MCC-AB2	DS-44-H-1100	P44-1100A	
	1"		DP-AB2	DS-44-G-1310	P44-1310A	
	1"		DP-AB2	DS-44-G-1320	P44-1320A	
	1"		DP-AB2	DS-44-G-1330	P44-1330A	
	1"		DP-AB2	DS-44-G-1340	P44-1340A	
	1"		DP-AB2	DS-44-G-1350	P44-1350A	
	1"		MCC-AB2	DS-44-H-1510	P44-1510A	
	1"		MCC-AB3	DS-44-H-1520	P44-1520A	
	1"	120VAC	PLC-AB	44-H-1611	P44-1611	
	1"		PLC-AB	44-H-1621	P44-1621	
	1"		PLC-AB	44-H-1621	P44-1621	
	1"		PLC-AB	LP-UV-2 TXFR	P110	
	1"	CONTROL	PLC-AB	44-G-1310	C44-1310	
	1"		PLC-AB	44-G-1320	C44-1320	
	1"		PLC-AB	44-G-1330	C44-1330	
	1"		PLC-AB	44-G-1340	C44-1340	
	1"		PLC-AB	44-G-1350	C44-1350	
	1"	SIGNAL	PLC-AB	44-FSH-1500	S44-1500	
	1"		PLC-AB	44-G-1310	S44-1310	
	1"		PLC-AB	44-G-1320	S44-1320	
	1"		PLC-AB	44-G-1330	S44-1330	
	1"		PLC-AB	44-G-1340	S44-1340	
	1"		PLC-AB	44-G-1350	S44-1350	
	1"		PLC-AB	44-TT-1530/44-AE-1530	S44-1530	
	1"		PLC-AB	44-TT-1550/44-AE-1550	S44-1550	
	1"		PLC-AB	HVAC INSTRUMENTATION	S44-1900	
DB-6	1"	480VAC	MCC-AB2	P-VLT28	P23-2100A	
	1"		MCC-AB3		P23-2200A	
	1"		MCC-AB3		P23-2300A	
	2"		VFD-52-P-1013		P52-1013B	
	2"		VFD-52-P-1014		P52-1014B	
	2"		MCC-AB		SP52-1100A	
	1"	240VAC	LP-AB		P503A	2
	1"		LP-AB		SP503A	2
	1"	120VAC	LP-AB		P066	
	1.5"		LP-AB		P43-1000A	
	1"		LP-AB		P43-1100A	
	1"		LP-AB		P43-1200A	
	2"		LP-AB		P43-1400A	
	1"		LP-AB		P43-2100A	1
	1"		LP-AB		P43-2200A	1
	1"		LP-AB		P43-2300A	1
	1"		LP-AB		P43-2400A	1
	1"		LP-AB		P43-H1520A	
	2"	CONTROL	VFD-52-P-1013/VFD-52-P-1014		C52-1013A	
	1"		MCC-AB		SP52-1000A	
	1"	SIGNAL	PLC-AB	A-VLT28	S23-1020C	
	1.5"		PLC-AB		S43-1000A	
	1"		VFD-52-P-1013		S52-1013A	
	1"		VFD-52-P-1014		S52-1014	
	2"		CTC-AB		F015	
	1"		PLC-AB		SP52-1001A	
DB-7	1"	240VAC	P-VLT28	JB-43-1000	P503B	2
	1"			JB-43-1000	SP503B	2
	1.5"	120VAC		FUEL TANK CONTROLLER	P067	
	1"			JB-43-1000	P43-1000B	
	1"			JB-43-1000	P43-1100B	
	1"			JB-43-1000	P43-1200B	
	2"			JB-43-1000	P43-1400B	
	1"			JB-43-1000	P43-H1520B	
	1.5"	SIGNAL	A-VLT28	JB-43-1001	S43-1000B	
DB-9	1"	480VAC	P-VLT28	JB-23-2000	P23-2100B	
	1"			JB-23-2000	P23-2200B	
	1"			JB-23-2000	P23-2300B	
	2"			52-P-1013	P52-1013C	
	2"			52-P-1013	P52-1014C	
	1'			JB-23-1000	SP066	
	2"			LCP-52-1001	SP52-1100B	
	2"	CONTROL		LCP-52-1001	C52-1013B	
	1"			JB-23-2000	SP067	
	1"			LCP-52-1001	SP52-1000B	
	1"	SIGNAL	A-VLT28	JB-23-2001	S23-1020D	
	1"			LCP-52-1001	S52-1013B	
	2"			LCP-52-1001	F016	
	1"			JB-23-2001	SP068	
	1"			LCP-52-1001	SP52-1001B	
DB-10	2"	480VAC	MCC-3	P-VLT1	P21-1200A	
	2"		DP-MCC3		P21-1210A	
	2"		MCC-3		P21-1300A	
	2"		DP-MCC-3		P22-2201A	
	2"	120VAC	LP-MCC3		P21-1204A	
	2"		LP-MCC3		P22-1204A	
	2"	SIGNAL	PLC-MCC3	A-VLT1	S21-1210A	
	2"		PLC-MCC3		S22-2201A	

DUCTBANK	CONDUIT	SERVICE	FROM	TO	CONDUITS	NOTES
DB-14	1"	480VAC	P-VLT25	P-VLT26	P052	
	1"				P112B	
	1"				P23-1100B	
	1"				P23-1200B	
	1"				P23-1300B	
	1"				P23-1400B	
	1"				P23-1500B	
	1"			JB-31-2000	P31-2100B	
	1"				P31-2200B	
	1"				P31-2300B	
	1"				P31-2400B	
	1"				P31-3100B	
	1"				P31-3200B	
	1"				P31-3300B	
	1"				P31-3400B	
	1"			P-VLT26	P31-4100B	
	1"				P31-4200B	
	1"				P31-4300B	
	1"				P31-4400B	
	2"			JB-31-2000	P31-3540B	
	2"			P-VLT26	P31-4550B	
	1"				P31-5300B	
	1"				P31-5400B	
	1"				P32-1100B	
	1"				P32-1200B	
	1"				P32-1300B	
	2"				P33-1100B	
	1"				P36-1100B	
	1"				P36-1200B	
	1"				P36-1300B	
	1"				P36-1400B	
	4-4"				P51B	
	1"				P61-1100B	
	1"				P61-1200B	
	1"				P61-1300B	
	1"				SP23-1000E	
	1"				SP23-1000G	
	2"			JB-31-2000	SP31-2100B	
	2"				SP31-4100B	
	1"			P-VLT26	SP31-5300B	
	1"	120VAC			P23-1000B	
	1"				P31-2000A	
	1"			JB-31-2000	P31-5500B	
	1"			P-VLT26	P32-1101B	
	1"				P36-1000B	
	1"			JB-31-2000	SP31-2000B	
	1"			P-VLT26	SP23-1000F	
	1"				SP31-4000B	
	1.5"				SP32-1100B	
	1.5"				SP32-1200B	
	1"	CONTROL			C23-1100B	
	1"				C23-1200B	
	1"				C23-1300B	
	1"				C23-1400B	
	1"				C23-1500B	
	2"			JB-31-2000	C31-2100B	
	2"				C31-3100B	
	2"			P-VLT26	C31-4100B	
	1"				C31-4100F	
	1"				C31-5300B	
	1.5"				C32-1100B	
	1.5"				C36-1400B	
	1"				C61-1100B	
	1"				C61-1200B	
	1"				C61-1300B	
	2"			JB-23-2001	SP31-2101A	
	2"			P-VLT26	SP31-4101A	
	3"	SIGNAL	A-VLT25	JB-23-2001	S31-2001A	
	1.5			A-VLT26	S121B	
	2"				S23-1000B	
	2"				S23-1100B	
	2"				S31-4100A	
	1"			JB-31-2001	S31-5510B	
	1"			A-VLT26	SP23-1000H	
	2"			JB-31-2001	SP31-2110	
	2"			A-VLT26	SP31-4110A	
	2"	COMM			F002	
	2"				F011	

DUCTBANK SCHEDULE 1

K:\LAS GALLINAS\000949.D LAS GALLINAS SECONDARY TREATMENT\SKM CAD FILES\14 E-44 DUCTBANK SCHEDULE 1.DWG

PLOTTED: 9/13/2018
SAVED: 9/13/2018

PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR:	No.
RED	0.70MM
YELLOW	0.20MM
GREEN	0.25MM
CYAN	0.40MM
BLUE	0.50MM
MAGENTA	0.20MM
WHITE	0.35MM
GRAY	0.15MM
9	0.15MM
10	1.00MM
100	0.70MM
210	0.60MM

LGVSD 1 FILE:
FD144793

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REGISTERED PROFESSIONAL ENGINEER
NO. E16627
EXP. 12-31-18
ELECTRICAL
STATE OF CALIFORNIA

NO.	DATE	DESCRIPTION	BY	APPR'D
2	9/14/18	ADDENDUM #4	MGJ	LAR
1	9/7/18	ADDENDUM #3	MGJ	LAR

REVISIONS

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT UPGRADE AND RECYCLED WATER EXPANSION

ELECTRICAL – POWER DISTRIBUTION
DUCTBANK SCHEDULE 1

CHECKED	DRAWN	SCALE
MPJ	DCL	AS SHOWN
APPROVED	DESIGNED	DATE
MPJ	MPJ	07/26/18
GENERAL MANAGER	DISTRICT ENGINEER	
Chris DeGabriele	Michael P Cortez	
	RCE # 54039	

SHEET	PLAN NO.	DRAWING NO.	REVISION NO.
153 OF 159		E-44	B

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4

DUCTBANK	CONDUIT	SERVICE	FROM	TO	CONDUITS	NOTES
DB-15	1"	480VAC	P-VLT26	P-VLT27	P051C	
	1"			DS-23-P-1100	P23-1100C	
	1"			DS-23-P-2100	P23-1200C	
	1"			DS-23-P-3100	P23-1300C	
	1"			DS-23-P-4100	P23-1400C	
	1"			DS-23-P-5100	P23-1500C	
	1"			DS-31-BLR-5300	P31-5300C	
	1"			DS-31-BLR-5400	P31-5400C	
	1"				P32-1300C	
	2"				P33-1100C	
	1"				P36-1100C	
	1"				P36-1200C	
	1"				P36-1300C	
	1"				P36-1400C	
	4-4"				P51C	
	1"			DS-61-P-1100	P61-1100C	
	1"			DS-61-P-1200	P61-1200C	
	1"			DS-61-P-1300	P61-1300C	
	1"	120VAC		JB-23-1000	P23-1000C	
	1"			P-VLT27	P36-1000C	
	1"	CONTROL		LCP-23-P-1100	C23-1100C	
	1"			LCP-23-P-1200	C23-1200C	
	1"			LCP-23-P-1300	C23-1300C	
	1"			LCP-23-P-1400	C23-1400C	
	1"			LCP-23-P-1500	C23-1500C	
	1"			DS-31-BLR-5300	C31-5300C	
	1.5"			P-VLT27	C36-1100A	
	1.5"			P-VLT27	C36-1400C	
	1"			LCP-61-P-1100	C61-1100C	
	1"			LCP-61-P-1200	C61-1200C	
	1"			LCP-61-P-1300	C61-1300C	
	3"	SIGNAL	A-VLT26	JB-23-2001	S31-2001A	
	1.5			A-VLT27	S121C	
	1"			LCP-23-P-1100	S23-1100C	
	1"			LCP-23-P-1200	S23-1200	
	1"			LCP-23-P-1300	S23-1300	
	1"			LCP-23-P-1400	S23-1400	
	1"			LCP-23-P-1500	S23-1500	
	1"			31-PIT-5000	S31-5000	
	1"			A-VLT27	S36-1000A	
	1"			JB-31-2001	S31-5510C	
	2"			A-VLT27	S51-1000A	
	1"			31-BLR-5300	SP31-5300C	
	2"			31-BLR-5400	SP31-5400C	
	2 - 1"			A-VLT27	SP51-2000A	
	2"	COMM		A-VLT27	F012	

DUCTBANK	CONDUIT	SERVICE	FROM	TO	CONDUITS	NOTES
DB-16	1"	480VAC	P-VLT26	JB-32-1100	P32-1101C	
	1"				P32-1100C	
	1"				P32-1200C	
	1.5"	120VAC			SP32-1100C	
	1.5"				SP32-1200C	
	1"	CONTROL			C32-1100C	
	1.5"	SIGNAL	A-VLT26		SP32-1101	
	1.5"	SIGNAL			SP32-1201A	
DB-17	1"	480VAC	JB-32-1100	JB-32-1200	P32-1200D	
	1"	120VAC			P32-1201	
	1.5"				SP32-1200D	
	1"	CONTROL			C32-1200A	
	1.5"	SIGNAL			SP32-1201B	
DB-18	4-4"	480VAC	P-VLT27	DP-RWDP	P51D	
	1"	CONTROL		JB-51-2000	C51-2100A	
	1.5	SIGNAL	A-VLT27	A-VLT30	S121D	
	2"			JB-51-2001	S51-1000B	
	2"	COMM		CTC-RWDP	F013	
DB-19	2"	120VAC	LP-RWDP	P-VLT30	P120	
	2"				P121	
	1"				P122	
	1"				P123	
	2"	SIGNAL	A-VLT27	A-VLT30	F014	
	1.5	SIGNAL	A-VLT27	A-VLT30	S121D	
DB-21	1"	120VAC	V#20P	POND RETURN METER VAULT	P44-1000	
	1"	120VAC	V#20P	SECONDARY EFFLUENT VAULT	P51-1009C	
	1"	SIGNAL	V#20S	42-FE-1120	S42-1120C	
	1"			42-LSH-1120	S42-1120C	
	1"			44-FE-1000	S44-1000C	
	1"			44-LSH-1000	S42-1120D	
	1"			51-FE-1009	S51-1009C	
	1"			51-LSH-1009	S51-1000D	
DB-25	4-4"	480VAC	MCC-3	LCP-62-ME-2100	P62-2100	
	1"	120VAC	LP-MCC3	SITE LIGHTS	P71	
	1"			62-FIT-2620	P62-2620	
	1"			62-FIT-2640	P62-2640	
	2"	COMM	PLC-MCC3	LCP-62-ME-2100	F103	
DB-30	1"	480VAC	P-VLT26	V#19P	P053	
	1"				P112C	
	1"	480VAC	DP-AB2		P23-3120A	
DB-33	1"	120VAC	LP-AB	V#20P	P41-1000	
	1"				P41-1100	
	1"				P44-1000A	
	1"				SP36-1002	
	2"	SIGNAL	42-FIT-1110		S42-1120B	
	2"	SIGNAL	44-FIT-1000		S44-1000B	
	2"	SIGNAL	51-FIT-1009		S51-1009B	
	1"	SIGNAL		V#20S	S23-3120A	
	1"	SIGNAL			SP36-1001	
	1"	SIGNAL	PLC-AB		SP36-1000	
	1"	SIGNAL			S41-1100A	
DB-36	1"	480VAC	P-VLT27	DS-36-P-1100	P36-1100D	
	1"			DS-36-P-1200	P36-1200D	
	1"			DS-36-P-1300	P36-1300D	
	1"			DS-36-V-1400	P36-1400D	
	1"			DS-36-V-1410	P36-1410A	
	1"	120VAC		LIGHTING	P36-1000D	
	1"	CONTROL		LCP-36-P-1100	C36-1100B	
	1"			LCP-36-P-1200	C36-1200A	
	1"			LCP-36-P-1300	C36-1300A	
	1"			36-V-1400	C36-1400D	
	1"			36-V-1410	C36-1410	
	1"			36-FIT-1000	S36-1000B	
	1"	SIGNAL	A-VLT27	36-V-1400	S36-1400	
	2"			36-V-1410	S36-1410	
DB-40	1"	240VAC	LP-AB	SITE LIGHT	P500	
	1"				SP500	
DB-41	1"	240VAC	SITE LIGHT	SITE LIGHTS	P501	
	1"				SP501	
DB-42	1"	240VAC	SITE LIGHT	SITE LIGHTS	P502	
	1"				SP502	
DB-43	1"	240VAC	JB-43-1000	SITE LIGHT	P503	
	1"				SP503	

1

1

2

DUCTBANK SCHEDULE 2

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REGISTERED PROFESSIONAL ENGINEER — MARK P. JORGENSEN — NO. E16627 EXP. 12-31-18 — ELECTRICAL — STATE OF CALIFORNIA

NO.	DATE	DESCRIPTION	BY	APPR'D
1	9/7/18	ADDENDUM #3	MGJ	LAR

REVISIONS

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT UPGRADE AND RECYCLED WATER EXPANSION

ELECTRICAL – POWER DISTRIBUTION
DUCTBANK SCHEDULE 2

CHECKED: MPJ	DRAWN: DCL	SCALE: AS SHOWN
APPROVED: MPJ	DESIGNED: MPJ	DATE: 07/26/18
GENERAL MANAGER: Chris DeGabriele	DISTRICT ENGINEER: Michael P Cortez, RCE # 54039	

SHEET	PLAN NO.	DRAWING NO.	REVISION NO.
154 OF 159		E-45	B

K:\LAS GALLINAS\000949.D LAS GALLINAS SECONDARY TREATMENT\SKM CAD FILES\14 E-45 DUCTBANK SCHEDULE 2.DWG

PLOTTED: 9/13/2018
SAVED: 9/13/2018

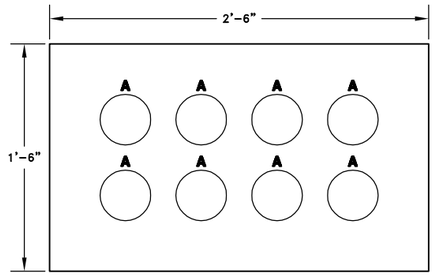
PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR: No.
RED 0.70MM
YELLOW 0.20MM
GREEN 0.25MM
CYAN 0.40MM
BLUE 0.50MM
MAGENTA 0.20MM
WHITE 0.35MM
GRAY 0.15MM
9 0.15MM
10 1.00MM
100 0.70MM
210 0.60MM

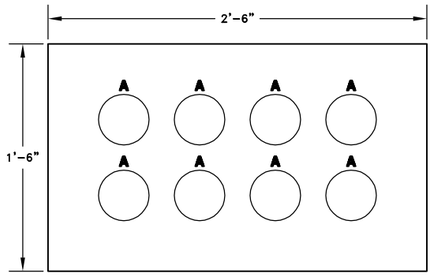
LGVSD 1 FILE: FD144793

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4

ADDENDUM 4



DB-1



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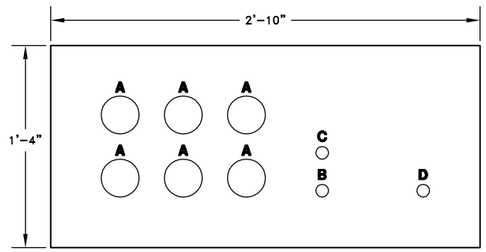
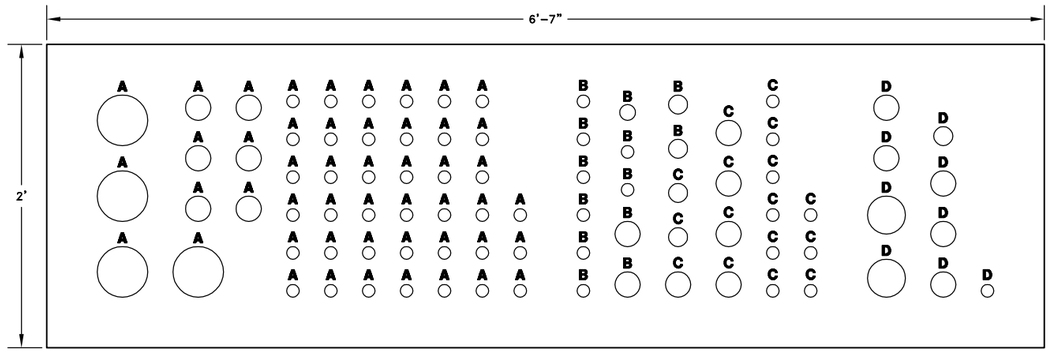
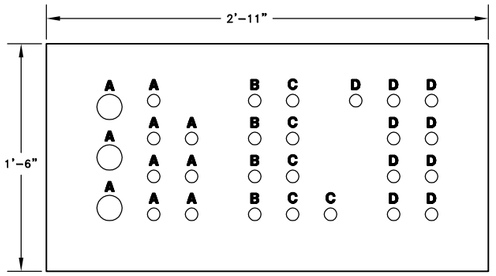


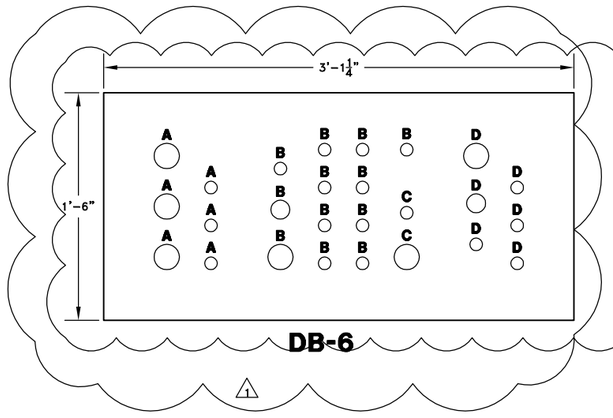
DB-3



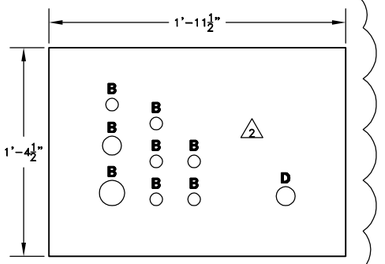
DB-4



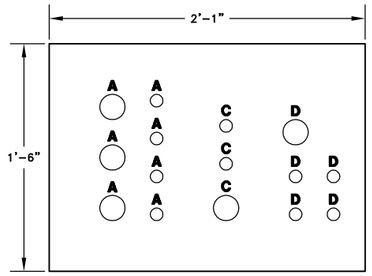
DB-5



DB-6



DB-7



DB-9

DUCTBANK CROSS SECTIONS

CONDUIT DESIGNATION KEY:

A 480VAC

B 120/208/240VAC

C 120VAC CONTROL

D SIGNAL, COMMUNICATION, OR 50VDC

DISTANCES BETWEEN CONDUITS IN DUCTBANKS					
	480VAC	120VAC	120VAC CONTROL	SIGNAL	EDGE OF CONCRETE DB
480VAC	2"	4"	4"	12"	4"
120/208/240VAC	4"	2"	2"	6"	4"
120VAC CONTROL	4"	2"	2"	4"	4"
SIGNAL/COMMS/50VDC	12"	6"	4"	2"	4"
EDGE OF CONCRETE DB	4"	4"	4"	4"	NA

NOTES:

1. DUCTBANK CROSS SECTION DRAWING
2. CONDUITS FOR LIGHTING AND RECEPTACLES ARE NOT SHOWN IN DUCTBANK CROSS SECTIONS

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REGISTERED PROFESSIONAL ENGINEER — MARK P JORDAN — NO. E 156627 — EXP. 12-31-18 — ELECTRICAL — STATE OF CALIFORNIA

NO.	DATE	DESCRIPTION	BY	APPR'D
2	9/14/18	ADDENDUM #4	MGJ	LAR
1	9/7/18	ADDENDUM #3	MGJ	LAR

REVISIONS

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT UPGRADE AND RECYCLED WATER EXPANSION

ELECTRICAL – POWER DISTRIBUTION
DUCTBANK CROSS SECTIONS 1

CHECKED	DRAWN	SCALE
MPJ	DCL	AS SHOWN
APPROVED	DESIGNED	DATE
MPJ	MPJ	07/26/18
GENERAL MANAGER: Chris DeGabriele	DISTRICT ENGINEER: Michael P Cortez, RCE # 54038	
SHEET: 155 OF 159	PLAN NO.	DRAWING NO.: E-46
		REVISION NO.: B

PLOTTED: 9/13/2018
SAVED: 9/13/2018

K:\LAS GALLINAS\000949.D LAS GALLINAS SECONDARY TREATMENT\SKM CAD FILES\14 E-46 DUCTBANK CROSS SECTIONS 1.DWG

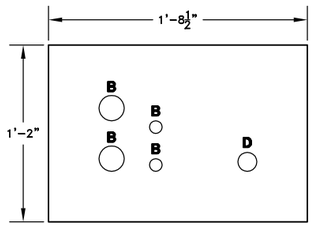
PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR: No.
RED 0.70MM
YELLOW 0.20MM
GREEN 0.25MM
CYAN 0.40MM
BLUE 0.50MM
MAGENTA 0.20MM
WHITE 0.35MM
GRAY 0.15MM
9 0.15MM
10 1.00MM
100 0.70MM
210 0.60MM

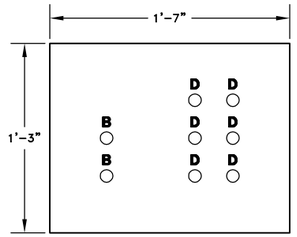
LGVSD 1 FILE: FD144793

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4

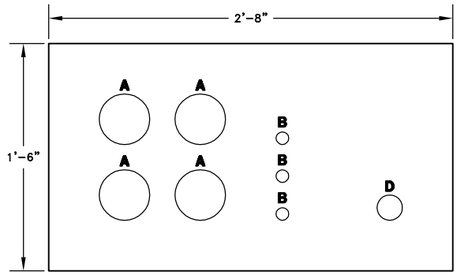
ADDENDUM 4



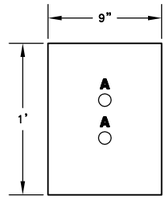
DB-19



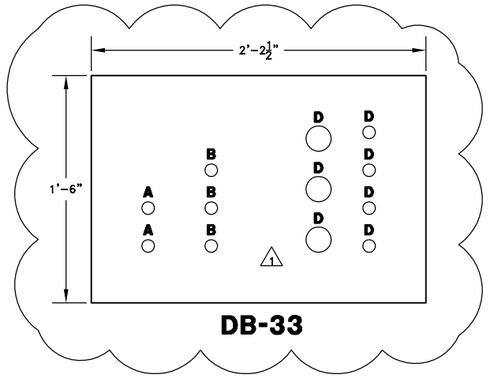
DB-21



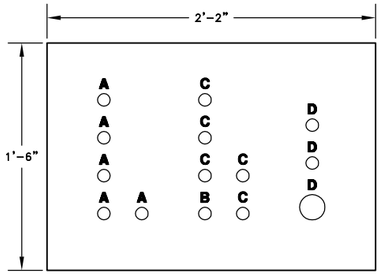
DB-25



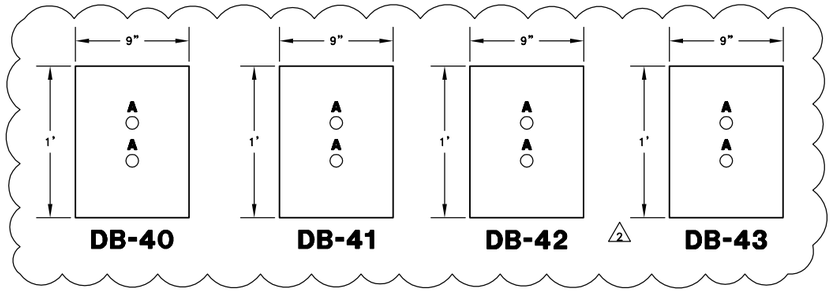
DB-30



DB-33



DB-36



DUCTBANK CROSS SECTIONS

DISTANCES BETWEEN CONDUITS IN DUCTBANKS

	480VAC	120VAC	120VAC CONTROL	SIGNAL	EDGE OF CONCRETE DB
480VAC	2"	4"	4"	12"	4"
120/208/240VAC	4"	2"	2"	6"	4"
120VAC CONTROL	4"	2"	2"	4"	4"
SIGNAL/COMMS/50VDC	12"	6"	4"	2"	4"
EDGE OF CONCRETE DB	4"	4"	4"	4"	NA

CONDUIT DESIGNATION KEY:

A 480VAC

B 120/208/240VAC

C 120VAC CONTROL

D SIGNAL, COMMUNICATION, OR 50VDC

NOTES:

(1) DUCTBANK CROSS SECTION DRAWING

(2) CONDUITS FOR LIGHTING AND RECEPTACLES ARE NOT SHOWN IN DUCTBANK CROSS SECTIONS

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REGISTERED PROFESSIONAL ENGINEER — MARK P. JORGENSEN — NO. E16627 — EXP. 12-31-18 — ELECTRICAL — STATE OF CALIFORNIA

NO.	DATE	DESCRIPTION	BY	APPR'D
2	9/14/18	ADDENDUM #4	MGJ	LAR
1	9/7/18	ADDENDUM #3	MGJ	LAR

REVISIONS

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT UPGRADE AND RECYCLED WATER EXPANSION

ELECTRICAL – POWER DISTRIBUTION
DUCTBANK CROSS SECTIONS 3

CHECKED: MPJ	DRAWN: DCL	SCALE: AS SHOWN
APPROVED: MPJ	DESIGNED: MPJ	DATE: 07/26/18
GENERAL MANAGER: Chris DeGabriele	DISTRICT ENGINEER: Michael P Cortez, RCE # 54038	
SHEET: 157 OF 159	PLAN NO.	DRAWING NO.: E-48
		REVISION NO.: B

PLOTTED: 9/13/2018
SAVED: 9/6/2018

PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

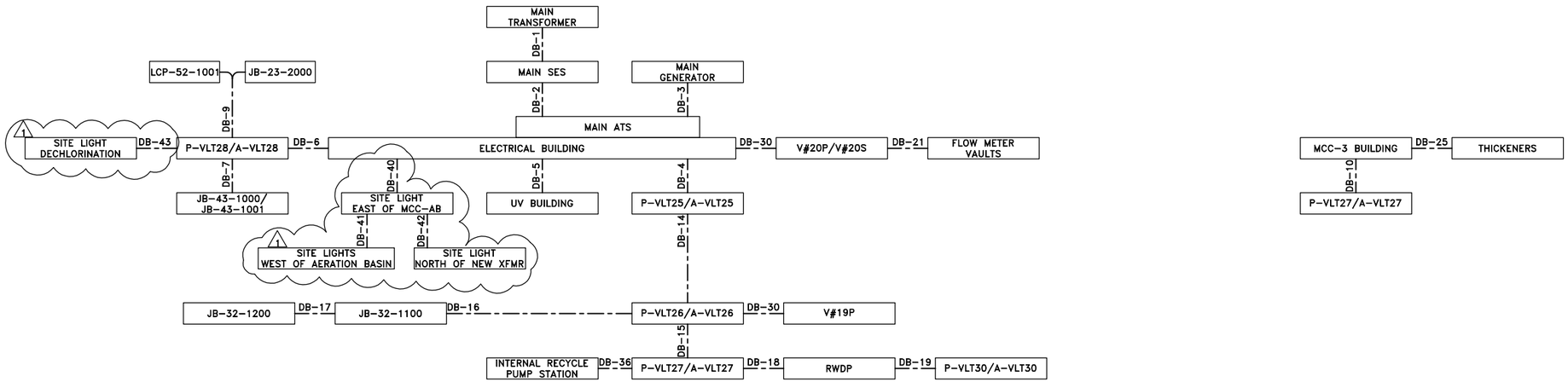
COLOR:	No.
RED	0.70MM
YELLOW	0.20MM
GREEN	0.25MM
CYAN	0.40MM
BLUE	0.50MM
MAGENTA	0.20MM
WHITE	0.35MM
GRAY	0.15MM
9	0.15MM
10	1.00MM
100	0.70MM
210	0.60MM

LGVSD 1 FILE: FD144793

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4

K:\LAS GALLINAS\000949.D LAS GALLINAS SECONDARY TREATMENT\SKM CAD FILES\14 E-48 DUCTBANK CROSS SECTIONS 3.DWG

ADDENDUM 4



K:\LAS GALLINAS\000949.D LAS GALLINAS SECONDARY TREATMENT\SKM CAD FILES\14 E-49 DUCT BANK DEVELOPMENT 1.DWG

PLOTTED: 9/13/2018
SAVED: 9/13/2018

PLOT: EXTEND
SCALE: 1:1
BORDER: 22,34

COLOR:	No.
RED	0.70MM
YELLOW	0.20MM
GREEN	0.25MM
CYAN	0.40MM
BLUE	0.50MM
MAGENTA	0.20MM
WHITE	0.35MM
GRAY	0.15MM
9	0.15MM
10	1.00MM
100	0.70MM
210	0.60MM

LGVSD 1 FILE:
FD144793

ADDENDUM 4

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 4

skm
533 W 2600 S, Suite 25
Bountiful, Utah 84010
Phone: (801) 677-0011
www.skmeng.com

AQUA ENGINEERING
533 W 2600 S, SUITE 275, BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

REGISTERED PROFESSIONAL ENGINEER — Mark P. Jespersen — NO. E16627 EXP. 12-31-18 — ELECTRICAL — STATE OF CALIFORNIA

NO.	DATE	DESCRIPTION	BY	APPR'D
1	9/7/18	ADDENDUM #3	MGJ	LAR

REVISIONS

JOB NO. 12600-07/16650-02

LAS GALLINAS VALLEY SANITARY DISTRICT
MARIN COUNTY, CALIFORNIA

SECONDARY TREATMENT PLANT UPGRADE AND RECYCLED WATER EXPANSION

ELECTRICAL – POWER DISTRIBUTION DUCT BANK DEVELOPMENT 1

CHECKED	DRAWN	SCALE
MPJ	DCL	AS SHOWN
APPROVED	DESIGNED	DATE
MPJ	MPJ	07/26/18
GENERAL MANAGER	DISTRICT ENGINEER	
Chris DeGabriele	Michael P Cortez	
	RCE # 54039	

SHEET	PLAN NO.	DRAWING NO.	REVISION NO.
158 OF 159		E-49	B