WEST YOST ASSOCIATES
Consulting Engineers

TECHNICAL MEMORANDUM

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TO: SRWA Technical Advisory Committee

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SUBJECT: Preliminary Design of SRWA Raw Water Pump Station

INTRODUCTION

The Stanislaus Regional Water Authority (SRWA) is preparing to construct a Surface Water Supply Project (Project) to provide a new, supplemental drinking water supply to the Cities of Ceres and Turlock (Cities). The sole drinking water supply for both cities has historically been groundwater. The source water for SRWA's new treatment plant (WTP) will be the Tuolumne River, at a location near the City of Hughson. Raw water will be withdrawn from an existing infiltration gallery (constructed and owned by Turlock Irrigation District [TID]) located four to five feet below the river bottom and pumped to the WTP from a new raw water pump station (RWPS) adjacent to the infiltration gallery via a new raw water transmission main. Treated water from the new WTP will be pumped to the Cities in new finished water transmission mains. Together, these facilities will comprise the Project's "regional facilities" operated by SRWA. SRWA intends to design and construct the regional facilities utilizing a Design-Build (DB) procurement method.

The purpose of this technical memorandum (TM) is to establish preliminary design criteria for a "Reference" RWPS[1], and to highlight important issues that must be considered and parameters which must be developed during final design. Design criteria and other information presented in this TM are expected to inform the development of technical requirements for the DB contract that will govern the design and construction of the new RWPS.

This TM is organized as follows:

- Introduction
- Background

[1] The "Reference" RWPS is intended to be one example of how the project could be designed that would meet the requirements of the DB contract.

- Overview of Reference RWPS
- Preliminary Design of Reference RWPS

BACKGROUND

The RWPS will be designed so that it can ultimately provide raw water to both SRWA and TID. However, during the initial phase of SRWA's 15 million gallons per day (mgd) WTP, the RWPS will be equipped to only serve the WTP, and TID would only convey water through the RWPS if an emergency situation were to arise.

The following subsections provide additional background on the existing infiltration gallery, the below-grade portion of the RWPS that is being designed and constructed separately from SRWA's DB procurement process, and the necessary conveyance facilities that will join the completed RWPS with the SRWA WTP. In addition, this section discusses the current condition of the existing infiltration gallery.

Overview of TID's Infiltration Gallery / Special Run Pool 9 Project

The infiltration gallery was constructed by TID between 2001 and 2003 as part of the "Special Run Pool Nine Tuolumne River Channel Restoration Project" (Special Run Pool 9 (SRP 9) Project). The gallery consists of 16 horizontally installed, 45-foot long segments of stainless steel perforated well screens, each 24-inch in diameter. Each group of four well screens is referred to as a "bay" of the infiltration gallery and manifolded together beneath the south bank of the Tuolumne River. The well screens are encapsulated within several gradations of progressively larger granular material (pea gravel, washed rock, and river cobble) roughly 6-feet below the river bed. The well screens were fabricated with 0.06-inch perforations to allow the passage of water while excluding most granular material. Each screen is fitted with a pair of 2-inch diameter perforated HDPE air pipes (one located within the screened 24-inch pipe, and one located in the adjacent gravel pack) intended to be used to periodically "purge" the gallery piping of accumulated sediment. The air purge pipelines manifold together, extend south of infiltration gallery, and terminate in a concrete utility vault. Additional information on the design and construction of these facilities can be found in the Special Run Pool 9 Project construction documents. An excerpt from these documents, including a partial plan and detail, is included herein as Attachment A.

Overview of SRWA's and TID's Raw Water Pump Station Phase 1 Project

In advance of SRWA's Project, SRWA and TID elected to design and construct the wet well portion of the future RWPS ahead of the other regional SRWA facilities, as part of SRWA's evaluation and testing of the existing infiltration gallery. The decision to accelerate the design and construction of this facility reflected SRWA's desire to: 1) develop the existing infiltration gallery and confirm its original design capacity, and 2) gain access to the infiltration gallery to collect raw water samples that have been "filtered" by the infiltration gallery. The design for the wet well (officially designated as the "Raw Water Pump Station Phase 1 Project") was completed in 2017 and construction is expected to be completed in late 2019 or early 2020, prior to the start of construction of the remainder of the RWPS.

The wet well will be located approximately 150 feet south of the Tuolumne River and 400 feet west of Geer Road. The structure includes a total of six (6) bays to accommodate the proposed vertical turbine pumps required to service SRWA's and TID's buildout raw water demands. The wet well is subdivided into two interconnected halves to allow one half of the wet well to be taken offline for inspection, cleaning and/or maintenance. To provide increased flexibility to the future DB contractor responsible for designing the remainder of the RWPS and the other regional SRWA facilities, the wet well was also designed to accommodate a variety of internal devices that may be recommended to optimize the hydraulic conditions experienced by the raw water pumps, as identified through future computational fluid dynamics (CFD) or physical modeling performed as part of the DB contract.

An excerpt from the RWPS Phase 1 contract documents, which includes a civil site plan, mechanical plans, and a mechanical section, is included herein as Attachment B.

Overview of Future Raw Water Conveyance Facilities

The infiltration gallery and RWPS must accommodate the raw water demands from both SRWA (for drinking water) and TID (for irrigation water). Raw water diverted at the RWPS will be conveyed approximately 2,600 lineal feet (LF) to the SRWA WTP through a new, 60-inch diameter transmission main to a flow-split vault located within the WTP site. At the flow-split vault, the raw water transmission main will bifurcate, with one branch leading to the head of the WTP and the other branch leading to TID's Ceres Main Canal. Flow split ratios will be determined by domestic and irrigation demands at the time. The raw water transmission main, flow-split vault, and WTP will be designed and constructed by SRWA's DB contractor.

Preliminary design information for the WTP and raw water conveyance facilities is included in the TMs titled "Preliminary Design for SRWA Water Treatment Plant" (Trussell Technologies, June 2018) and "Preliminary Design of Raw and Finished Water Transmission Mains" (West Yost Associates, June 2018).

Current (May 2018) Condition of Infiltration Gallery

As of May 2018, the condition of the existing infiltration gallery is unknown, as the gallery has not been tested or otherwise utilized since its construction in 2001-2003. As part of the Raw Water Pump Station Phase 1 Project, the condition and capacity of the infiltration gallery and air purge system will be assessed and subsequently documented in an Infiltration Gallery Development and Testing Report. Development and testing activities will include air purging and pumping. Throughout the testing phases, various parameters will be monitored and recorded, including river and wet well water surface elevations, pump flow rates, turbidity levels, and wet well influent sand content. It is anticipated that the results of the development and testing activities will yield important information about the infiltration gallery's yield, the nature of suspended solids that pass through the infiltration gallery, and the procedures necessary to complete periodic air purging and redevelopment of the gallery to maintain its yield. The DB contractor selected to complete the design and construction of SRWA's regional facilities will be required to incorporate the results of the development and testing activities in its design.

Draft EIR and Water Sales Agreement

SRWA issued its Surface Water Supply Project Draft Environmental Impact Report (EIR) in January 2018. The Draft EIR includes the RWPS as part of the larger water supply project. The Draft EIR explains the SRWA plans for the phased construction and implementation of the RWPS and WTP consistent with the phased raw water flow criteria described below. Portions of the Draft EIR analysis focus on the Phase 1 WTP capacity of 15 mgd (or 23.2 cubic feet per second (cfs)). Additionally, as discussed in the Draft EIR, TID will only use the RWPS in an emergency situation, and normal use of the RWPS is not included as part of the Draft EIR project description. As noted in the Draft EIR, the SRWA/TID Water Sales Agreement provides for the sale and transfer of up to 30,000 acre-feet per year. Consequently, in the future, as SRWA and TID proceed with subsequent project phases that involve greater pumping at the RWPS, it may be necessary for SRWA and TID to first undertake supplemental environmental review, obtain additional permits and entitlements, and amend the Water Sales Agreement or obtain another, additional raw water supply. These issues are beyond the scope of this TM. Rather, this TM focuses on planning and engineering to aid in the design of the RWPS and to ensure that the design for RWPS Phase 1 will accommodate and not hinder the ability to implement any future phase expansions. This TM is a planning document that will inform and guide that design and any future supplemental environmental review, permitting, or other activities relating to later phases.

OVERVIEW OF REFERENCE RWPS

This section provides a brief overview of SRWA's Reference RWPS, including a preliminary site layout and a hydraulic profile. Preliminary drawings for the Reference RWPS are included in Attachment C to this TM.

The Reference RWPS includes the following major features:

- Infiltration gallery
- Wet well
- Raw water pumps
- Sediment management system
- Raw water transmission main (and flow split structure)
- Surge protection
- Pigging station
- Compressed air system for air purging
- Electrical transformer
- Electrical switchgear
- Motor control center(s)
- Standby generator

Site Layout

A site layout for the Reference RWPS is shown in Attachment C (see Drawing C10). This layout shows the placement of the pump station building, electrical room, yard piping courtyard, raw water transmission main, and standby generator equipment.

Hydraulic Profile

The hydraulic profile between the Tuolumne River at the infiltration gallery and the static mixer at the beginning of the 15 mgd Reference WTP is shown in Figure 1.

Scheduled RWPS Downtime

The combination of the new SRWA RWPS and WTP is intended to provide a "base load" of treated drinking water to each city, to be supplemented as needed with existing groundwater supplies. Prior to the expansion of the WTP from 15 to 30 mgd, for example, the amounts of groundwater needed to supplement surface water during peak demand months is expected to be greater than the total drinking water demand during minimum demand months (West Yost Associates, June 2016). By virtue of the continued availability of groundwater supplies, the Cities have indicated that both the RWPS and the WTP may undergo periodic, partial shutdowns during low demand months (typically December through February) to facilitate planned maintenance. This assumption is reflected in a number of sizing criteria presented throughout this TM.

PRELIMINARY DESIGN OF REFERENCE RWPS

This section summarizes the preliminary design approach and/or criteria for the major features of the Reference RWPS. This section is organized as follows:

- Flow Criteria
- Site Improvements
- Mechanical Improvements
- Instrumentation and Controls
- Electrical Improvements

Flow Criteria

The infiltration gallery was designed to divert up to 100 cubic feet per second (cfs) from the Tuolumne River. Pending development and testing of the existing gallery, it is assumed that its rated capacity will be 100 cfs.

Utilization of the RWPS by SRWA and TID will increase in phases, with corresponding predictions of the flows that will be diverted by the two agencies. Initially, though, TID does not intend to divert water for regular delivery through the RWPS. However, it will have the capability to divert water on an emergency basis (e.g., in the event of an operational problem in TID's canal system, or if the WTP needed to be shutdown for some operational issue). However, regular TID diversions are expected to begin at some point before buildout, at a time to be determined by TID. Depending on the installed RWPS pumping capacity in any given phase, TID may divert any

amount of flow between SRWA's instantaneous flow demand and the RWPS' firm capacity. Flow criteria for the RWPS is presented in Table 1.

Table 1. Raw Water Flow Criteria

Condition	Max Flow to SRWA, mgd, cfs	Max Combined Flow to SRWA and TID, mgd, cfs	RWPS Firm Capacity, mgd, cfs
Phase 1	15 (23.2)	15 (23.2)	15 (23.2)
Phase 2	30 (46.4)	TBD[(a)]	TBD[(a)]
Buildout	45 (69.6)	65 (100)	65 (100)

(a) TID has not yet determined when it will begin diverting raw water from the infiltration gallery, and at what flow rates.

Because buildout is not expected to occur until approximately 2040 or later, fewer than six raw water pumps will need to be installed during Phase 1 of the Reference RWPS. The sizing and selection of the raw water pumps is discussed in further detail later in this TM.

Site Improvements

This section discusses the preliminary design of the Reference RWPS site improvements, including: site layout; site access; grading, paving and drainage; yard piping; and site security.

Site Layout

The RWPS site is constrained by a number of factors, including the boundaries of relevant easements and private properties, the locations of the existing infiltration gallery and wet well, the location of existing overhead high-voltage TID transmission lines, a potential future utility corridor for TID, the surrounding topography, and the established 100-year flood elevation. All permanent RWPS facilities (e.g., wet well, pump station building, electrical equipment, graded and paved areas, access road, fencing, etc.) must be contained within the area comprised by TID's existing, 1.99-acre permanent easement and the adjacent 0.97-acre parcel to the south. Table 2 provides a summary of several other constraints considered in the layout of the Reference RWPS.

Table 2. Site Layout Constraints for Reference RWPS	
Category	**Constraint(s)**
Clearances and setbacks for TID's high-voltage transmission mains	Permanent and temporary construction equipment must maintain a minimum of 20 feet of radial clearance from transmission lines at all times. No permanent structures may be located within TID's transmission main easement (with the exception of a retaining wall and a buried, traffic-rated pig[2] launching vault).
Easements	Easements and available adjacent property have already been acquired.
100-year flood elevation	Pump station finished floor elevation must be above the 100-year flood elevation of approximately 82.4 feet.

The site plan for the Reference RWPS is shown on Drawing C10 of Attachment C.

Site Access

The access to the RWPS site will be from the east, via an access road from the Fox Grove Recreation and Fishing Access ("Fox Grove Park") parking lot. As part of the Raw Water Pump Station Phase 1 Project, a gravel access road will be constructed between the wet well and Fox Grove Park and will be left in place for use by SRWA, TID and the DB contractor. The access road will be improved as part of construction of the RWPS; the improved access road for the Reference RWPS is 12 feet wide and will have a pavement section in accordance with a Traffic Index selected during final design and based on the Project geotechnical recommendations.

To facilitate the future installation and/or removal of raw water pumps and other large, heavy equipment, the access road and parking areas adjacent to the pump station must be capable of accommodating a crane of sufficient size to be able to remove the pumps and place them on a transport. As shown in Drawings C10 and C11 of Attachment C, the parking area to the west of the pump station building is sized to accommodate a large crane for servicing the vertical turbine pumps. The parking area to the east of the building is available for smaller cranes to remove smaller equipment (e.g., the raw flow meter, air compressors, and/or compressed air receiver tanks). Crane heights will be limited by the radial clearances around overhead power lines as required by TID.

Grading, Paving and Drainage

Surface drainage at the site will be directed via sheet flow off the site and downhill, away from the wet well. The access road along the bottom of the hill to the south of the RWPS will be paved to prevent erosion. Drainage of the piping courtyard will be collected in an area drain and discharged down the side of the hill to the north of the RWPS.

[2] A "pig" is a pipe cleaning device, typically made of foam, that is inserted into a pipeline and pushed through the pipe by the normal system pressure (in this case the RWPS pumps). As the pig moves through the pipe, it pushes any sediment or debris through the pipe and expels it at the end of the line.

Yard Piping

Yard piping on the RWPS site will include the raw water transmission main, pigging station, air purge piping, utility water piping, storm drainage piping, irrigation piping, and raw water sample station piping. Pipe materials are discussed in the mechanical portion of this TM.

Site Security

The RWPS site will include security measures to protect the site from trespassing, theft, vandalism and other unauthorized uses. The preliminary design of the Reference RWPS includes yard lighting, chain link fencing, and barbed wire fencing around the perimeter of the site, as well as motorized gates opened by access keypad to allow vehicle access by SRWA and TID. The perimeter fencing will include additional, manual lockable vehicle gates to facilitate pass-through access by the Nazareno family.

As a remotely operated facility, the RWPS will also include 24/7 video surveillance and intrusion alarms on all pump station building ingress and egress points.

Mechanical Improvements

This section discusses the preliminary design of the Reference RWPS mechanical improvements, including: raw water system hydraulics; sizing and selection of pumps; sediment management; infiltration gallery air purging; utility and irrigation water supply; piping systems; and gates, valves and other appurtenances.

Raw Water System Hydraulics

The hydraulics for the raw water conveyance system are governed by the water surface elevation (WSEL) inside the wet well, the head losses incurred by the raw water piping system, and by the controlling WSEL or hydraulic grade level (HGL) at the head of the WTP and/or Ceres Main Canal. To determine the required static lift conditions for the Reference WTP, preliminary design WSELs and HGLs were assumed as shown in Table 3.

Table 3. Design WSELs and HGLs for Reference RWPS

Category	Elevation[a], feet	Basis of WSEL
Minimum wet well WSEL	49.5	Estimated minimum WSEL in Tuolumne River (based on natural weir downstream of infiltration gallery), minus estimated head loss through infiltration gallery
Maximum wet well WSEL	68.3	Estimated WSEL in Tuolumne River at infiltration gallery at 15,000 cfs (maximum release from Don Pedro Reservoir under controlled conditions), minus estimated head loss through infiltration gallery
100-year flood WSEL	82.4	Output from HEC-RAS hydrologic model developed by TID in December 2007
Maximum WSEL at discharge to Ceres Main Canal	137.2	Weir elevation inside the canal discharge structure
Maximum HGL at Reference WTP flash mix facility	134.0	Preliminary hydraulic profile for Reference WTP

(a) NAVD88 datum

Calculated head losses for the raw water piping system are based on the diameters and approximate lengths shown in Table 4.

Table 4. Design Pipeline Diameters for Reference RWPS

Category	Diameter, inches	Approximate Length, feet
Raw water pump columns	20	45
Piping from individual raw water pumps to common discharge header	20	13
Exposed, common discharge header	48	135
Buried pipeline between RWPS and flow split structure	60	2,445
Buried pipeline between flow split structure and Ceres Main Canal discharge structure	60	1,375
Buried pipeline between flow split structure and Reference WTP flash mix facility	60[1]	515

Note:
The diameter of this branch of the piping will be selected by the DB Contractor (e.g., based on desired WTP hydraulic profile, approach to RWPS pump selection, maximum pig diameter, etc.).

The RWPS must be capable of providing adequate head to satisfy the variety of raw water flow and distribution scenarios. Although the RWPS will only need to provide up to 15 mgd during the first phase of the Project, the design of the pumps and piping systems must consider buildout conditions. As such, pump selection for the Reference RWPS was completed with the following buildout flow scenarios in mind:

- A minimum of 7.5 mgd to the WTP
- Up to 45 mgd to the WTP
- Up to 65 mgd to the Ceres Main Canal
- 15 mgd to the WTP and 50 mgd to the Ceres Main Canal[3]

The highest TDH is expected to occur when raw water is split to both the WTP and the Ceres Main Canal, as the flow split structure will introduce additional head losses through the partially open control valves. Preliminary system curves reflecting the scenarios listed above are presented in Figure 2.

Sizing and Selection of Pumps

Sizing of raw water pumps was determined based on meeting the proposed buildout demand of 65 mgd (45,110 gpm) with one pump out of service, the initial demand of 15 mgd (10,410 gpm), and the available number of pump bays in the wet well. All pumps will be the same size. The results of this analysis are shown in Table 5.

Table 5. Raw Water Pump Design Criteria for Reference RWPS

Condition	Minimum Flow[(a)], mgd gpm	Maximum Flow, mgd gpm	No. Duty Pumps	Minimum Required Capacity per Pump, gpm	Firm Capacity, gpm	Design TDH at Max Flow, feet
Phase 1	7.5 (5,205)	15 (10,410)	1	10,410[(b)]	10,410	95
Buildout	22.5 (15,615)	65 (45,110)	5	9,022[(b)]	45,110	125

(a) Assumes that the WTP is temporarily reduced to 50% of its design capacity, and no raw water is being diverted by TID.
(b) The shape of the flow vs. head curve for the preliminary pump selection (i.e., Floway 29JKL) allows the same pump to be used for both the Phase 1 and Buildout conditions.

Recommendations for vertical turbine pumps capable of meeting the criteria presented in Table 5 were solicited from pump manufacturers. The pump recommended for the Reference RWPS is the Floway® Model 29JKL, with a 19.2-inch impeller trim and 400 horsepower (hp) motor. The manufacturer's cutsheet for this pump is included in Attachment D. Pump curves reflecting the selected Floway® pump are shown alongside the system curves in Figure 3.

[3] Assumes that TID will elect to begin diverting raw water for irrigation purposes prior to the expansion of the SRWA WTP from 15 to 30 mgd.

Each of the pumps for the Reference RWPS would be equipped with variable frequency drives (VFDs) to allow the RWPS to meet raw water demands by SRWA and/or TID, to ensure that the pumps can be used interchangeably, and to limit the inrush current associated with the startup of pumps and its associated impacts on TID's electrical distribution system.

Hydraulic Conditions within the Wet Well

Due to the asymmetrical relationship between the raw water entrance and exit locations within the wet well (i.e., the 36-in infiltration gallery pipes are concentrated near the middle of the north wall of the wet well structure, while the raw water pump bays are distributed evenly along the south wall of the structure), there is a potential that raw water flowing to the pumps will not be entirely uniform under certain flow and pumping configurations. As a result, the final design of the RWPS must evaluate and account for potential remedial measures to improve pump approach hydraulics and ensure that the pump station conforms to Hydraulic Institute standards. Modeling of the pump station by the DB contractor, either through the use of CFD or a scaled physical model, will be required to identify and evaluate any needed remedial measures.

Sediment Management

The raw water entering the pump station wet well will be filtered by the infiltration gallery, which is constructed of a combination of 2- to 12-inch cobble, 3/8- to 1-inch rock, pea gravel, and the slotted screens of the gallery pipes. Thus, much of the particulate matter in the raw water will be removed. However, it is expected that some sand- and silt-sized particles will pass through the infiltration gallery and reach the wet well. It is furthermore expected that some of the particles settle out and accumulate in the wet well under certain operating conditions (e.g., in the initial years of the Project in which peak raw water flows are 15 mgd or lower). In addition, there will be empty pump bays during the initial phase of the Project, providing relatively quiescent zones that will allow sediment to settle out.

To mitigate this issue, the RWPS should provide for the periodic or continuous resuspension of accumulated sediment. For the Reference RWPS, the mechanism for providing this capability is envisioned as a hydraulic jetting procedure powered by submersible pumps (one pump for each half of the wet well). Each pump would be piped to a series of nozzles or orifices in a pipe network that would be located at strategic points in the wet well. The velocity of water leaving the nozzles/orifices would resuspend the sediment and therefore prevent sediment from blocking the entrance to the pump. The suspended sediment would then be pumped through the transmission main and removed in the WTP's clarification process. A new pipe network will be required as part of the RWPS project to convey the pressurized water to strategic locations along the floor of the wet well. Depending on the configuration and discharge pressures for the sediment management piping and nozzle/orifice networks, respectively, operation of the sediment management pumps may require more horsepower than the existing sump pumps are capable of providing. As such, the existing sump pumps could be connected to the sediment management piping, or a new set of pumps could be installed. Detailed design of the sediment management system should consider sediment data obtained during initial development and testing of the infiltration gallery (to be conducted as part of the Raw Water Pump Station Phase 1 [i.e., wet well] Project), and should be coordinated with the CFD or scaled physical modeling of the pump station.

Suspended sediment pumped from the wet well may settle out in the raw water transmission main, particularly during the initial years of the Project when velocities in the 60-inch pipeline are not expected to exceed 1.2 feet per second (fps). To mitigate the impacts of sediment accumulation in the pipeline, the Reference RWPS includes a pig launching facility. This facility will allow a foam pig to be inserted into the pipeline and propelled (via pressure generated by the raw water pumps) towards the WTP, scouring the interior of the pipe and resuspending accumulated solids along the way. Any diversions to TID's Ceres Main Canal should be temporarily suspended during pigging of the pipeline, to prevent the pig from being discharged to the canal where recovery would be difficult.

Infiltration Gallery Air Purging

Over time, sediment of varying size and composition is expected to accumulate above and within the granular material in the existing infiltration gallery. The need for periodic "air purging" of this sediment is anticipated, and was accounted for in the original design and construction of the infiltration gallery. Within and adjacent to each 24-inch screened gallery pipe is a pair of 2-inch perforated HDPE pipelines, each of which was designed to distribute and discharge pressurized air to loosen the surrounding granular material and dislodge (or purge) accumulated sediment. The individual HDPE air purge pipelines manifold into eight 4-inch pipelines, and eventually terminate in a vault near the wet well.

To facilitate air purging for the Reference RWPS, the existing HDPE air purge pipelines will be connected to a new compressed air system. The air purging system will be operated so that all compressed air is directed through one of the existing 4-inch HDPE lines, thus only one half of one bay of the infiltration gallery (i.e., two adjacent 24-inch screened gallery pipes) will be purged at a time. Compressed air will be stored on site in steel storage tanks with internal working pressure of 140 pounds per square inch (psi). Two air compressors (one duty and one standby) and four 6,250-gallon storage tanks are recommended to provide the necessary air to the purging system.

Detailed design of the air purging system should consider the results obtained during initial development and testing of the infiltration gallery, as described previously. If necessary, the volume, flow rate and discharge pressure of air delivered during a given purging cycle should be adjusted to reflect the conditions observed in the field.

To the extent feasible, air purging should be conducted during specified time periods to minimize any adverse effects on special-status fish and wildlife[4].

[4] In accordance with the Mitigation, Monitoring and Reporting Program (MMRP) developed for the wet well project, air purging should be limited to between April 1 and September 30 of any year.

Design criteria for the Reference RWPS' air purging system are presented in Table 6 below.

Table 6. Air Purge Design Criteria for Reference RWPS

Criteria	Value
Pressure to release air at the end of perforated HDPE	15 psi (a)
Unit purge air flow rate	2 standard cubic feet per minute (scfm) per square foot (ft^2) of gallery being purged (b)
Plan area of one half of one infiltration gallery bay (i.e., two 24-inch diameter screens)	1,510 ft^2(c)
Purge air flow rate	3,020 scfm(d)
Purge duration	5 min(b)
Minimum volume of free air	15,100 ft^3 (e)
Minimum volume of compressed air	1,650 ft^3 (f)
Safety factor	2(g)
Recommended compressed air storage volume	3,300 ft^3 (25,000 gallons)(h)
Air compressor capacity	70 scfm(i)

(a) Based on river water surface elevation of 66 feet.
(b) Based on guidance from well screen manufacturers, as documented in a TM titled "Raw Water Pump Station and Supply System, TM No. 1" (Brown & Caldwell, July 2006).
(c) Based on the length x width of one-half of an infiltration gallery bay, with additional 5 -10 ft on each side.
(d) 3,020 scfm = 2 scfm/ft^2 x 1,510 ft^2
(e) 15,100 ft^3 = 3,020 scfm x 5 min
(f) Using the ideal gas law, storage volume = (15 psi) x (15,100 ft^3) / (140 psi) = 1,650 ft^3 140 psi was selected as a reasonable pressure for storage vessels and air compressors.
(g) Allows for increased flow or duration of purging.
(h) Recommend 4 tanks at 6,250 gallons each. Multiple smaller tanks may fit on site better than fewer larger tanks and may be easier to remove and replace.
(i) Sized to refill storage tanks in less than 1 hour.

Detailed design of the air purging system should consider the results obtained during initial development and testing of the infiltration gallery, as described previously. If necessary, the volume, flow rate and discharge pressure of air delivered during a given purging cycle should be adjusted to reflect the conditions observed in the field.

To the extent feasible, air purging should be conducted during specified time periods to minimize any adverse effects on special-status fish and wildlife[5].

[5] In accordance with the Mitigation, Monitoring and Reporting Program (MMRP) developed for the wet well project, air purging should be limited to between April 1 and September 30 of any year.

Utility and Irrigation Water Supply

The preliminary design for the Reference RWPS assumes that raw water will be a suitable supply for utility stations (i.e., hose bibs), pump seal water, and landscape irrigation. During detailed design of the RWPS, the DB contractor will be responsible for coordinating with regulatory agencies (e.g., the Regional Water Quality Control Board and the Division of Drinking Water) to confirm the suitability of raw water for these purposes, as well as identifying any needs for pressure boosting and/or filtering. If raw water cannot be permitted as a supply for these purposes, the DB contractor will need to consider alternatives, which may include installation of an onsite groundwater well, use of drip oiler for raw water pumps instead of seal water, xeriscaping in lieu of conventional landscaping, or some combination of the above.

Piping Systems

This section describes the preliminary design basis for the Reference RWPS' raw water and appurtenant piping systems.

Raw Water Transmission Piping

The raw water transmission main will be AWWA C200 welded steel. Individual raw water pumps will discharge through 20-inch diameter pipes before they manifold into a common 48-inch diameter header. Pipeline sizing criteria are shown in Table 7.

Table 7. Raw Water Pipeline Sizing Criteria for Reference RWPS

Location	Diameter, inches	Max Flow, mgd, gpm	Max Velocity, fps	Comments
Individual Pump Discharge	20	15 (10,400)	10.6	Despite initial phase velocities over 10 fps, velocities at buildout (max flow of 9,000 gpm) will be lower (9.2 fps)[6]
Common Pump Discharge Header	48	65 (45,100)	8.0	Relatively high velocity is acceptable due to relatively short length and the corresponding reduction in cost for valves and flow meter
Raw Water Transmission Main	60	65 (45,100)	5.1	Minimizes head loss in longer pipeline

The raw water flow meter, isolation valves and several bypass piping branches will be located along the 48-inch header. The pipeline will transition to a diameter of 60 inches after the flow meter. Additional information on the raw water transmission main between the RWPS and the

[6] Velocity at buildout is less than initial velocity because as the total flow in the pipeline increase, each individual pump will contribute less flow due to increased frictional headloss in the pipeline.

WTP is discussed in the TM titled "Preliminary Design of Raw and Finished Water Transmission Mains" (West Yost Associates, June 2017).

A flow meter bypass loop will be provided to allow continued RWPS operation during maintenance of the flow meter. Manually actuated butterfly valves will allow isolation of the flow meter (or insertion type magnetic flow meter) and re-routing of flow through the bypass line.

The bypass loop will also be provided with a discharge to the wet well. The discharge will serve several functions: 1) to allow initial testing of the individual pumps (i.e., without having to send water to the WTP or Ceres Main Canal); 2) to allow the pipeline to be drained in the event that pipeline maintenance is required; and 3) to alleviate pressure surges in the event of power failure to the RWPS (see additional discussion below).

Raw Water Transmission Main Surge Protection

Surge protection for the transmission pipeline will be accomplished through a variety of measures. A detailed assessment of hydraulic transients will be presented in a separate TM and appended to this Reference RWPS TM at a later date. To reduce the risk and/or impact of hydraulic transients, the Reference RWPS includes pump control valves that will allow each raw water pump to start against a closed valve that opens gradually (in conjunction with the pump's VFD gradually speeding up). Additionally, a pressure relief valve on the transmission pipeline will allow bypassing of raw water back into the wet well in the event of a pressure surge after a power failure.

Flow Split Structure

The control of water discharged to the WTP, TID's Ceres Main Canal, or both will be facilitated by a flow split structure located on the WTP site. Upon reaching the flow split structure, the 60-inch transmission pipeline will split into two pipes (one to the WTP and one to the canal), each with a separate flow control valve and a flow meter. The flow control valve(s) will automatically modulate in response to operator-selected flow rate(s).

Appurtenant Piping Systems

In addition to the raw water transmission main, several appurtenant piping systems are included in the Reference RWPS and are described in the following paragraphs.

Compressed Air Piping

As part of the infiltration gallery air purging system described elsewhere in this TM, new piping will be required to convey compressed air to the existing buried air piping in the infiltration galleries located adjacent to the wet well. New, exposed compressed air piping will be Schedule 40 stainless steel. New buried air purge piping material will be HDPE, to match the existing buried pipes.

Sediment Management Piping

As part of the sediment management system described elsewhere in this TM, piping will be required to distribute pressurized raw water (or "sediment control water") to a network of nozzles located along the floor of the wet well. New, exposed or submerged sediment control water piping

will be AWWA C200 welded steel with appropriate coatings and linings for sizes 4-inch and up or Schedule 40, Type 316 stainless steel for sizes 3-inch and smaller.

Utility Water Piping

Utility water piping will be required to supply washdown stations located in and around the pump station. New, exposed utility water piping will be galvanized steel, ductile iron or stainless steel.

Irrigation Piping

Assuming that landscaping requiring irrigation will be included at the RWPS site, irrigation piping will be required. New, buried irrigation piping will be ductile iron or Schedule 80 polyvinyl chloride (PVC).

Sample Station Piping

Exposed sample station piping will be Type K copper.

Gates, Valves and Other Appurtenances

This section describes the preliminary design approach for the Reference RWPS' gates, valves and other appurtenances.

Sluice Gates and Actuators

As part of the wet well project, each of the four 36-inch HDPE infiltration gallery pipes will be fitted with cast iron sluice gates where the pipes enter the pump station. Additionally, an opening in the concrete wall that divides the wet well into two halves will be fitted with a sluice gate. Together, these gates will facilitate the as-needed isolation of individual infiltration gallery bays and/or wet well halves. The sluice gates will initially be installed with manual actuators. As part of the RWPS construction, however, the Reference RWPS assumes that the manual actuators will be replaced with electric motor actuators (which also have the ability to be opened manually in the event of a power failure).

The wet well also includes six 30-inch square openings in the baffle wall that sits between the infiltration gallery sluice gates and the entrances to the individual raw water pump bays. Depending on the results of the wet well hydraulic modeling to be conducted by the DB Contractor, these openings may need to be fitted with sluice gates; installation of the gates is not currently envisioned in the Reference RWPS preliminary design.

Isolation Valves

Isolation valves for the Reference RWPS will be AWWA C504 butterfly valves. The exception to this rule will be valves at the pig launching facility and any downstream isolation valves, which require a full port opening to allow passage of the pig. Where required for passage of pigs, full port opening valves may be gate valves or knife gate valves in accordance with applicable AWWA standards. Most isolation valves will be infrequently operated and will be provided with manual actuators. Where valve access is difficult, motorized actuators may be required.

Flow Control Valves

The Reference RWPS includes control valves on the discharge of each pump, and at the flow split structure. Pump control valves are intended to minimize pressure surges on pump start-up and shut down. Each pump control valve shall also have an automatic check feature to prevent reverse flow through the valve. Pump control valves shall be per AWWA C530. Pump control valves should also feature full port openings to minimize headloss.

Pressure Relief Valves

A pressure relief valve (PRV) will be provided to allow raw water to flow back into the wet well during high pressure events, such as after a power outage. A general rule of thumb for the size of the PRV is half the diameter of the force main; the Reference RWPS includes a 24-inch PRV installed on the flow meter bypass piping and is located within the pump station building. The type and size of the PRV will be confirmed as part of the transient analysis discussed above.

Above-Grade Pump Station Structures

This section provides a brief discussion of major above-grade structures included in the Reference RWPS.

Materials

The Reference RWPS will include a concrete masonry unit (CMU) building with a standing seam metal roof to provide shelter for the pumps and electrical equipment. The building should be designed in accordance with mechanical codes for insulation and HVAC requirements. The building is not intended to be an occupied space, as the RWPS will generally be operated remotely.

To protect the outdoor equipment from vandalism (e.g., gunfire), a CMU wall will be erected to shield certain outdoor equipment (e.g., compressed air storage tanks, flow meter, HVAC equipment, generator) from public view. Final design of the RWPS should consider the ability of the public to see over any walls from Geer Road.

Operator access to the outdoor equipment will be provided by pedestrian doorways. Equipment that cannot fit through the doors will need to be removed and installed via crane over the CMU wall.

Equipment Access

The pump station building will have skylights for overhead access (i.e., by crane) to the raw water pumps and motors. An overhead rollup door on the west side will allow gantry crane (or similar) access into the building for valves or other smaller equipment. Although the sluice gates are not expected to require replacement for 50 or more years, consideration should be given during final design to maneuvering gates into or out of the wet well and building. To this end, a bridge crane or monorail hoist system in the building should be considered by the DB Contractor.

Pump Station Instrumentation and Controls

This section summarizes conceptual control strategies and primary instruments envisioned for the Reference RWPS.

Raw Water Pumping Conceptual Control Strategy

The delivery of water to the WTP and TID's Ceres Main Canal will be controlled by the RWPS and the flow split structure. At buildout, up to 65 mgd of raw water is available to TID or up to 45 mgd to the WTP and up to 20 mgd to TID. To control the delivery of water to the respective locations, operators will enter the proposed flows for each delivery point into the SCADA system. The SCADA system will signal the proposed flow set points to the WTP flow meter and the TID flow meter. The initial RWPS pump will start at reduced speed and ramp up to full speed. If the flow set point is not reached at full speed, then the second RWPS pump will start at reduced speed and the first pump will slow down to match the reduced speed, then both pumps will ramp up to full speed together. This will continue until the required number of pumps is in operation. The number of pumps to operate will be based on the total flow established by the operators. As the flows approach the total flow desired, the flow control valves will begin to throttle the flows to match the individual set points (to the WTP and TID) and thereby begin to pressurize the pipe. With the pipe under pressure, the RWPS pumps will modulate to maintain the set point pressure in the discharge pipe.

The control strategy requires two flow meters to monitor flow to the WTP and TID's Ceres Main Canal. The location of the two flow meters is still to be determined. The final design could have one flow meter at the RWPS and one at the WTP, and the SCADA/PLC system could determine the flow to the canal by subtracting the WTP flow from the RWPS flow. Alternatively, a flow meter could be provided at the Ceres Main Canal and at the WTP. The preferred locations of the flow meters will be determined at a later date. The RWPS Predesign Drawings reflect a flow meter at the RWPS.

Air Purging Conceptual Control Strategy

The air purging system is expected to be largely manually controlled due to the infrequent need for purging. The RWPS will have an air compressor that will fill the storage tanks with compressed air at 140 psi. The compressed air tanks will have discharge piping that is connected together so that the entire volume of air will be directed into the same 4-inch HDPE pipe which will purge one half of an infiltration gallery bay. The piping will have an isolation valve and a flow modulating valve. The modulating valve will need to be adjusted during start-up of the RWPS. It is expected that there will be an iterative process to determine the optimum flowrate and duration for purging. The isolation valve will be manually opened when the tanks are full. It is expected purging of the entire Infiltration Gallery will take one to two days depending on how quickly the storage tanks can be recharged by the air compressors.

Sediment Management Conceptual Control Strategy

The sediment management system, consisting of two submersible pumps connected to piping with nozzles/orifices, is expected to operate on a timed basis. The duration and frequency of operation will be determined after testing and development of the infiltration gallery, and may change seasonally. The pumps will be called to run automatically via PLC.

Instrumentation

Primary monitoring and control instruments for the RWPS are summarized in Table 8.

Table 8. Summary of Reference RWPS Primary Instrumentation

Instrument Type	Location(s)	Description
Level transmitter	Wet well (each side)	Provides continuous water level monitoring. High, low and transducer fail alarms will be generated by the PLC in response to signals from the analog instruments.
Level switch	Wet well (each side)	Provides backup alarm for low water level.
Flow meter	RWPS discharge piping	Raw water flow will be totalized based on pulse output from the transmitter. Instantaneous, daily flow, and total flow can be generated by the PLC.
Pressure transmitter	RWPS discharge piping	High, low and transducer fail alarms will be generated by the PLC in response to signals from the analog instruments.
	Air purge discharge piping	High, low and transducer fail alarms will be generated by the PLC in response to signals from the analog instruments.
Position indicator	Infiltration gallery inlet sluice gates	Provides open/closed indication for remote monitoring.
PLC	Electrical Room	The PLC will display and send alarms for water level, flow, pressure, sluice gate position, pump run status, pump speed.

Electrical Improvements

The following section will discuss recommendations for power distribution and backup power to the Reference RWPS.

Power Distribution

Preliminary loads for the Reference RWPS are shown on Drawings E02 and E03 in Attachment C. The total estimated buildout electrical load is approximately 2,700 Amps (A). The National Electric Code requires a circuit breaker be rated such that it can handle the non-continuous load plus 125 percent of the continuous load[7]. This would require the main circuit breaker to be sized

[7] Per National Electric Code Section 210.20(A)

for 4000A. However, an alternate "100-percent rated" circuit breaker would be able to be sized for 3000A. According to TID, the largest metering service size offered at 480 Volts (V) is 3000A (or 2500 kilo-volt-ampere [kVA]). So that 480V service is possible for the Reference RWPS, a "100-percent rated" circuit breaker is recommended.

Primary (i.e., medium voltage) power metering and distribution is also available from TID and could also be used to provide power for the RWPS. For a primary service, utility metering would occur at 12 kilovolts (kV), and SRWA would be responsible for providing and maintaining the 12kV switchgear, utility tie-in equipment (e.g., recloser), transformer protection equipment, and 12kV-480V transformer. While a 12kV service would facilitate having multiple motor control centers (MCCs) to provide more than 4000A, maintaining 12kV equipment is generally more expensive than maintaining 480V equipment and requires specialized training. Due to the higher costs of ownership and specialized training associated with 12 kV service, SRWA has indicated that the RWPS and WTP shall both utilize 480V services.

Standby Power

TID stated that power outages that last approximately 5 hours or more occur only once every 10 years. Typical planned power outages are short periods to replace fuses. Based on the historical reliability of TID's distribution system, a typical, radial-type power distribution configuration is recommended; a secondary utility feed is not generally necessary. A dual feed system can be provided, but would be associated with higher installation costs for the second service and second transformer. A dual feed system would still be limited to a maximum of 3000A service at 480V. Due to the higher initial costs associated with a dual feed service, the Reference RWPS assumes a single utility service with standby generator.

For the Reference RWPS, two potential standby power configuration alternatives were evaluated:

- **Alternative 1**: Single 480V, 3000A service with 3000A, 100-percent rated main circuit breaker with a 2500 kilowatt (kW) standby generator (capable of running 5 of 6 raw water pumps) and a 3000A automatic transfer switch (ATS). This configuration would require only one utility transformer and would provide enough standby power for buildout of the RWPS. The Main Switchboard will distribute power to the RWPS VFDs and the MCC to handle loads less than 100 hp.
- **Alternative 2**: Single 480V, 3000A service with 3000A, 100-percent rated main circuit breaker, and a 1500 kW generator and 3000A ATS. The smaller generator has a smaller footprint, and would be less costly than the larger unit. The smaller generator would be sized to provide capacity to handle 3 of the 5 raw water pumps, or enough to provide approximately 43 mgd. Similar to the above scenario, this configuration will require only one utility transformer. The Main Switchboard will distribute power to the RWPS VFDs and the MCC to handle loads less than 100 hp.

Because buildout of the WTP (at which time the RWPS could potentially need the ability to pump up to 45 mgd during a TID power outage) is not expected to occur for more than 20 years, a 1500 kW generator is recommended for the first phase of the RWPS. A larger generator could be installed in the future when the 1500 kW generator reaches the end of its useful life and/or when more than 43 mgd of raw water pump capacity is required.

Figure 1. RWPS Hydraulic Profile to WTP

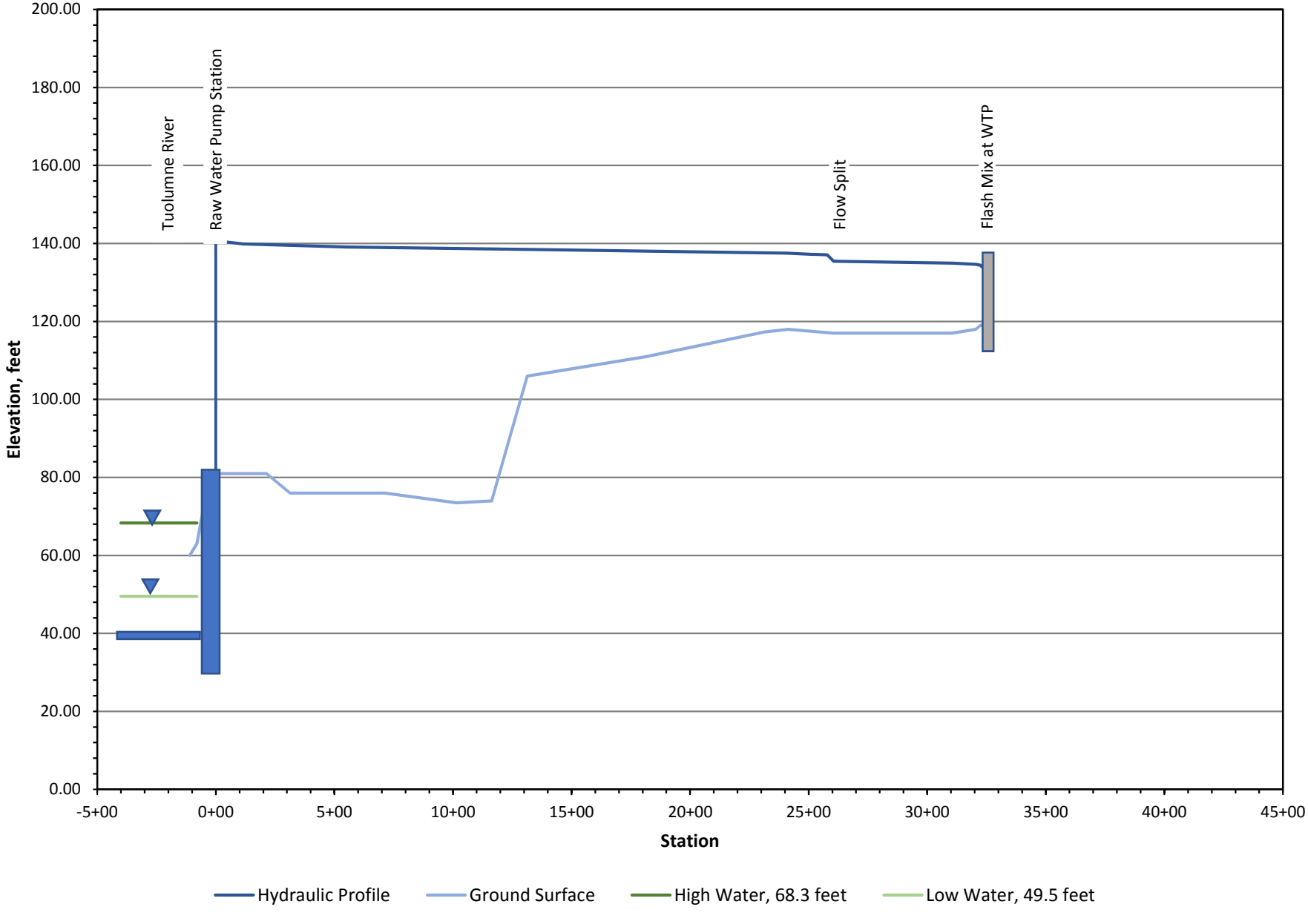


Figure 2. RWPS Hydraulic Profile to Canal

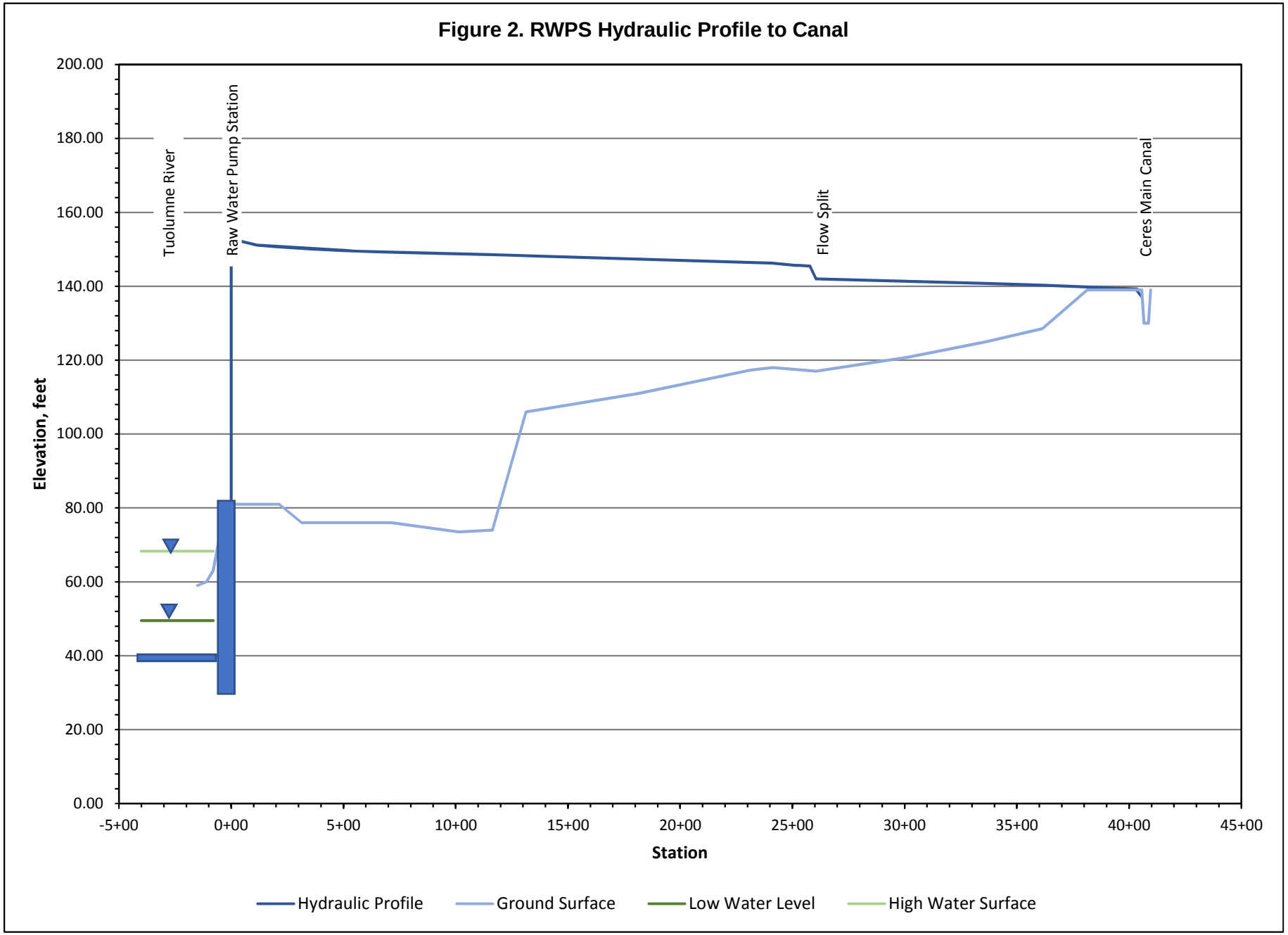
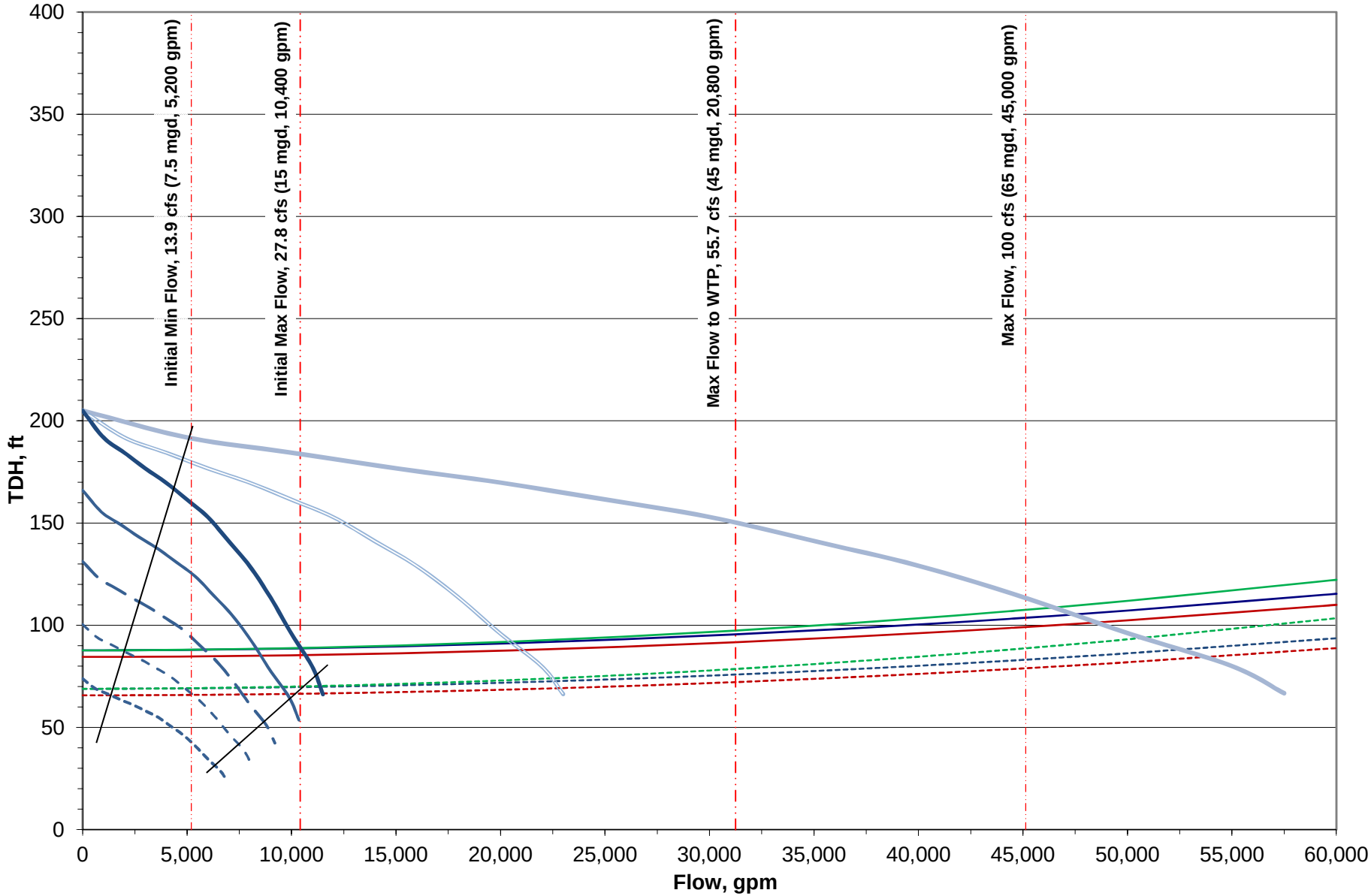


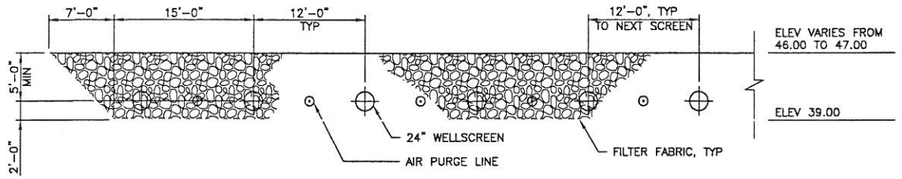
Figure 3. Raw Water Pump Station System and Pump Curves 6 Pumps (5 duty, 1 standby)



Note: Pump Curves based Floway 29JKL

ATTACHMENT A

Excerpt of Infiltration Gallery Record Drawings



SECTION
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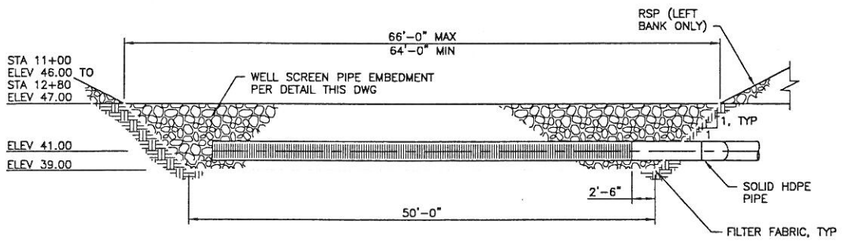
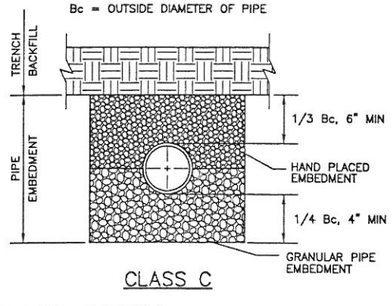


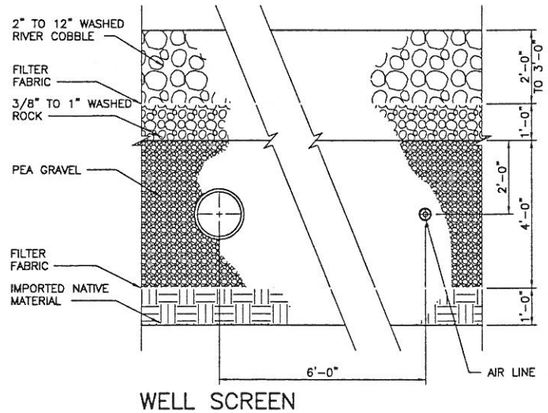
NOTE: FILTER FABRIC IS PLACED ON SLOPE BETWEEN THE GRAVEL PACK AND IMPORTED NATIVE MATERIAL. THE FABRIC EXTENDS THE LENGTH OF THE GALLERY FROM ELEVATION OF 46.00 TO 46.00.

SECTION
1/8" = 1'-0"

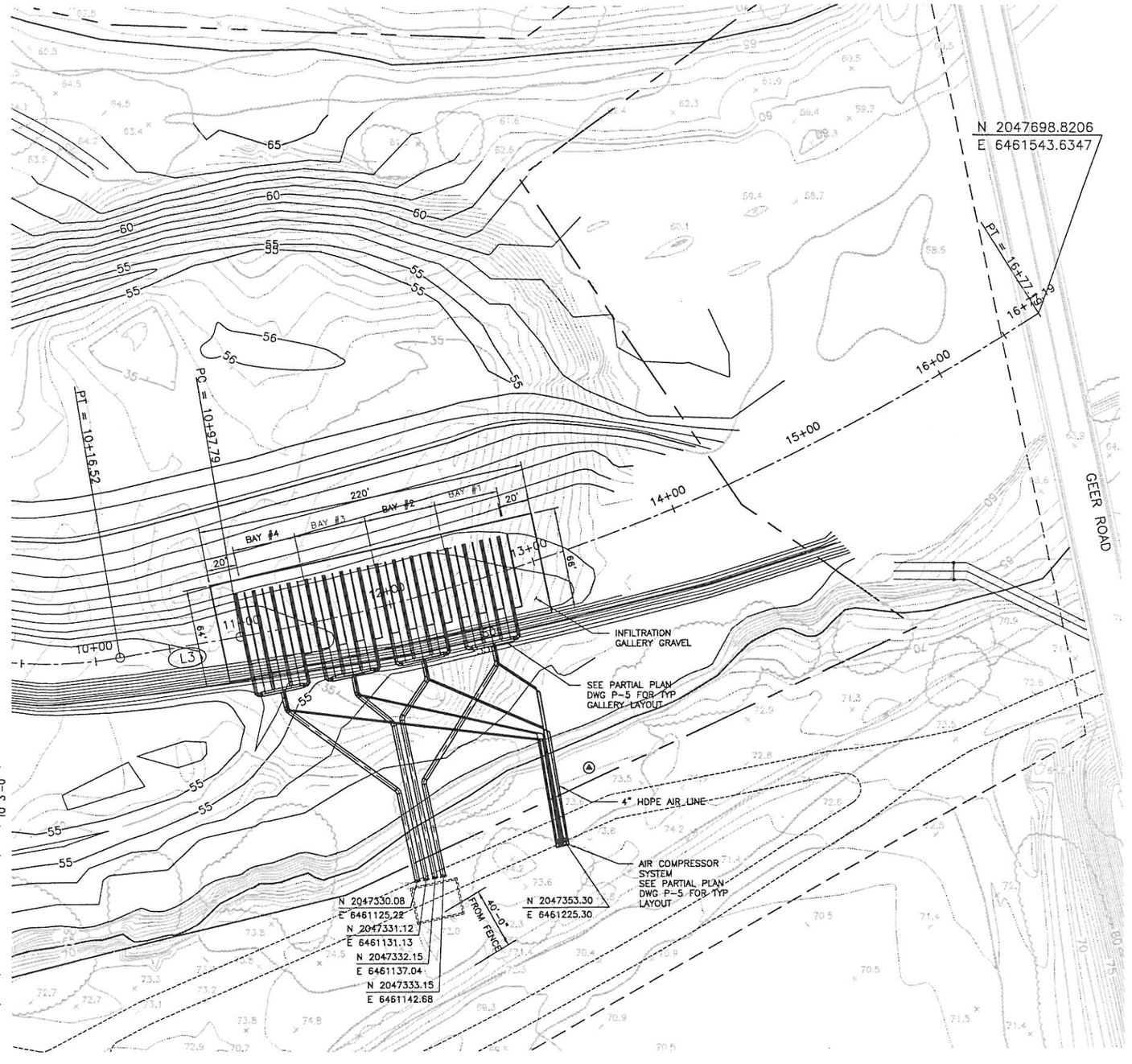


CLASS C

HEADER SYSTEM
PIPE EMBEDMENT
NTS



WELL SCREEN
PIPE EMBEDMENT DETAIL
NTS



PLAN
1" = 40'

Issue No.	Description	Date	Drwn.	Chkd.	Resp. Engr.	Proj. Mgr.
0	CORRECTED ACCORDING TO CONSTRUCTION RECORDS	12/06/02	JKW	TDB	TDB	DAP
A	ISSUED FOR BIDS	4/5/01	JKW	BOR	JWD	DAP

HDR Engineering, Inc.

BAR LENGTH ON ORIGINAL DRAWING EQUALS ONE INCH. ADJUST SCALE ACCORDINGLY.

Project Manager	D. PETERSON
Designed	J. DOMENICHELLI
Designed	T. BARELA
Checked	F. O'REGAN
Drawn	J. WEBB

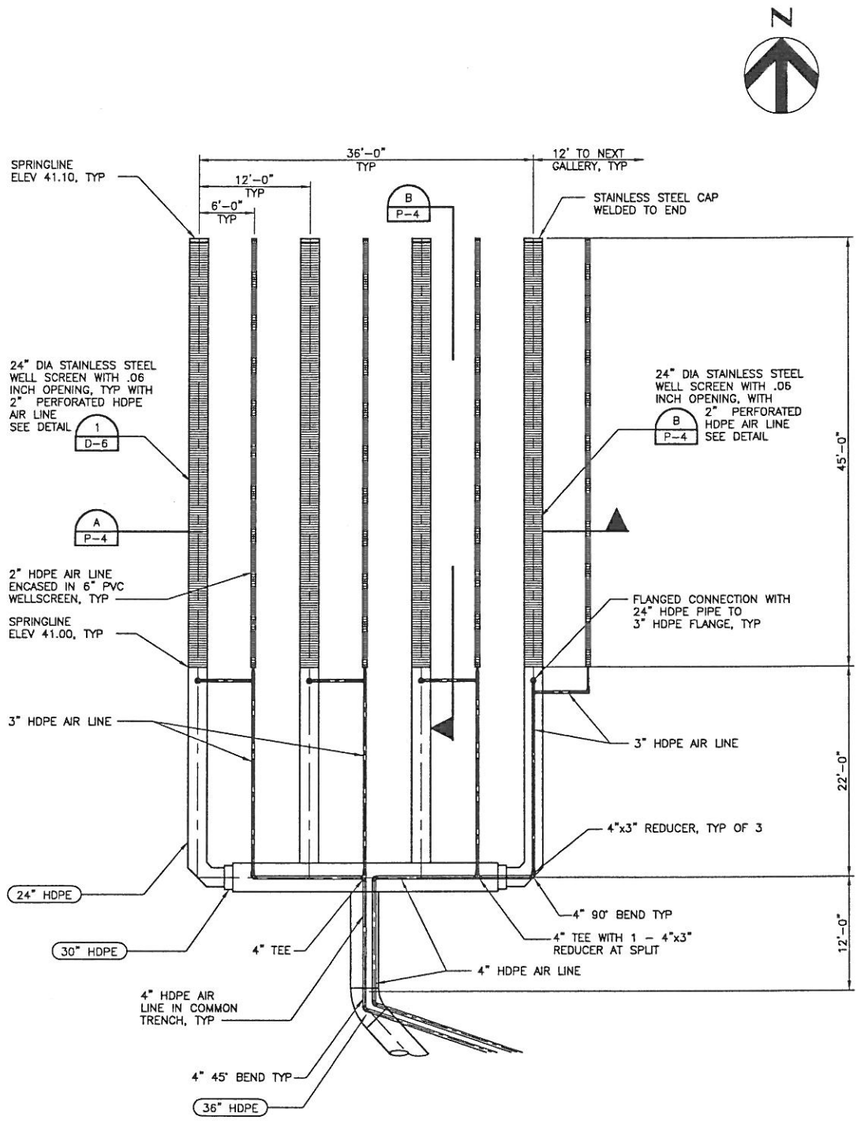
TURLOCK IRRIGATION DISTRICT

TUOLUMNE RIVER
CHANNEL RESTORATION PROJECT

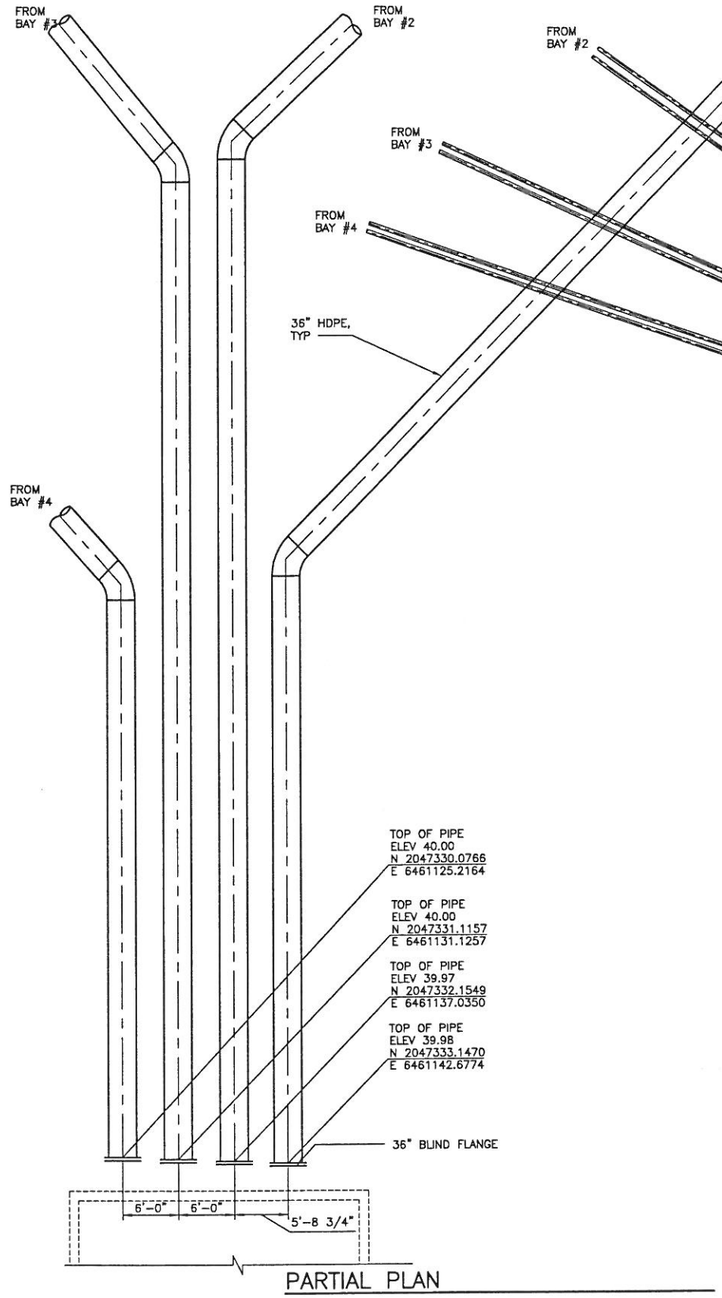
SPECIAL RUN POOL NINE MINING REACH
INFILTRATION GALLERY
SITE PLAN, SECTIONS AND DETAILS

Date	Project No.	Scale	Drawing No.	Sheet No.
DECEMBER, 2002	08254-020-141	AS NOTED	P-4	15 of 36

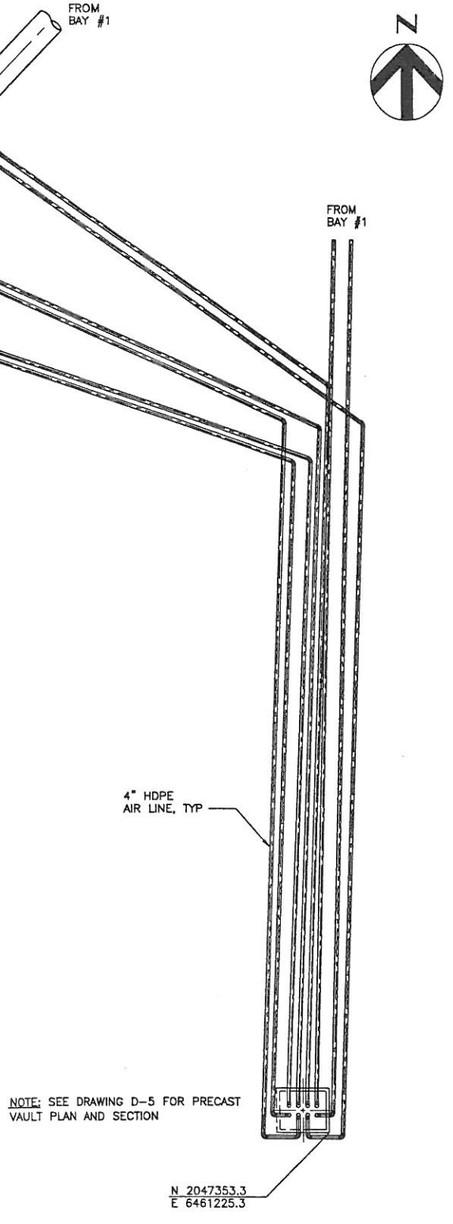
//SAC-BDC1/PROJECTS/08254/004/PLANS/SRP9_P04-ASBUILT.DWG
01-17-03 HOCONNEL 08:20:20



PARTIAL PLAN



PARTIAL PLAN



Issue No.	Description	Date	Drwn.	Chkd.	Resp. Engr.	Proj. Mgr.
0	CORRECTED ACCORDING TO CONSTRUCTION RECORDS	12/06/02	JKW	TDB	TDB	DAP
A	ISSUED FOR BIDS	4/5/01	JKW	BOR	JWD	DAP

HDR Engineering, Inc.

BAR LENGTH ON ORIGINAL DRAWING EQUALS ONE INCH. ADJUST SCALE ACCORDINGLY.

Project Manager	D. PETERSON
Designed	J. DOMENICHELLI
Designed	T. BARELA
Checked	F. O'REGAN
Drawn	J. WEBB

TURLOCK IRRIGATION DISTRICT

TUOLUMNE RIVER
CHANNEL RESTORATION PROJECT

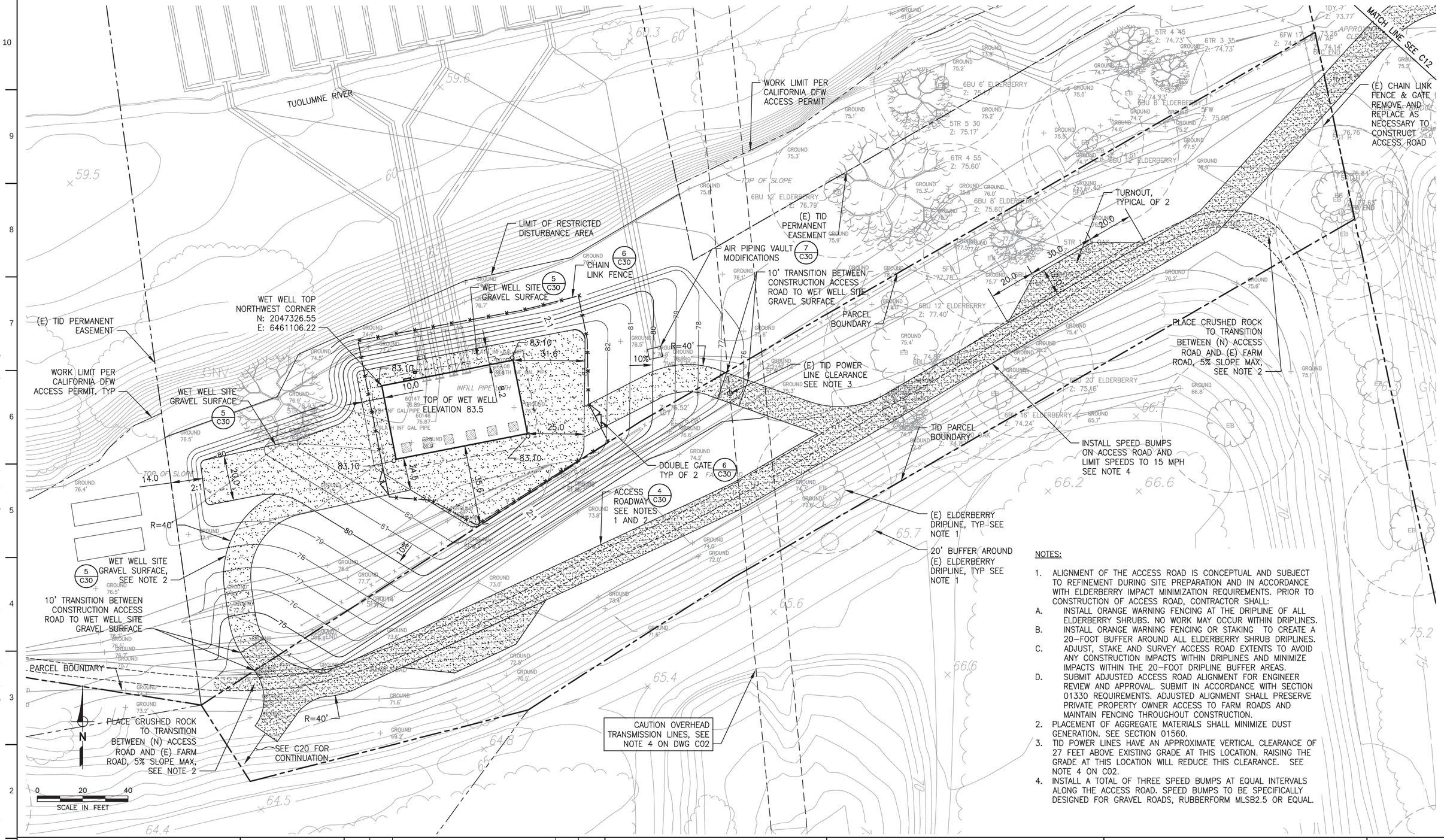
SPECIAL RUN POOL NINE MINING REACH
INFILTRATION GALLERY
PARTIAL PLANS

Date	Project No.	Scale	Drawing No.	Sheet No.
DECEMBER, 2002	08254-020-141	1/8" = 1'-0"	P-5	16 of 36

//SAC-BDC1/PROJECTS/08254/004/PLANS/SRP9_P05-ASBUILT.DWG
01-17-03 HOCONNEL 08:20:30

ATTACHMENT B

Excerpt of RWPS Phase 1 Contract Documents



NOTES:

1. ALIGNMENT OF THE ACCESS ROAD IS CONCEPTUAL AND SUBJECT TO REFINEMENT DURING SITE PREPARATION AND IN ACCORDANCE WITH ELDERBERRY IMPACT MINIMIZATION REQUIREMENTS. PRIOR TO CONSTRUCTION OF ACCESS ROAD, CONTRACTOR SHALL:
   - A. INSTALL ORANGE WARNING FENCING AT THE DRIPLINE OF ALL ELDERBERRY SHRUBS. NO WORK MAY OCCUR WITHIN DRIPLINES.
   - B. INSTALL ORANGE WARNING FENCING OR STAKING TO CREATE A 20–FOOT BUFFER AROUND ALL ELDERBERRY SHRUB DRIPLINES.
   - C. ADJUST, STAKE AND SURVEY ACCESS ROAD EXTENTS TO AVOID ANY CONSTRUCTION IMPACTS WITHIN DRIPLINES AND MINIMIZE IMPACTS WITHIN THE 20–FOOT DRIPLINE BUFFER AREAS.
   - D. SUBMIT ADJUSTED ACCESS ROAD ALIGNMENT FOR ENGINEER REVIEW AND APPROVAL. SUBMIT IN ACCORDANCE WITH SECTION 01330 REQUIREMENTS. ADJUSTED ALIGNMENT SHALL PRESERVE PRIVATE PROPERTY OWNER ACCESS TO FARM ROADS AND MAINTAIN FENCING THROUGHOUT CONSTRUCTION.
2. PLACEMENT OF AGGREGATE MATERIALS SHALL MINIMIZE DUST GENERATION. SEE SECTION 01560.
3. TID POWER LINES HAVE AN APPROXIMATE VERTICAL CLEARANCE OF 27 FEET ABOVE EXISTING GRADE AT THIS LOCATION. RAISING THE GRADE AT THIS LOCATION WILL REDUCE THIS CLEARANCE. SEE NOTE 4 ON C02.
4. INSTALL A TOTAL OF THREE SPEED BUMPS AT EQUAL INTERVALS ALONG THE ACCESS ROAD. SPEED BUMPS TO BE SPECIFICALLY DESIGNED FOR GRAVEL ROADS, RUBBERFORM MLSB2.5 OR EQUAL.

REGISTERED PROFESSIONAL ENGINEER MARY LEW'S TOMEY No. 38713 Exp. 12-31-17 CIVIL STATE OF CALIFORNIA
10/17/17

THIS LINE IS 1 INCH
AT FULL SCALE
IF NOT SCALE ACCORDINGLY

SCALE : AS SHOWN
DRAWN BY : MLY
DESIGNED BY : MLY
PROJ. MGR. : AMS

No.	ZONE	REVISIONS	BY	DATE

WEST YOST ASSOCIATES
2020 Research Park Drive
Suite 100
Davis, California 95618
(530) 756-5905
FAX (530) 756-5991

SRWA STANISLAUS REGIONAL WATER AUTHORITY

TID WATER & POWER Serving Central California since 1887

RAW WATER PUMP STATION
PHASE 1 PROJECT

PAVING AND GRADING PLAN 1

JOB NUMBER 693–14–16–02
DRAWING NUMBER **C10**
SHEET NUMBER 9 OF 44
REVISION

N:\Clients\693 SRWA\14-16-02 Wet Well Design\CAD\Production\69314-1602-C10.dwg 10/17/2017 11:00 AM myoung

NOTES:

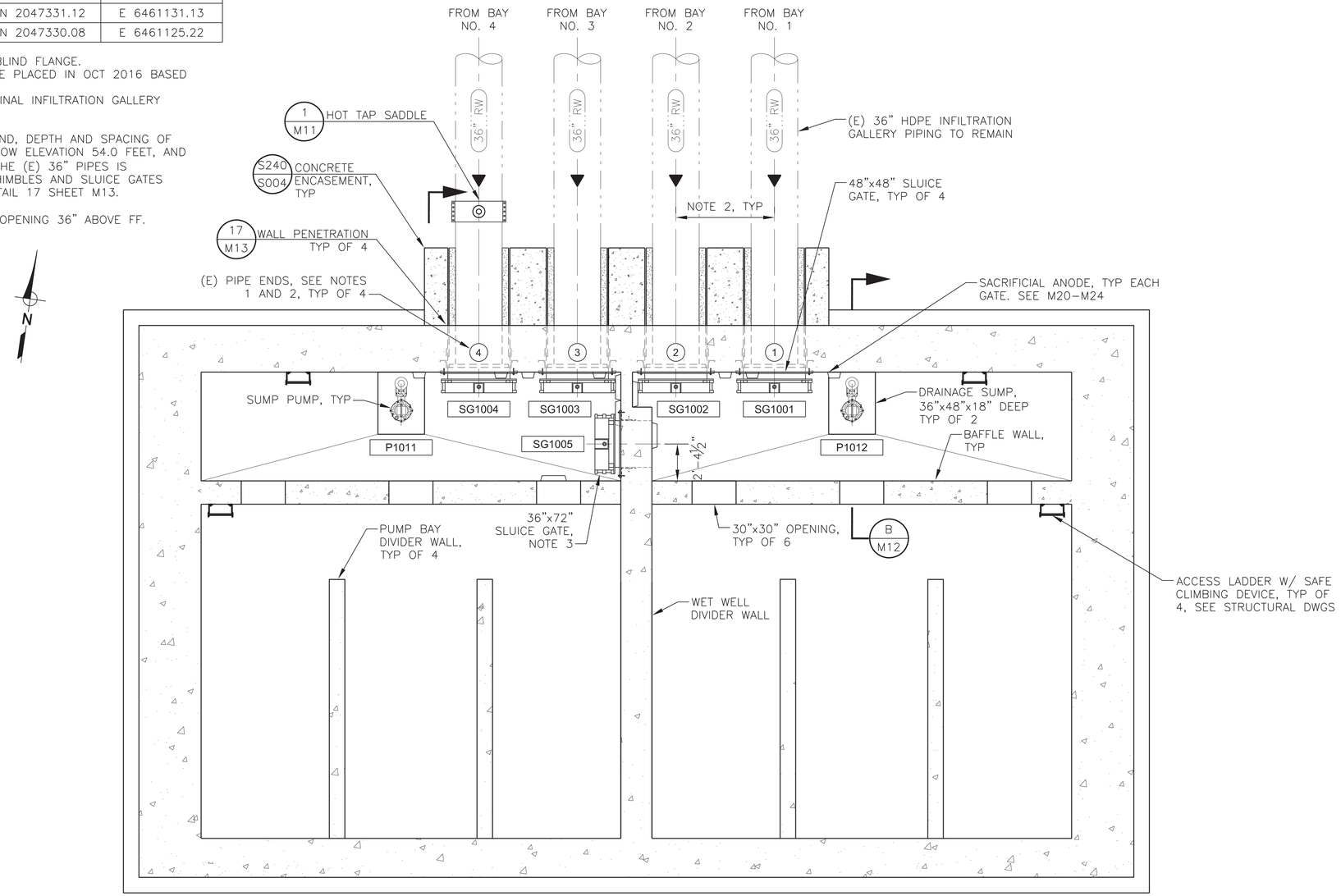
1. PIPING COORDINATES:

36" RW PIPING COORDINATES				
POINT (A)	SURVEYED (B)		AS-BUILTS (C)	
(1)	N 2047332.26	E 6461143.61	N 2047333.15	E 6461142.68
(2)	N 2047331.23	E 6461137.95	N 2047332.16	E 6461137.04
(3)	N 2047329.97	E 6461131.80	N 2047331.12	E 6461131.13
(4)	N 2047328.92	E 6461126.10	N 2047330.08	E 6461125.22

A. LOCATION OF PIPE CENTERLINE AT EXISTING BLIND FLANGE.
B. BASED ON SURVEYED STAKES WHICH WERE PLACED IN OCT 2016 BASED ON AS-BUILT DRAWINGS.
C. BASED ON AS-BUILT DRAWINGS FOR ORIGINAL INFILTRATION GALLERY CONSTRUCTION, DEC 2002, NAD83.

2. CONTRACTOR SHALL FIELD-VERIFY LOCATION, END, DEPTH AND SPACING OF ALL GALLERY PIPES PRIOR TO EXCAVATING BELOW ELEVATION 54.0 FEET, AND VERIFY THAT SPACING BETWEEN FLANGES ON THE (E) 36" PIPES IS SUFFICIENT FOR INSTALLATION OF THE WALL THIMBLES AND SLUICE GATES AND DEPTH MEETS CLEARANCE TO FF PER DETAIL 17 SHEET M13.

3. 36"x72" CLEAR OPENING. LOCATE BOTTOM OF OPENING 36" ABOVE FF.



WET WELL
BOTTOM PLAN @ ELEV: 47'
SCALE: 1"=4'

N:\Clients\693 SRWA\14-16-02 Wet Well Design\CAD\Production\69314-1602-M10-M12.dwg 10/17/2017 9:27 AM sbarber

REGISTERED PROFESSIONAL ENGINEER
YADASHI TRAPP
No. C66147
Exp. 6-30-18
CIVIL
STATE OF CALIFORNIA
10/17/17

THIS LINE IS 1 INCH
AT FULL SCALE
IF NOT SCALE ACCORDINGLY

SCALE : AS SHOWN
DRAWN BY : SMB
DESIGNED BY : TTT
PROJ. MGR. : AMS

No.	ZONE	REVISIONS	BY	DATE

WEST YOST ASSOCIATES
2020 Research Park Drive
Suite 100
Davis, California 95618
(530) 756-5905
FAX (530) 756-5991

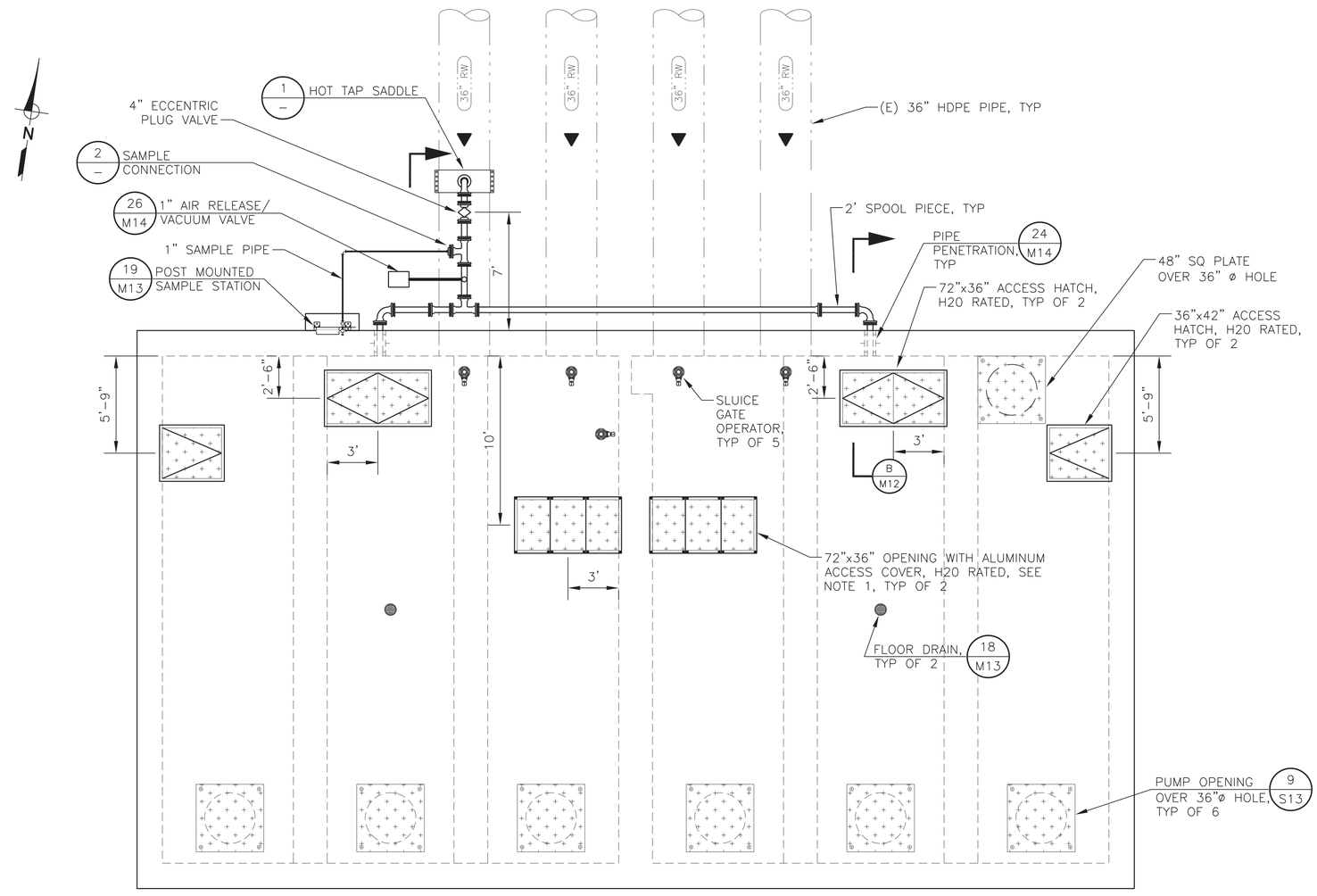
SRWA STANISLAUS REGIONAL WATER AUTHORITY

WATER & POWER
Serving Central California since 1887

RAW WATER PUMP STATION
PHASE 1 PROJECT

MECHANICAL BOTTOM PLAN

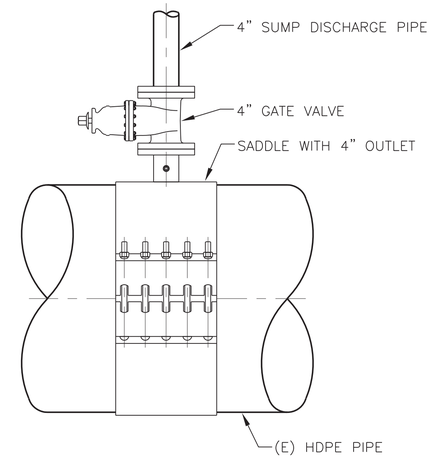
JOB NUMBER 693-14-16-02
DRAWING NUMBER **M10**
SHEET NUMBER 28 OF 44
REVISION



WET WELL
TOP PLAN
SCALE: 1"=4'

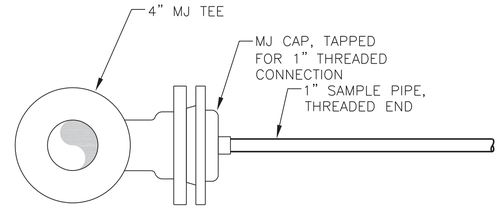
NOTES:

1. ACCESS COVER SHALL BE DRAG-OFF STYLE (IE NON-HINGED). SEE SPEC 05545.



NOTES:
1. TAPPING SLEEVE SHALL BE PER SECTION 15148.
2. COORDINATE GATE VALVE WITH SADDLE MANUFACTURER.
3. COAT WITH SYSTEM M-1 PER SECTION 09960 AND WRAP ENTIRE ASSEMBLY WITH PE PLASTIC.
4. SEE SECTION 02300 FOR BACKFILL REQUIREMENTS.

HOT TAP SADDLE
DETAIL 1/–
SCALE: 1"=1'-0"



SAMPLE CONNECTION
DETAIL 2/–
NOT TO SCALE

REGISTERED PROFESSIONAL ENGINEER
TYADASHI TAJIRI
No. C66147
Exp. 6-30-18
CIVIL
STATE OF CALIFORNIA
10/17/17

THIS LINE IS 1 INCH
AT FULL SCALE
IF NOT SCALE ACCORDINGLY

SCALE : AS SHOWN
DRAWN BY : SMB
DESIGNED BY : TTT
PROJ. MGR. : AMS

No.	ZONE	REVISIONS	BY	DATE

WEST YOST ASSOCIATES
2020 Research Park Drive
Suite 100
Davis, California 95618
(530) 756-5905
FAX (530) 756-5991

SRWA STANISLAUS REGIONAL WATER AUTHORITY
TID WATER & POWER Serving Central California since 1887

RAW WATER PUMP STATION
PHASE 1 PROJECT

MECHANICAL TOP PLAN

JOB NUMBER 693-14-16-02
DRAWING NUMBER **M11**
SHEET NUMBER 29 OF 44
REVISION

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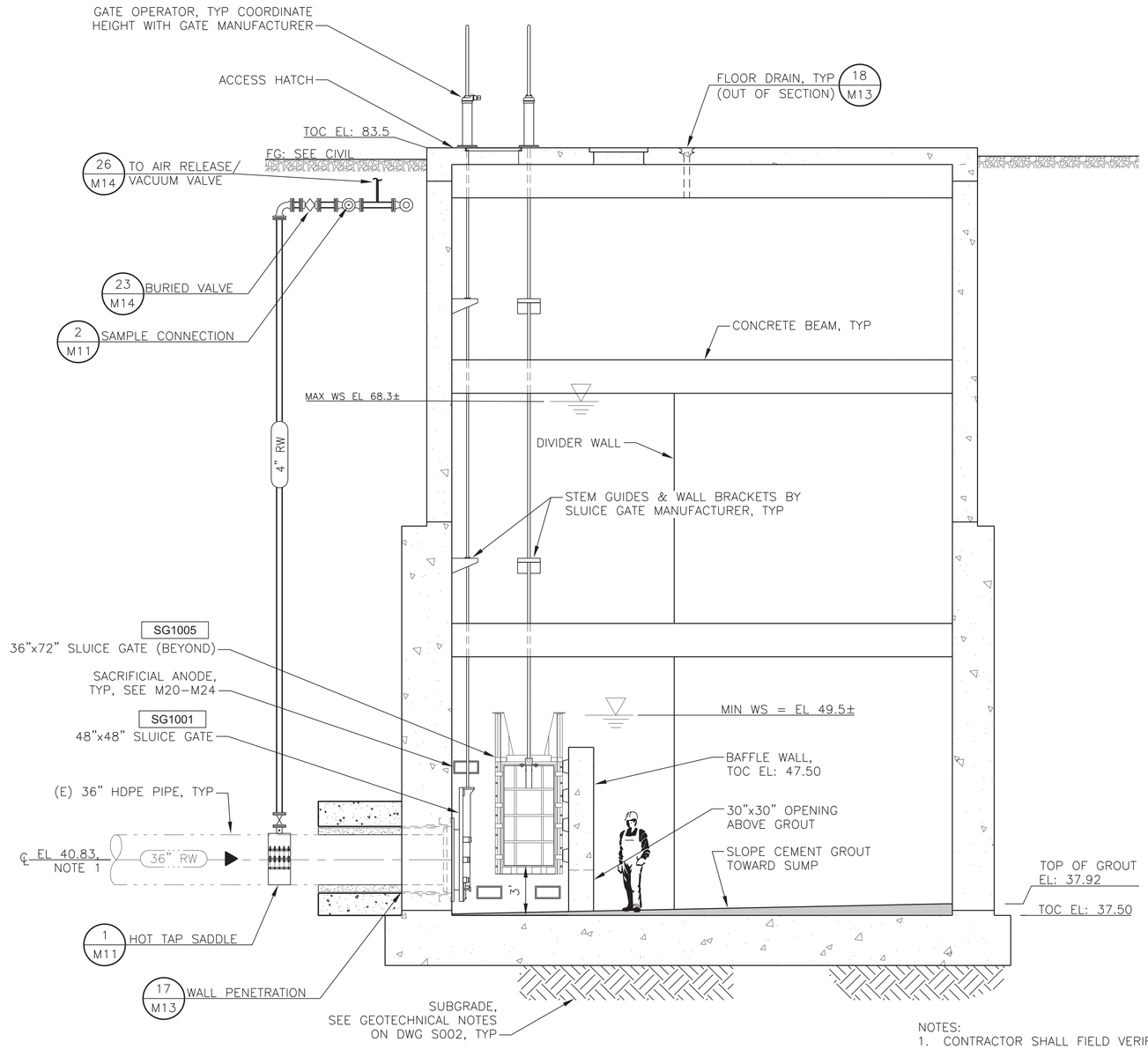
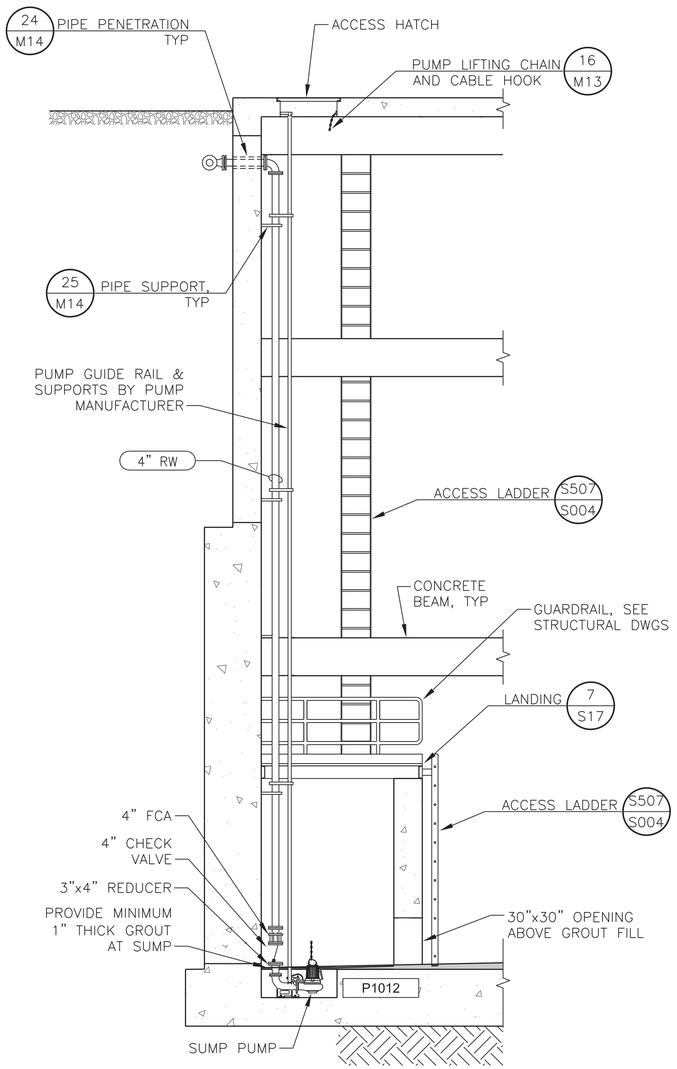


NOTES:
1. CONTRACTOR SHALL FIELD VERIFY (E) 36" PIPE ELEVATIONS.

WET WELL
SECTION A / M10
SCALE: 1"=4'



DRAINAGE SUMP
SECTION B / M10
SCALE: 1"=4'

REGISTERED PROFESSIONAL ENGINEER — TADASHI TAKAHASHI — No. C66147 Exp. 6-30-18 — CIVIL — STATE OF CALIFORNIA
10/17/17

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DESIGNED BY : TTT
PROJ. MGR. : AMS

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RAW WATER PUMP STATION
PHASE 1 PROJECT

MECHANICAL SECTIONS 1

JOB NUMBER 693-14-16-02
DRAWING NUMBER **M12**
SHEET NUMBER 30 OF 44
REVISION

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ATTACHMENT C

RWPS Preliminary Design Drawings

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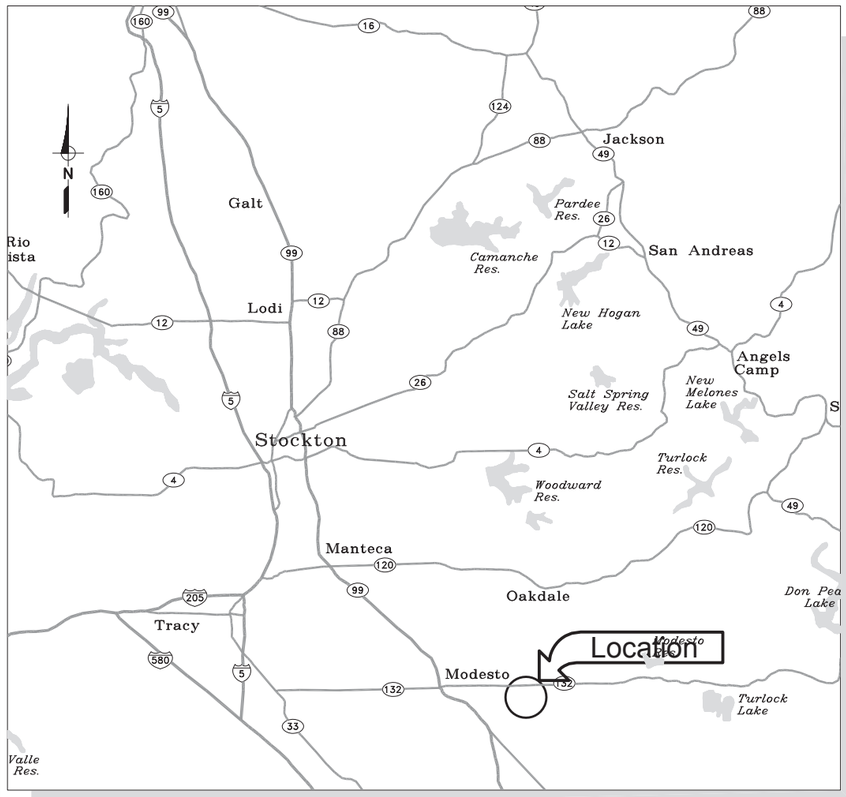
STANISLAUS REGIONAL
WATER AUTHORITY

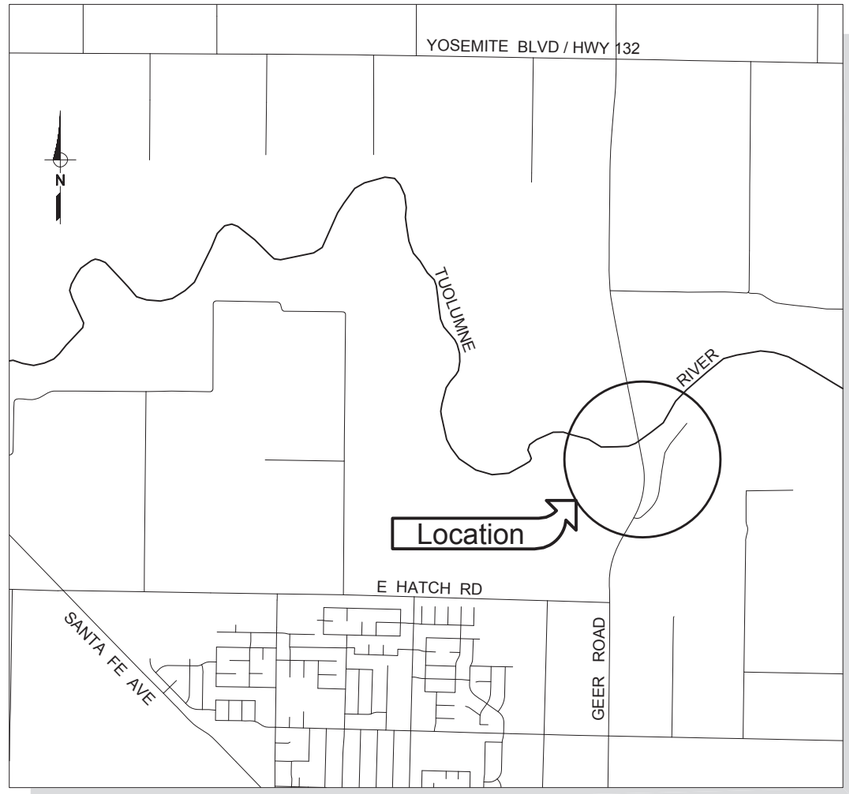
SURFACE WATER SUPPLY PROJECT

MAY 2018

PRELIMINARY DESIGN DRAWINGS FOR THE REFERENCE RAW WATER PUMP STATION



LOCATION MAP



VICINITY MAP

PRELIMINARY - NOT FOR CONSTRUCTION

XX/XX/XX

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DRAWN BY : TZN
DESIGNED BY : ---
PROJ. MGR. : GSN

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STANISLAUS REGIONAL
WATER AUTHORITY

SURFACE WATER SUPPLY PROJECT
RAW WATER PUMP STATION - PREDESIGN
TITLE SHEET, LOCATION MAP, AND VICINITY MAP

JOB NUMBER 693-20-16-01
DRAWING NUMBER **G01**
SHEET NUMBER 1 OF __
REVISION

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SHEET INDEX		
SHEET No.	DWG No.	DESCRIPTION
GENERAL		
1	G01	TITLE SHEET, LOCATION MAP, AND VICINITY MAP
2	G02	SHEET INDEX AND LEGENDS
CIVIL		
3	C10	SITE PLAN
4	C11	GRADING PLAN
MECHANICAL		
5	M10	PUMP STATION TOP PLAN
6	M11	PUMP STATION SECTIONS 1
7	M12	PUMP STATION SECTIONS 2
8	M13	WET WELL BOTTOM PLAN
ELECTRICAL		
9	E1	ELECTRICAL SYMBOLS & ABBREVIATIONS
10	E2	MMS-1 ONE LINE DIAGRAM
11	E3	MCC-1 ONE LINE DIAGRAM
INSTRUMENTATION		
12	I1	INSTRUMENTATION SYMBOLS & ABBREVIATIONS
13	I2	OVERALL P&ID
14	I3	INLET CHANNEL A P&ID
15	I4	INLET CHANNEL B P&ID
16	I5	TYPICAL RAW WATER PUMP P&ID
17	I6	RAW WATER FLOW METER P&ID
18	I7	FLOW SPLIT VAULT P&ID
19	I8	AIR COMPRESSOR & PRESSURE VESSELS P&ID
20	I9	AIR COMPRESSOR STATION P&ID
21	I10	AUXILIARY SYSTEM P&ID

ABBREVIATIONS

AB	AGGREGATE BASE
AC	ASPHALT CONCRETE
AFF	ABOVE FINISH FLOOR
AL, ALUM	ALUMINUM
APPROX	APPROXIMATE
ARV	AIR RELIEF VALVE
ASPH	ASPHALT
AWG	AMERICAN WIRE GAUGE
BC	BEGIN CURVE
BF	BLIND FLANGE
BV, BFV	BUTTERFLY VALVE
CB	CATCH BASIN
CL, ℄	CENTER LINE
CLR	CLEAR
CLSM	CONTROLLED LOW STRENGTH MATERIAL
CO	CLEAN OUT
CONC	CONCRETE
CMU	CONCRETE MASONRY UNIT
CV	CHECK VALVE
CY	CUBIC YARDS
DI	DRAIN INLET
DIA, ⌀	DIAMETER
DFT	DRY FILM THICKNESS
DFW	DEPARTMENT OF FISH AND WILDLIFE
DIP	DUCTILE IRON PIPE
DWG	DRAWING
EA	EACH
ECC	ECCENTRIC
EF	EACH FACE
EL	ELEVATION
ELEC	ELECTRIC
EP	EDGE OF PAVEMENT
EQUIP	EQUIPMENT
EW	EACH WAY
EX, E, (E)	EXISTING
EXP	EXPANSION
FCA	FLANGED COUPLING ADAPTER
FCO	FLOOR CLEANOUT
FD	FLOOR DRAIN
FF	FINISHED FLOOR
FH	FIRE HYDRANT
FL, ℄	FLOW LINE
FLG	FLANGE
FO	FIBER OPTIC
FOC	FACE OF CURB
FOT	FLAT ON TOP
FRP	FIBERGLASS REINFORCED PLASTIC
FT, '	FEET, FOOT
FUT, F, (F)	FUTURE
GA	GAUGE
GALV	GALVANIZED
GB	GRADE BREAK
GS	GROUND SURFACE
GSP	GROUND SURFACE PROFILE
GV	GATE VALVE
HC	HANDICAPPED
HP	HIGH POINT IN PVMT, HIGH PRESSURE
HPI	HORIZONTAL POINT OF INFLECTION
HMWPE	HIGH MOLECULAR WEIGHT POLYETHYLENE
HORZ	HORIZONTAL
IE	INVERT ELEVATION
IN, "	INCH
INV	INVERT
IRR	IRRIGATION
LAT	LATERAL
LF	LINEAL FEET
MFR	MANUFACTURER
MAX	MAXIMUM
MIN	MINIMUM
MH	MANHOLE
MJ	MECHANICAL JOINT
MON	MONUMENT, MONITORING
MOV	MOTOR OPERATED VALVE
N, (N)	NEW, NORTH
NIC	NOT IN CONTRACT
No., #	NUMBER
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OF	OVERFLOW
OH	OVERHEAD
PE	PLAIN END, POLYETHYLENE
PL, ℄	PLATE, PROPERTY LINE
PSV	PRESSURE RELIEF VALVE
PRV	PRESSURE REDUCING VALVE
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PG	PRESSURE GAUGE
PV	PLUG VALVE
PVC	POLYVINYL CHLORIDE
PVM'T	PAVEMENT
R	RADIUS
RCP	REINFORCED CONC PIPE
REQ'D	REQUIRED
REV	REVISION
RR	RAILROAD
R/W	RIGHT OF WAY
S	SEWER, SOUTH, SLOPE
SCH	SCHEDULE
SDMH	STORM DRAIN MANHOLE
SPD	SUMP PUMP DISCHARGE
SQ	SQUARE
SS	SANITARY SEWER, STAINLESS STEEL
SSB	STAINLESS STEEL BOLT
SSMH	SANITARY SEWER MANHOLE
SST	STAINLESS STEEL
STA	STATION
ST	STREET
STD	STANDARD
STL	STEEL
SVC	SERVICE
SW	SIDEWALK
T	TELEPHONE
T&B	TOP & BOTTOM
TOC	TOP OF CONCRETE
TOS	TOP OF STEEL OR TOP OF STRUCTURAL FRAME
TOW	TOP OF WALL
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
UG	UNDERGROUND
UPRR	UNION PACIFIC RAILROAD
VAR	VARIOUS
VTR	VENT THROUGH ROOF
W	WEST
W/	WITH
W/O	WITH OUT
WL	WATER LEVEL
WS	WATER SURFACE
WSE	WATER SURFACE ELEVATION
WWF	WELDED WIRE FABRIC
WV	WATER VALVE

LEGEND

- (E) FACILITY
- (N) FACILITY
- (F) FACILITY
- (N) SLOPE
- (N) SWALE
- 202 (E) GRADE CONTOURS
- PROPERTY LINE
- CENTER LINE
- × 34.8 (E) SPOT ELEVATION
- ×202.5 (N) SPOT ELEVATION
- (E) OVERHEAD ELECTRICAL
- (E) PIPELINE
- (N) PIPELINE
- (N) PIPELINE UNDER CONCRETE
- (F) PIPELINE
- (E) ELECTRICAL
- E (N) ELECTRICAL
- T(UG) (E) UNDERGROUND TELEPHONE
- (N) DOUBLE LINE PIPE
- DEMOLISH OR REMOVE (E) PIPE
- DEMOLISH (E) STRUCTURE
- X X (E) FENCE
- X X (N) FENCE
- (N) ASPHALT CONCRETE
- (N) CONCRETE SLAB
- AC PAVING SECTION
- CONCRETE SECTION
- AGGREGATE BASE /CRUSHED ROCK
- COMPACTED SOIL
- UNDISTURBED SOIL
- (N) PERMANENT BOLLARD
- (N) REMOVABLE BOLLARD
- (E) VALVE BOX
- BLOWOFF (BO)
- AIR RELEASE VALVE (ARV)
- SURVEY MONUMENT
- ANODE TEST STATION

LEGEND: PIPING

DOUBLE LINE	SINGLE LINE	DOUBLE LINE	SINGLE LINE	DOUBLE LINE
FLANGED JOINT	FLANGED COUPLING ADAPTER		ELBOW UP	
PLAIN OR GROOVED END MECHANICAL COUPLING	RESTRAINED FLANGED COUPLING ADAPTER		ELBOW DOWN	
PUSH ON, MECHANICAL JOINT	UNION		TEE UP	
WELDED JOINT	ELASTOMER & FABRIC EXPANSION JOINT		TEE DOWN	
SLEEVE TYPE MECHANICAL COUPLING	EXPANSION JOINT (SEE SPECS FOR TYPE)		LATERAL UP	
RESTRAINED SLEEVE TYPE MECHANICAL COUPLING	FLEXIBLE METAL HOSE		LATERAL DOWN	
			REDUCER	

- THREE WAY VALVE
- GATE VALVE (NORMALLY OPEN)
- GATE VALVE (NORMALLY CLOSED)
- PLUG VALVE (NORMALLY OPEN)
- PLUG VALVE (NORMALLY CLOSED)
- BALL VALVE (NORMALLY OPEN)
- BALL VALVE (NORMALLY CLOSED)
- BUTTERFLY VALVE
- GLOBE VALVE
- DIAPHRAGM VALVE
- ANGLE VALVE
- PINCH VALVE
- NEEDLE VALVE
- DOUBLE LEAF CHECK VALVE
- CHECK VALVE
- BALL CHECK VALVE
- KNIFE GATE VALVE
- FLAP GATE
- HOSE VALVE
- PRESSURE & VACUUM RELIEF VALVE
- VACUUM RELIEF VALVE
- PRESSURE RELIEF VALVE
- STRAINER
- IN-LINE, SPRING LOADED RELIEF VALVE
- PRESSURE REGULATING VALVE
- BACK PRESSURE REGULATING VALVE
- SOLENOID VALVE
- DIAPHRAGM OPERATED VALVE
- MOTOR OPERATED VALVE
- PISTON OPERATED VALVE
- MUD VALVE
- FIRE HYDRANT
- UTILITY STATION
- BACK FLOW PREVENTER

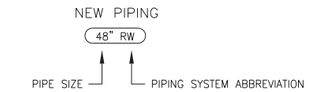
SECTION & DETAIL DESIGNATIONS

SECTION CUT ON DWG M21

ON DWG M23 THIS SECTION IS IDENTIFIED AS:

DETAILS ARE CROSS REFERENCED IN A SIMILAR MANNER, EXCEPT THAT DETAILS ARE IDENTIFIED BY NUMBER (OR NUMBER AND LETTER) RATHER THAN LETTER

PIPING DESIGNATIONS



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DESIGNED BY : TTT
PROJ. MGR. : GSN

XX/XX/XX

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2020 Research Park Drive
Suite 100
Davis, California 95618
(530) 756-5905
FAX (530) 756-5991

SRWA STANISLAUS REGIONAL WATER AUTHORITY

SURFACE WATER SUPPLY PROJECT
RAW WATER PUMP STATION - PREDESIGN

SHEET INDEX AND LEGENDS

JOB NUMBER 693-20-16-01
DRAWING NUMBER **G02**
SHEET NUMBER 2 OF __
REVISION

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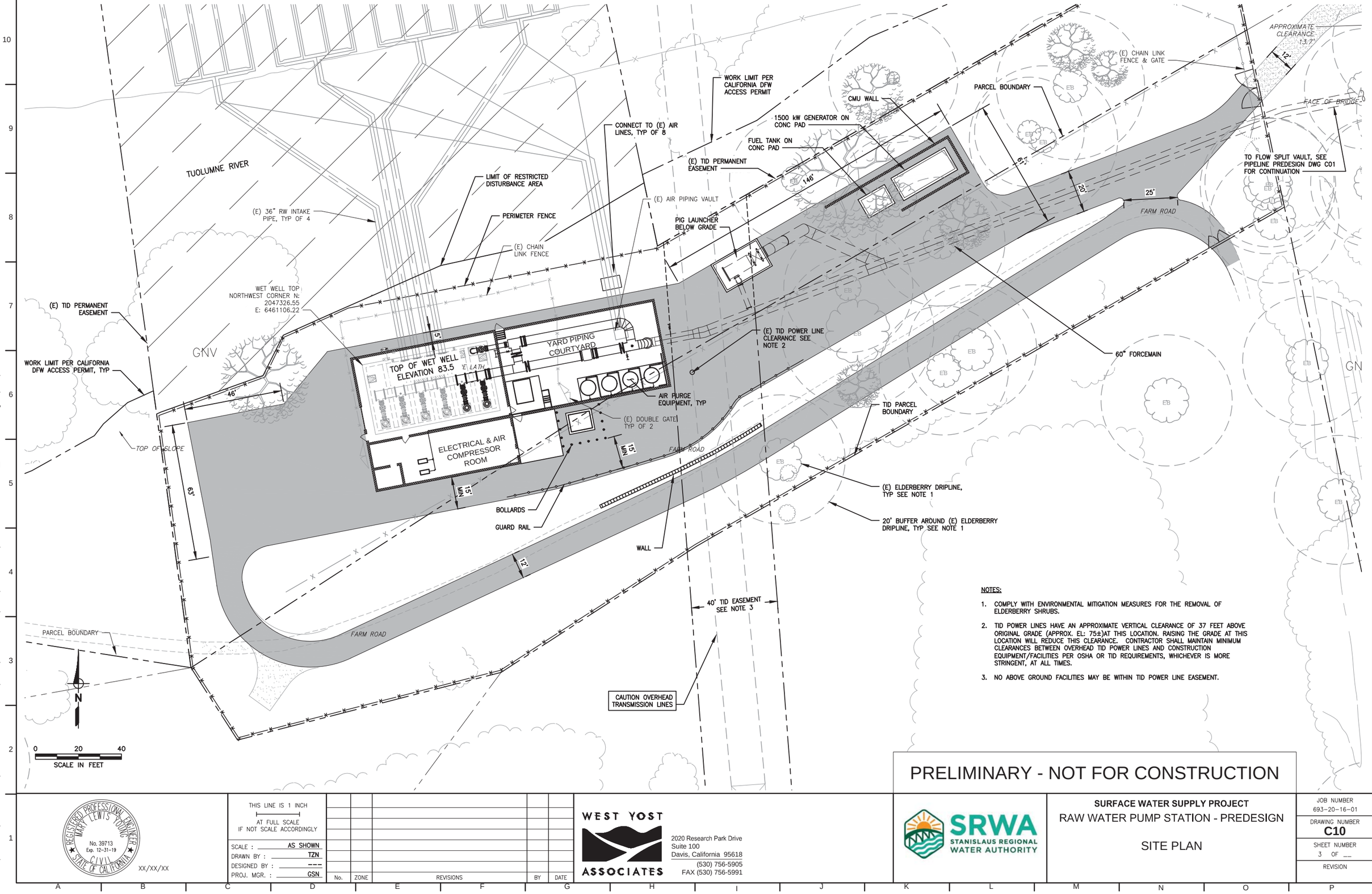

NOTES:

1. COMPLY WITH ENVIRONMENTAL MITIGATION MEASURES FOR THE REMOVAL OF ELDERBERRY SHRUBS.
2. TID POWER LINES HAVE AN APPROXIMATE VERTICAL CLEARANCE OF 37 FEET ABOVE ORIGINAL GRADE (APPROX. EL: 75±)AT THIS LOCATION. RAISING THE GRADE AT THIS LOCATION WILL REDUCE THIS CLEARANCE. CONTRACTOR SHALL MAINTAIN MINIMUM CLEARANCES BETWEEN OVERHEAD TID POWER LINES AND CONSTRUCTION EQUIPMENT/FACILITIES PER OSHA OR TID REQUIREMENTS, WHICHEVER IS MORE STRINGENT, AT ALL TIMES.
3. NO ABOVE GROUND FACILITIES MAY BE WITHIN TID POWER LINE EASEMENT.

PRELIMINARY - NOT FOR CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER
MARY LEWIS YOUNG
No. 39713
Exp. 12-31-19
CIVIL
STATE OF CALIFORNIA
XX/XX/XX

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DESIGNED BY : ---
PROJ. MGR. : GSN

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SURFACE WATER SUPPLY PROJECT

RAW WATER PUMP STATION - PREDESIGN

SITE PLAN

JOB NUMBER	693-20-16-01
DRAWING NUMBER	C10
SHEET NUMBER	3 OF __
REVISION	

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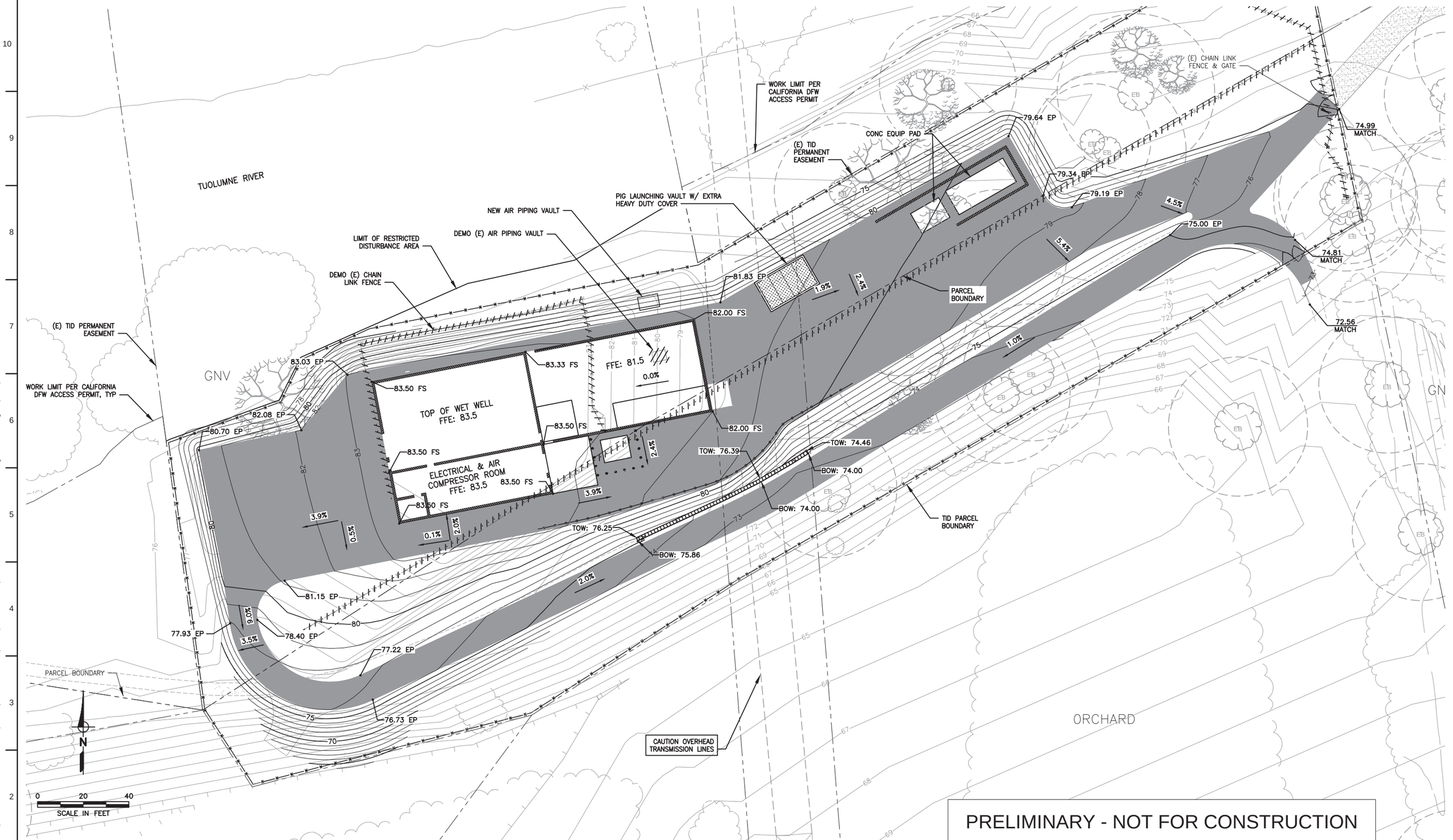

PRELIMINARY - NOT FOR CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER
MARY LEWIS TOMC
No. 39713
Exp. 12-31-19
CIVIL
STATE OF CALIFORNIA
XX/XX/XX

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SCALE : AS SHOWN
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DESIGNED BY : ---
PROJ. MGR. : GSN

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SURFACE WATER SUPPLY PROJECT

RAW WATER PUMP STATION - PREDESIGN

GRADING PLAN

JOB NUMBER 693-20-16-01
DRAWING NUMBER **C11**
SHEET NUMBER 4 OF __
REVISION

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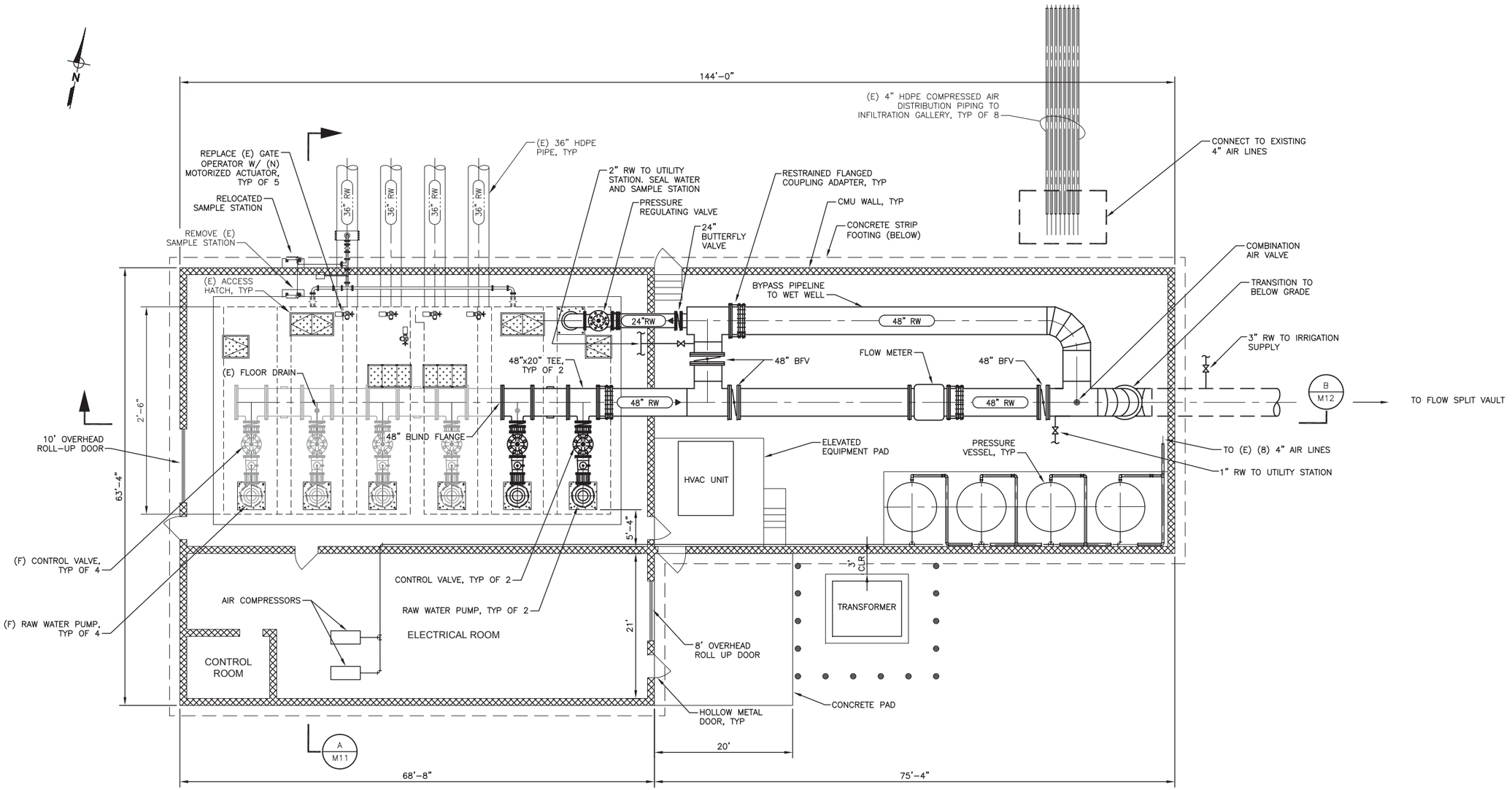

PUMP STATION
TOP PLAN
SCALE: 1"=8'

PRELIMINARY - NOT FOR CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER
TY YADASHI TADANO
No. C66147
Exp. 6-30-20
CIVIL
STATE OF CALIFORNIA
XX/XX/XX

THIS LINE IS 1 INCH
AT FULL SCALE
IF NOT SCALE ACCORDINGLY

SCALE : AS SHOWN
DRAWN BY : TZN
DESIGNED BY : TTT
PROJ. MGR. : GSN

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SRWA STANISLAUS REGIONAL WATER AUTHORITY

SURFACE WATER SUPPLY PROJECT
RAW WATER PUMP STATION - PREDESIGN

PUMP STATION TOP PLAN

JOB NUMBER	693-20-16-01
DRAWING NUMBER	M10
SHEET NUMBER	5 OF __
REVISION	

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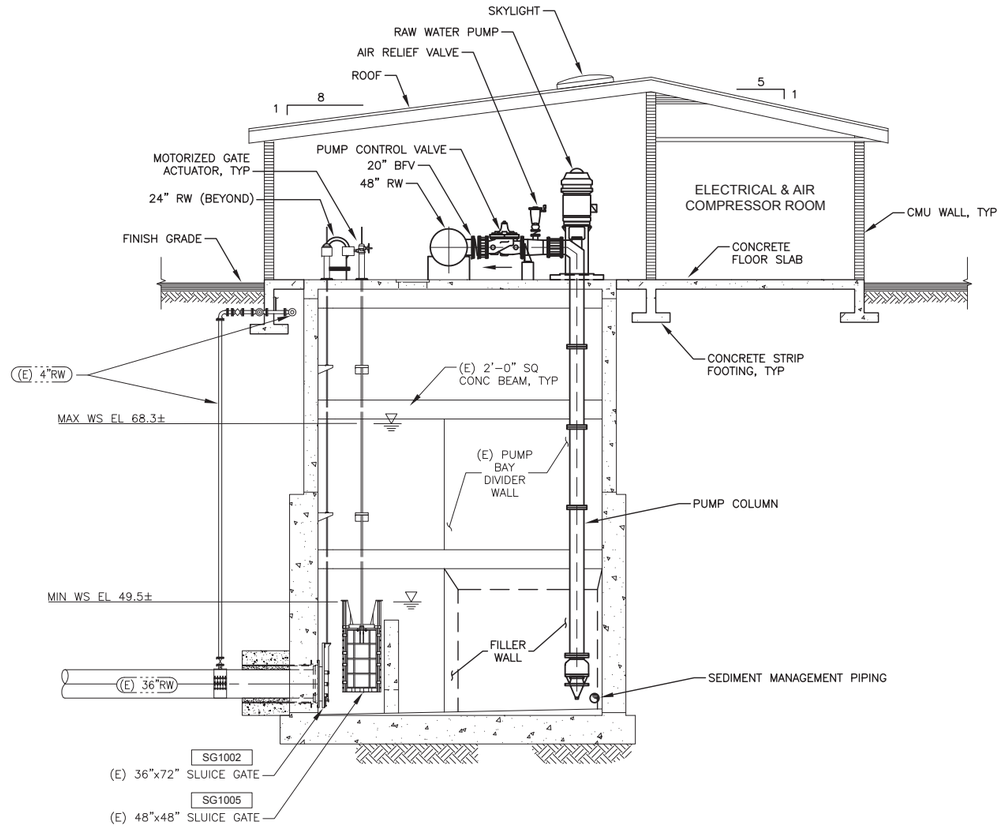

PUMP STATION

SECTION A

SCALE: 1"=8'

PRELIMINARY - NOT FOR CONSTRUCTION

XX/XX/XX

THIS LINE IS 1 INCH
AT FULL SCALE
IF NOT SCALE ACCORDINGLY

SCALE : AS SHOWN
DRAWN BY : TZN
DESIGNED BY : TTT
PROJ. MGR. : GSN

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(530) 756-5905
FAX (530) 756-5991

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SURFACE WATER SUPPLY PROJECT

RAW WATER PUMP STATION - PREDESIGN

PUMP STATION SECTIONS 1

JOB NUMBER 693-20-16-01
DRAWING NUMBER M11
SHEET NUMBER 6 OF __
REVISION

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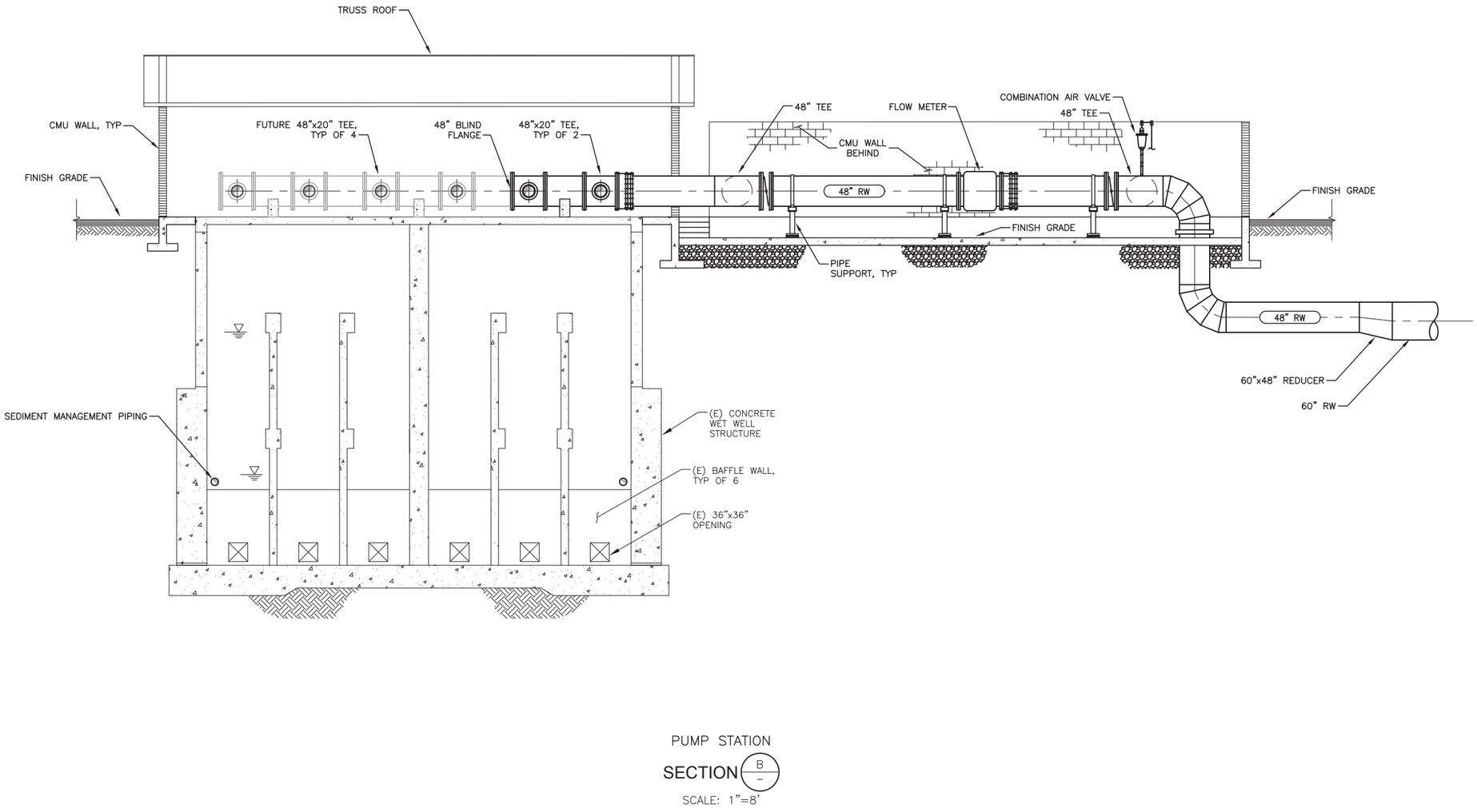

PUMP STATION

SECTION B/–

SCALE: 1"=8'

PRELIMINARY - NOT FOR CONSTRUCTION

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XX/XX/XX

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IF NOT SCALE ACCORDINGLY

SCALE : AS SHOWN
DRAWN BY : TZN
DESIGNED BY : TTT
PROJ. MGR. : GSN

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FAX (530) 756-5991

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SURFACE WATER SUPPLY PROJECT

RAW WATER PUMP STATION - PREDESIGN

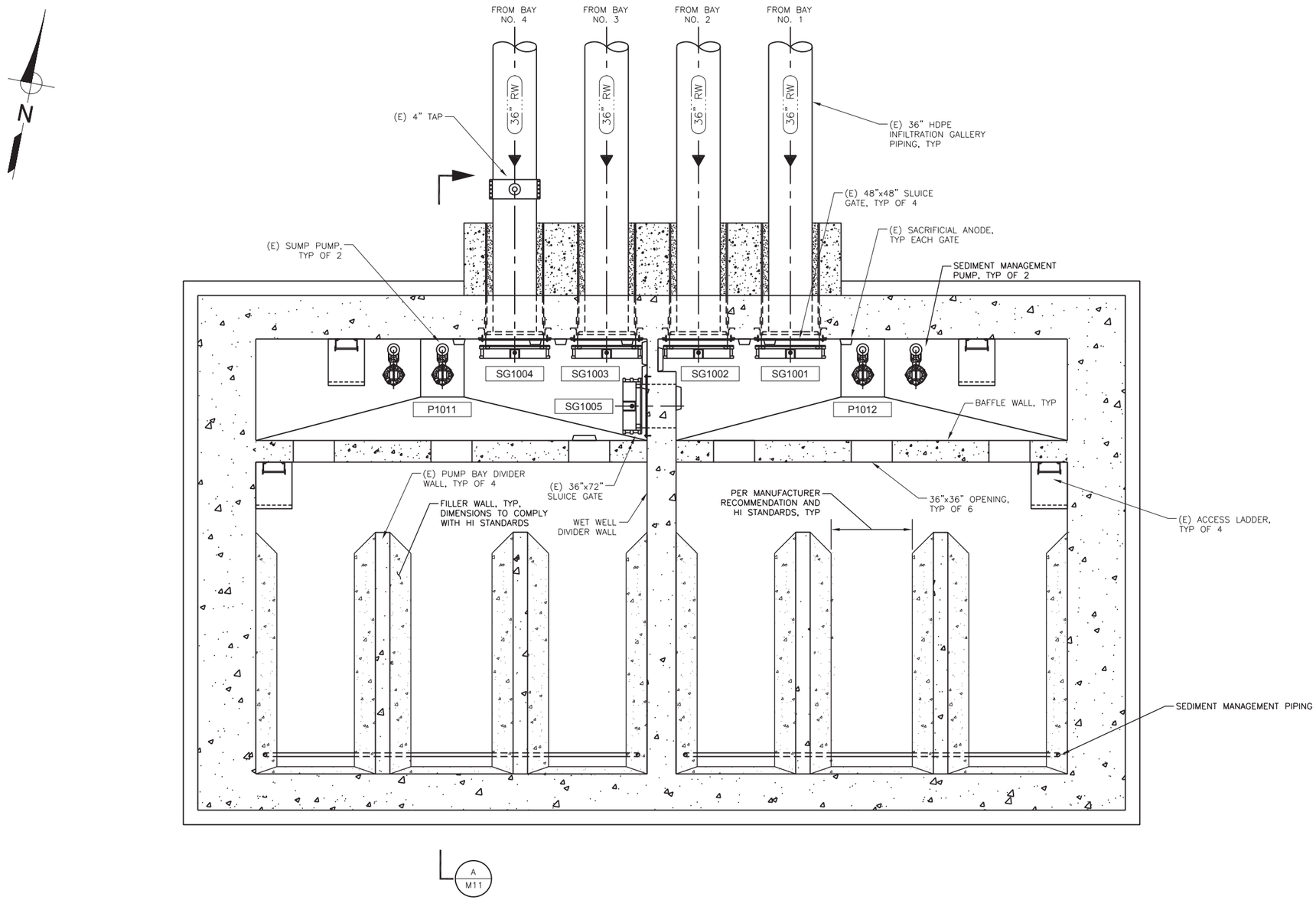
PUMP STATION SECTIONS 2

JOB NUMBER 693-20-16-01

DRAWING NUMBER M12

SHEET NUMBER 7 OF __

REVISION



PUPM STATION

BOTTOM PLAN

SCALE: 1"=4'

PRELIMINARY - NOT FOR CONSTRUCTION

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SCALE : AS SHOWN
DRAWN BY : TZN
DESIGNED BY : TTT
PROJ. MGR. : GSN

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SRWA STANISLAUS REGIONAL WATER AUTHORITY

SURFACE WATER SUPPLY PROJECT

RAW WATER PUMP STATION - PREDESIGN

WET WELL BOTTOM PLAN

JOB NUMBER 693-20-16-01
DRAWING NUMBER M13
SHEET NUMBER 8 OF __
REVISION

MISCELLANEOUS ELECTRICAL & INSTRUMENTATION ABBREVIATIONS

&	AND	MUX	MULTIPLEXER
@	AT	MV	MEDIUM VOLTAGE
A	AMBER, AMPERES	N	NEUTRAL
AC	ALTERNATING CURRENT	NC	NORMALLY CLOSED
AFF	ABOVE FINISHED FLOOR	NIC	NOT IN CONTRACT
AI	ANALOG INPUT	NL	NIGHT LIGHT
AIC	AMP INTERRUPTING CAPACITY SYMMETRICAL	NO	NORMALLY OPEN
ALT	ALTERNATOR	NP	NAMEPLATE
AM	AMMETER	NTS	NOT TO SCALE
AO	ANALOG OUTPUT	(N)	NEW
AWG	AMERICAN WIRE GAUGE	OC	ON CENTER
B	BLUE	OL	OVERLOAD
BC	BARE COPPER	ORP	OXIDATION REDUCTION POTENTIAL
BFC	BELOW FINISHED CEILING	P	PHASE, POLE
BOD	BIOCHEMICAL OXYGEN DEMAND	PB	PUSHBUTTON
C	CONDUIT	PBX	PULL BOX
CAP	CAPACITOR	PC	PERSONAL COMPUTER
CB	CIRCUIT BREAKER	PE	PHOTOCELL
CKT	CIRCUIT	PF	POWER FAIL
COAX	COAXIAL CABLE	PFR	POWER (PHASE) FAIL RELAY
COMM	COMMUNICATION PORT	PH	HYDROGEN ION CONCENTRATION
CPT	CONTROL POWER TRANSFORMER	PI	PULSE INPUT
CR	CONTROL RELAY	PLC	PROGRAMMABLE LOGIC CONTROLLER
CT	CURRENT TRANSFORMER	PMP	PUMP
CTQ	CONSTANT TORQUE	PNL	PANEL
CTR	CYCLE COUNTER	POT	POTENTIOMETER
CU	COPPER	PR	PAIR, TWISTED & SHIELDED CABLE
DC	DIRECT CURRENT	PRESS	PRESSURE
DET	DETAIL	PRI	PRIMARY
DI	DIGITAL INPUT	PROVIDE	FURNISH, INSTALL & CONNECT
DIAG	DIAGRAM	PRR	POWER RELAY
DISC	DISCONNECT	PS	PRESSURE SWITCH
DO	DIGITAL OUTPUT	PT	POTENTIAL TRANSFORMER
DPDT	DOUBLE POLE DOUBLE THROW	PTT	PUSH TO TEST
DWG	DRAWING	PV	PROCESS VARIABLE
ELEV	ELEVATION	PVC	POLY VINYL CHLORIDE
EMT	ELECTRICAL METALLIC TUBING	PWM	PULSE WIDTH MODULATION
ETM	ELAPSED TIME METER	PWR	POWER
(E)	EXISTING	R	RED
F	FRAME	RCT	REPEAT CYCLE TIMER
FC	FAIL CLOSED	REF	REFERENCE
FCS	FIELD CONTROL STATION	RIO	REMOTE I/O
FLA	FULL LOAD AMPS	RMS	ROOT MEAN SQUARED
FLP	FAIL LAST POSITION	RT	RESET TIMER
FO	FAIL OPEN	RTD	RESISTANCE TEMPERATURE DETECTOR
FLR	FLASHER RELAY	RTM	RUN TIME METER
FLUOR	FLUORESCENT	RTU	REMOTE TELEMETRY UNIT
FLEX	FLEXIBLE, METAL LIQUID TIGHT CONDUIT	RVNR	REDUCED VOLTAGE NON-REVERSING
FS	FLOW SWITCH OR FULL SPEED	(R)	REWIRE, RELOCATE, REVISE, REUSE
FV, FVNR	FULL VOLTAGE NON-REVERSING	S	SWITCH
FVR	FULL VOLTAGE REVERSING	SCH	SCHEDULE
FWD	FORWARD	SEC	SECONDARY
(F)	FUTURE	SECS	SECONDS
G	GREEN	SEL	SELECTOR
GALV	GALVANIZED	SFA	SERVICE FACTOR AMPS
GFI	GROUND FAULT CIRCUIT INTERRUPTER	SP	SET POINT
GND	GROUND	SPEC	SPECIFICATION
GRS	GALVANIZED RIGID STEEL CONDUIT	SR	SENSING RELAY
GRS-PVC	PVC COATED GRS CONDUIT	SS	STAINLESS STEEL
HI	HIGH	SSS	SOLID STATE SOFT STARTER
HID	HIGH INTENSITY DISCHARGE	STT	START
HIM	HUMAN INTERFACE MODULE	STP	STOP
HOA	HAND-OFF-AUTO	SV	SOLENOID VALVE
HP	HORSEPOWER	SW	SWITCH
HPS	HIGH PRESSURE SODIUM	SWBD	SWITCHBOARD
HS	HAND SWITCH	SYMM	SYMMETRICAL
HTR	HEATER	T	TRIP
HZ	HERTZ (CYCLES PER SECOND)	TB	TERMINAL BLOCK
HZD	HAZARDOUS AREA, EXPLOSION PROOF	TC	TIME CLOCK
I	INTERLOCK	TDOD	TIME DELAY ON DE-ENERGIZATION
I/O	INPUT/OUTPUT	TDOE	TIME DELAY ON ENERGIZATION
ICR	INSTRUMENTATION CONTROL RELAY	TEL	TELEMETRY
INCAN	INCANDESCENT	TELCO	TELEPHONE COMPANY
INST	INSTANTANEOUS	TM	THERMAL MAGNETIC
ISC	SHORT CKT INTERRUPTING CURRENT (SYMM)	TEMP	TEMPERATURE
ISR	INTRINSICALLY SAFE RELAY	TOC	TOTAL ORGANIC CARBON
J	JUNCTION BOX	TR	TIME DELAY RELAY
K	KILO, PREFIX	TRIAD	TWISTED & SHIELDED 3 CONDUCTOR
LA	LIGHTNING ARRESTOR	TS	TEMPERATURE SWITCH
LC	LIGHTING CONTACTOR	TSPR	TWISTED & SHIELDED PAIR
LEL	LOWER EXPLOSIVE LIMIT	TYP	TYPICAL
LO	LOW	UG	UNDERGROUND
LOS	LOCK-OUT STOP SWITCH	UON	UNLESS OTHERWISE NOTED
LPU	LINE PROTECTION UNIT	V	VOLTAGE
LR	LATCHING RELAY	VA	VOLT AMPS
LS	LEVEL SWITCH	VAR	VOLT AMP REACTIVE
M	MOTOR CONTACTOR	VFD	VARIABLE FREQUENCY DRIVE
MAX	MAXIMUM	VLV	VALVE
MCC	MOTOR CONTROL CENTER	VM	VOLTMETER
MCM	THOUSAND CIRCULAR MILS	VTQ	VARIABLE TORQUE
MCP	MOTOR CIRCUIT PROTECTOR	W	WHITE, WATTS
MD	MOISTURE DETECTION	WHM	WATT-HOUR METER
MH	MANHOLE	WM	WATTMETER
MHD	METAL HALIDE	WP	WATERPROOF, WEATHER PROOF
MIN	MINIMUM	WS	TORQUE SWITCH
MINS	MINUTES	XFMR	TRANSFORMER
MODEM	MODULATOR/DEMODULATOR	XS	MISCELLANEOUS SWITCH
MOV	MOTOR OPERATED VALVE	Y	YELLOW
MPS	MOTOR PROTECTION SYSTEM	Z	IMPEDANCE
MTR	MOTOR	ZS	LIMIT SWITCH

SWITCHES – PROCESS

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

SWITCHES – OPERATOR

SYMBOL	DESCRIPTION
SW	TOGGLE OR DISCONNECT SWITCH
PB	PUSHBUTTON – NORMALLY OPEN, MOMENTARY ACTION
PB	PUSHBUTTON – NORMALLY CLOSED, MOMENTARY ACTION
PB	PUSHBUTTON, MECHANICALLY INTERLOCKED, DOUBLE CIRCUIT – NORMALLY CLOSED AND NORMALLY OPEN, MAINTAINED ACTION
H O A	SELECTOR SWITCH, 3 POSITION – CONTACT STATUS SHOWN EXISTS AT POSITION OF H-HAND, O-OFF, OR A-AUTO
2-1 1-2	SELECTOR SWITCH, 2 POSITION – CONTACT STATUS SHOWN EXISTS AT POSITION AS SHOWN

DEVICES – RELAY

SYMBOL	DESCRIPTION
CR 1 / 28, 111	CONTROL RELAY CR1 WITH NORMALLY OPEN CONTACT ON LINE 28 & NORMALLY CLOSED CONTACT ON LINE 111
TR 2	TIME DELAY RELAY TR2 – ADJUSTABLE TIME DELAY RANGE & SETTING AS SHOWN
TDOE / TDOD	TIME DELAY ON ENERGIZATION / TIME DELAY ON DE-ENERGIZATION
M 1	CONTACTOR OR STARTER M1
SV	SOLENOID
CR1 (105)	NORMALLY OPEN, RELAY CONTACT – ACTUATED BY RELAY CR1 COIL LOCATED ON LINE 105
CR1	NORMALLY CLOSED, RELAY CONTACT – ACTUATED BY RELAY CR1
TR2	NORMALLY OPEN, TIME DELAY RELAY CONTACT – CONTACT CLOSES AFTER TR2 IS ENERGIZED
TR2	NORMALLY CLOSED, TIME DELAY RELAY CONTACT – CONTACT OPENS AFTER TR2 IS ENERGIZED
TR2	NORMALLY OPEN, TIME DELAY RELAY CONTACT – CONTACT OPENS AFTER TR2 IS DE-ENERGIZED
TR2	NORMALLY CLOSED, TIME DELAY RELAY CONTACT – CONTACT CLOSES AFTER TR2 IS DE-ENERGIZED
TR2	CONTACT OPENS AND CLOSES IN A TIMED REPEAT CYCLE

DEVICES – FRONT PANEL

SYMBOL	DESCRIPTION
X	INDICATING LIGHT, LETTER "X" INDICATES COLOR: R=RED G=GREEN, A=AMBER, W=WHITE Y=YELLOW, B=BLUE
PTT X	INDICATING LIGHT, PUSH TO TEST
AMC	AMP METER
VMC	VOLT METER
ETM	ELAPSED TIME METER
RTM	RUN TIME METER
XS	MULTI-POSITION SWITCH WHERE LETTER "X" IS FUNCTION: A=AMP, V=VOLT

COMPONENTS

SYMBOL	DESCRIPTION
RES	RESISTOR
	POTENTIOMETER
	CAPACITOR, FIXED
	CAPACITOR, ADJUSTABLE
	DIODE
	DIODE, ZENER
	VARISTOR TRANSIENT VOLTAGE SUPPRESSOR
	VOLTAGE SURGE SUPPRESSOR, AC
	LIGHT EMITTING DIODE
	TRANSISTOR
	RESISTANCE TEMPERATURE DETECTOR (RTD)
	THERMOCOUPLE (T/C)
	THERMISTOR

DEVICES – MISCELLANEOUS

SYMBOL	DESCRIPTION
	AUDIBLE ALARM
TG	TACHOMETER GENERATOR
+ -	BATTERY
HTR	HEATER
	3 PHASE HEATER
# HP	3 PHASE MOTOR # = MOTOR HP
# HP	SINGLE PHASE MOTOR
	TRANSFORMER

DEVICES – PROTECTIVE

SYMBOL	DESCRIPTION
	DISCONNECT, 3 POLE
	CIRCUIT BREAKER, 3 POLE THERMAL MAGNETIC (TM) OR MOTOR CIRCUIT PROTECT (MCP)
OL	THERMAL OVERLOAD CONTACT
	THERMAL OVERLOAD ELEMENT
	FUSE WITH BLOWN FUSE INDICATING LIGHT
	FUSE

WIRING – CONNECTIONS

SYMBOL	DESCRIPTION
	PANEL OR EQUIPMENT WIRING
	FIELD WIRING
	CONDUCTORS – NOT CONNECTED
	CONDUCTORS – CONNECTED
	GROUND
	CHASSIS OR FRAME GROUND
	PLUG AND RECEPTACLE
	INCOMING LINE
	TERMINAL BLOCKS
	TERMINALS
SHIELD CONDUCTOR	SHIELDED CABLE

PLAN – SYMBOLS

SYMBOL	DESCRIPTION
	CONDUIT, EXPOSED
	CONDUIT, IN SLAB OR BELOW GRADE
	CONDUIT STUBBED OUT & CAPPED
	CONDUIT BENDS TOWARD OBSERVER
	CONDUIT BENDS AWAY FROM OBSERVER
	CONDUIT ENDS
	CONDUIT CHANGE IN ELEVATION
G	BARE COPPER GROUND WIRE
	GROUND CONNECTION BOLTED TYPE
	GROUND CONNECTION EXOTHERMIC WELD TYPE
	DISCONNECT SWITCH
	FIELD CONTROL STATION WITH JUNCTION BOX
#A	FIELD CONTROL STATION WITH #AMP DISCONNECT SWITCH
	FIELD MOUNTED DEVICE
	SPECIAL RECEPTACLE
J	JUNCTION BOX
T	THERMOSTAT
# A a	LIGHTING, FANS, HEATERS # – CIRCUIT BREAKER NUMBER A – FIXTURE SCHEDULE REF. a – CONTROL SWITCH REFERENCE
#	DUPLEX RECEPTACLE # – CIRCUIT BREAKER NUMBER
# $ 2 a	TOGGLE SWITCH # – CIRCUIT BREAKER NUMBER SUBSCRIPT – CIRCUIT CONTROLLED SUPERSCRIPT – BLANK = 1 POLE 2 = 2 POLE 3 = 3 WAY
#	CONDUIT #

T.E.E.M.
(916) 457-8144

REGISTERED PROFESSIONAL ENGINEER
SHARON M. KIMZEWA
NO. 15698
Exp.6-30-2018
ELECTRICAL
STATE OF CALIFORNIA
XX/XX/XX

THIS LINE IS 1 INCH
AT FULL SCALE
IF NOT SCALE ACCORDINGLY

SCALE : AS SHOWN
DRAWN BY : ZKV
DESIGNED BY : XML
PROJ. MGR. : SMK

No.	ZONE	REVISIONS	BY	DATE

WEST YOST ASSOCIATES
2020 Research Park Drive
Suite 100
Davis, California 95618
(530) 756-5905
FAX (530) 756-5991

PRELIMINARY - NOT FOR CONSTRUCTION

SRWA
STANISLAUS REGIONAL WATER AUTHORITY

SURFACE WATER SUPPLY PROJECT
RAW WATER PUMP STATION - PREDESIGN

ELECTRICAL SYMBOLS & ABBREVIATIONS

JOB NUMBER 693-20-16-01
DRAWING NUMBER **E1**
SHEET NUMBER __ OF __
REVISION

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POWER UTILITY SERVICE DIVISION OF WORK	Electrical Contractor	Utility Company
Primary Conduits	X	
Primary Conductors	X	
Transformer Pad	X	
Transformer		X
Transformer Connections		X
Transformer Ground Rod	X	
Secondary Conduits	X	
Secondary Conductors	X	
Bollards	X	
Meter Enclosure/Base	X	
Utility Meter		X
C/T Enclosure	X	
Current Transformers C/T		X
Meter Room Lock Box	X	

Power Company Information:

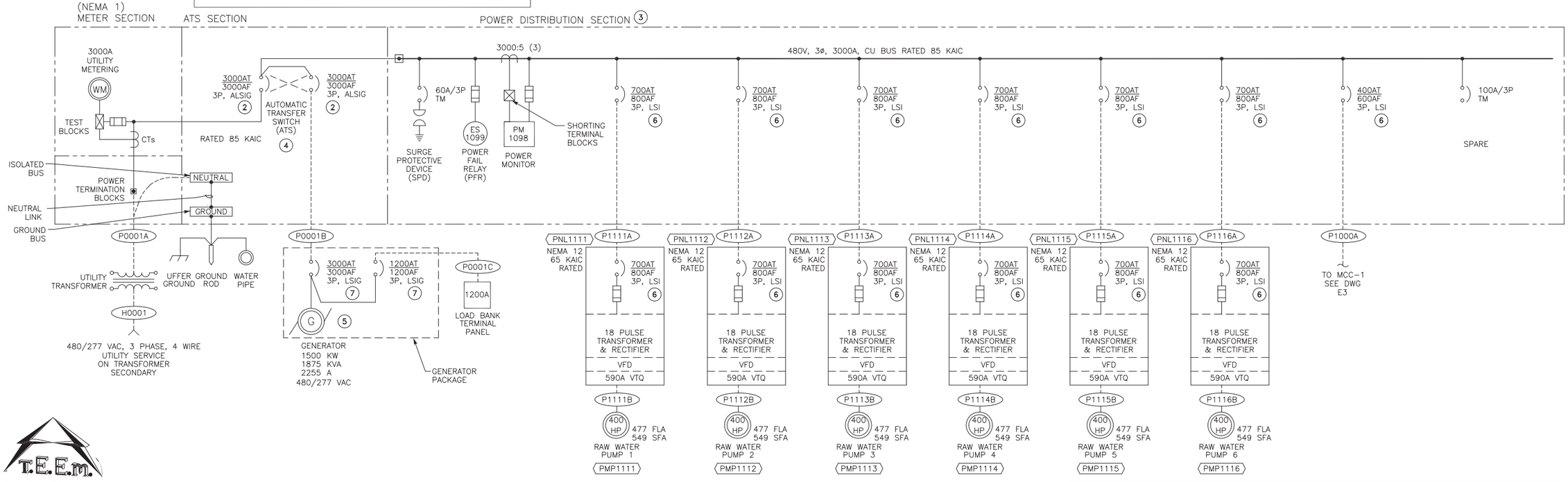
Contact Name:	
Power Utility:	Turlock Irrigation District
Address:	P.O. Box 949
City/State/Zip:	Turlock, CA 95381-0949
Phone:	
Fax:	
E-mail:	

Notes:

1. All Utility Service installation work shall be done by Contractor per Power Utility Engineered drawings (which supersedes what is shown on Contract Drawings).
2. Contractor shall coordinate and schedule all Power Utility inspections and tests in strict compliance with Power Utility requirements.

MMS-1 LOAD CALCULATIONS	UTILITY SERVICE						GENERATOR SERVICE	
HP DESCRIPTION	LOAD AMPS	QTY LOAD	LOAD VA	RUN AMPS	QTY RUN	RUN VA	QTY RUN	RUN VA
400 RW PUMP	477	6	2,379,422		5	1,982,852	3	1,189,711
MCC-1	328.8		273,325			160,091		160,091
SUBTOTAL	3,190.8		2,652,747	2,714		2,142,942		1,349,802
DIVERSITY FACTOR			81 %					
400 HP Largest motor @ 25% additional				396,570	0.25	99,143	GEN SIZE	
TOTAL						2,242,085	1,500 KW 1,875 KVA 2255 AMPS	
/ 480 V, 3 Phase 4 Wire Service Amps =	2,696.8 Amps						AMPS=	1,624
1.00 Multiplier							KVA=	1,350
Service Size =	2,696.8 Amps							
Main Size =	3,000.0 Amps						%GEN	
% Main Load =	89.9%						LOAD=	72.0%

NOTES:
1. ALL LUGS SHALL BE COPPER. SIZE FOR WIRES LISTED IN "CONDUIT & WIRE ROUTING SCHEDULE".
2. 100% RATED BREAKER TO HAVE ARCFLASH REDUCTION, LONG, SHORT, INSTANTANEOUS AND GROUND (ALSIG) ADJUSTABLE TRIP UNIT.
3. SEE DWG E4 FOR ELEVATION DIAGRAM OF BREAKERS POSITION.
4. ATS SHALL BE OPEN TRANSITION TYPE.
5. GROUND NEUTRAL PER GENERATOR MANUFACTURER'S RECOMMENDATION.
6. BREAKER TO HAVE LONG, SHORT AND INSTANTANEOUS (LSI) ADJUSTABLE TRIP UNIT.
7. BREAKER TO HAVE LONG, SHORT, INSTANTANEOUS AND GROUND (LSIG) ADJUSTABLE TRIP UNIT.



METER/MAIN SWITCHBOARD MMS-1 (1)

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NO. 15698
Exp.6-30-2018
ELECTRICAL
STATE OF CALIFORNIA
XX/XX/XX

THIS LINE IS 1 INCH
AT FULL SCALE
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SCALE : AS SHOWN
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DESIGNED BY : XML
PROJ. MGR. : SMK

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SRWA STANISLAUS REGIONAL WATER AUTHORITY

SURFACE WATER SUPPLY PROJECT
RAW WATER PUMP STATION - PREDESIGN
METER/MAIN SWITCHBOARD MMS-1
ONE LINE DIAGRAM

JOB NUMBER	693-20-16-01
DRAWING NUMBER	E2
SHEET NUMBER	__ OF __
REVISION	

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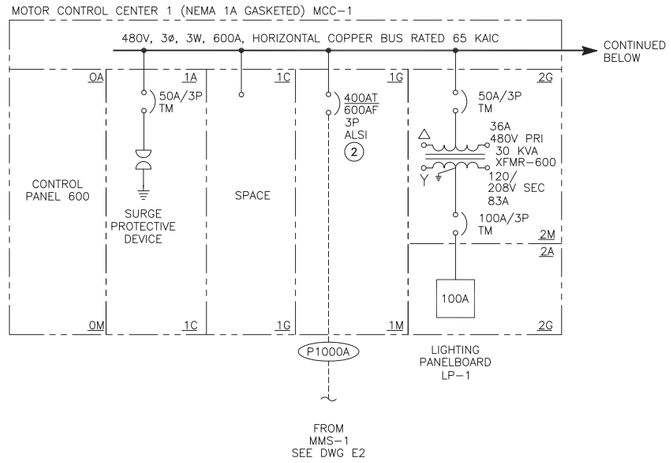
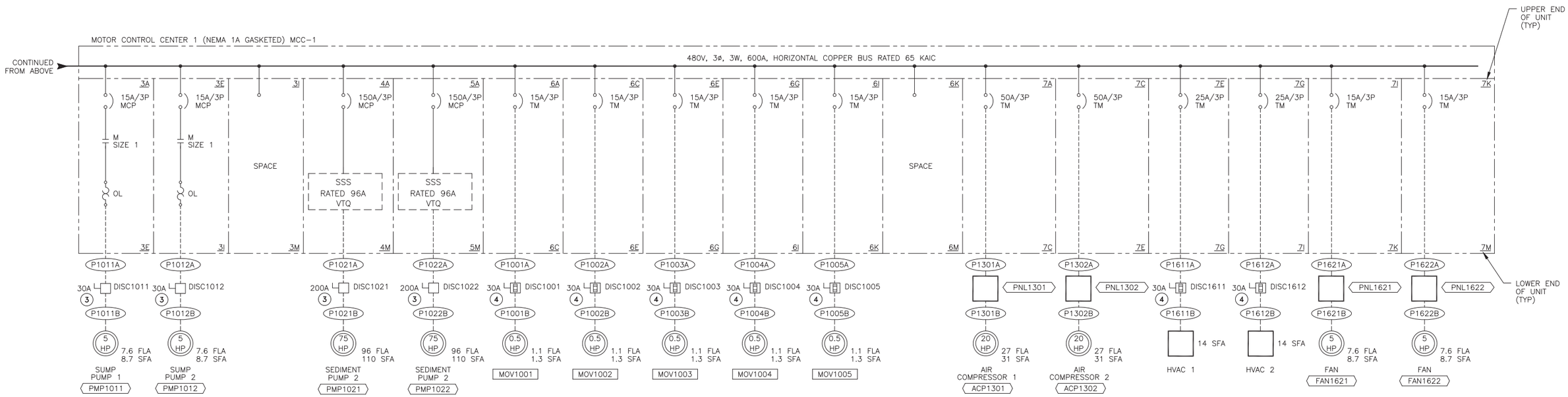
MCC-1 LOAD CALCULATIONS	UTILITY SERVICE						GENERATOR SERVICE	
HP DESCRIPTION	LOAD AMPS	QTY LOAD	LOAD VA	RUN AMPS	QTY RUN	RUN VA	QTY RUN	RUN VA
75 SEDIMENT MANAGEMENT PUMP	96	2	159,626		1	79,813	1	79,813
20 AIR COMPRESSOR	27	2	44,895		1	22,447	1	22,447
10 HVAC	14.0	2	23,279		2	23,279	2	23,279
5 SUMP PUMP	7.6	2	12,637		1	6,319	1	6,319
5 FAN FOR PUMP ROOM	7.6	1	6,319		1	6,319	1	6,319
0.5 SLUICE GATE	1.1	5	4,573		1	915	1	915
0.25 ELECTRIC HEATER	0.6	2	998		0	0	0	0
PANELBOARD	25.3		21,000			21,000		21,000
SUBTOTAL	328.8		273,325	193		160,091		160,091
DIVERSITY FACTOR				59 %			GEN SIZE	
75 HP Largest motor @ 25% additional					0 0.25	0	1,500 KW	
							1,875 KVA	
TOTAL						160,091	2255 AMPS	
/ 480 V, 3 Phase 4 Wire Service Amps =	192.6 Amps						AMPS=	193
	1.25 Multiplier							
Service Size =	240.7 Amps						KVA=	160
Main Size =	400.0 Amps						%GEN	
% Main Load =	60.2%						LOAD=	8.5%





MCC-1 ONE LINE DIAGRAM (1)

NOTES:
1. ALL LUGS SHALL BE COPPER. SIZE FOR WIRES LISTED IN "CONDUIT & WIRE ROUTING SCHEDULE".
2. BREAKER TO HAVE ARC REDUCTION, LONG, SHORT AND INSTANTANEOUS (ALSI) ADJUSTABLE TRIP UNITS.
3. NEMA 4X SS DISCONNECT SWITCH WITH MINIMUM AMP RATING SHOWN TO BE LOCATED BELOW FCS.
4. NEMA 4X SS FUSED DISCONNECT SWITCH WITH MINIMUM AMP RATING SHOWN AND FUSES SIZED TO PROTECT EQUIPMENT.

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RAW WATER PUMP STATION - PREDESIGN

MCC-1 ONE LINE DIAGRAM

JOB NUMBER 693-20-16-01
DRAWING NUMBER **E3**
SHEET NUMBER __ OF __
REVISION

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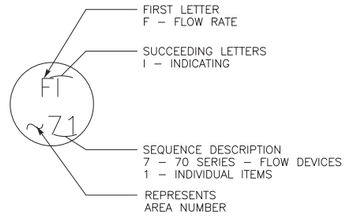
SYMBOL	DESCRIPTION
P & I DIAGRAM SYMBOLS	
XXX / XXX	FIELD MOUNTED INSTRUMENT
XXX / XXX	FACE MOUNTED INSTUMENT ON LOCAL PANEL, OPERATOR ACCESSIBLE
XXX / XXX	FACE MOUNTED INSTRUMENT ON FIELD PANEL, OPERATOR ACCESSIBLE
XXX / XXX	INSTRUMENT MOUNTED IN LOCAL PANEL, OPERATOR INACCESSIBLE
XXX / XXX	INSTRUMENT MOUNTED IN FIELD PANEL, OPERATOR INACESSIBLE
I	OPERATION PERFORMED WITH LOGIC OR HARDWIRED DEVICES
DWG #	– REFERENCE ELEMENTARY DWG. #
XXX / XXX	PLC OR COMPUTER FUNCTION PERFORMING OPERATION WITH VISUAL INDICATION
XXX / XXX	PLC OR COMPUTER FUNCTION PERFORMING OPERATION WITH VISUAL ALARM INDICATION
XXX / XXX	PLC OR COMPUTER PERFORMING INTERNAL OPERATION
XXX / XXX	PLC OR COMPUTER PERFORMING INTERNAL ALARM OPERATION
$\propto \int \partial_{\partial t}$	PROPORTIONAL, INTEGRAL, AND DIFFERENTIAL PARAMETERS
% +/–	RATIO AND BIAS PARAMETERS
	AUDIBLE ALARM (BUZZER OR HORN)
R#–C#	ANNUNCIATOR WINDOW R – ROW # C – COLUMN #
X	LAMP INDICATION (STATUS OR ALARM)
XXXXX	DISCRETE INPUT
	DISCRETE OUTPUT
	ANALOG INPUT
	ANALOG OUTPUT
a XXXX	JUMP TAG FROM ONE AREA TO ANOTHER AREA OF DRAWING "a" TAG CONNECT POINT ON EACH DRAWING
XXXX a	
P–X	CONTINUED ON DWG P–X
P–X	
#	AUTODIALER PRIORITY # PC BASED SOFTWARE

SYMBOL	DESCRIPTION
P & I DIAGRAM SYMBOLS	
OPEN / CLOSED	VALVE (GENERAL)
OPEN / CLOSED	BUTTERFLY VALVE
OPEN / CLOSED	GATE (GENERAL)
	CHECK VALVE (GENERAL)
	PUMP (GENERAL)
	BLOWER (GENERAL)
XXXX	VALVE/GATE NUMBER
XXXXX	EQUIPMENT NUMBER
	ELECTRIC SIGNAL
	LOGIC OR DATA SIGNAL
	PNEUMATIC SIGNAL
	CAPILLARY TUBING (FILLED SYSTEM)
	HYDRAULIC SIGNAL
ES / AS	SONIC OR ELECTROMAGNETIC SIGNAL
E	ELECTRIC SUPPLY
SA	SERVICE AIR
IA	INSTRUMENT AIR
	DISCONNECT SWITCH

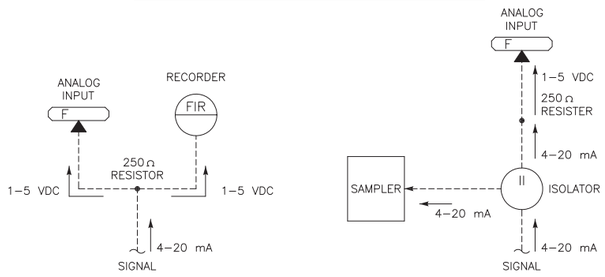
INSTRUMENT IDENTIFICATION LETTERS

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



NUMBERING SEQUENCE	
SEQUENCE NUMBER	DESCRIPTION
00	COMMON ALARM
01–09	INDIVIDUAL ITEMS
10	MECHANICAL
20	MECHANICAL
30	MECHANICAL
40	MECHANICAL
50	LEVEL DEVICES
60	PRESSURE DEVICES
70	FLOW DEVICES
80	ANALYTICAL DEVICES
90	SAFETY & SECURITY DEVICES

P&ID INSTRUMENT IDENTIFICATION EXAMPLE



TYPICAL SIGNAL FLOWS

T.E.E.M.
(916) 457–8144

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SHARON M. KIMZUKA
NO. 15698
Exp.6-30-2018
ELECTRICAL
STATE OF CALIFORNIA
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(530) 756-5905
FAX (530) 756-5991

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SRWA STANISLAUS REGIONAL WATER AUTHORITY

SURFACE WATER SUPPLY PROJECT
RAW WATER PUMP STATION - PREDESIGN

INSTRUMENTATION SYMBOLS & ABBREVIATIONS

JOB NUMBER 693-20-16-01
DRAWING NUMBER I1
SHEET NUMBER __ OF __
REVISION

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PROGRAMMABLE
LOGIC
CONTROLER
PLC

PLC

MOTOR
CONTROL
CENTER
MCC

MCC

FIELD
CONTROL
STATION
FCS

FCS

FIELD

FIELD

SEE DWG 16

SEE DWG 13

SEE DWG 17

SEE DWG 18

SEE DWG 15

SEE DWG 14

INFILTRATION
BAY 1 (E)

INFILTRATION
BAY 2 (E)

INFILTRATION
BAY 3 (E)

INFILTRATION
BAY 4 (E)

MOG1001

MOG1002

MOG1003

MOG1004

MOG1005

SUMP PUMP 1
PMP1011 (E)

SUMP PUMP 2
PMP1012 (E)

SED PUMP 1
PMP1021

SED PUMP 2
PMP1022

WETWELL A

WETWELL B

PUMP BAY 1

PUMP BAY 2

PUMP BAY 3

PUMP BAY 4

PUMP BAY 5

PUMP BAY 6

RAW WATER
PUMP 1
PMP1111

RAW WATER
PUMP 2
PMP1112

RAW WATER
PUMP 3
(F) PMP1113

RAW WATER
PUMP 4
(F) PMP1114

RAW WATER
PUMP 5
(F) PMP1115

RAW WATER
PUMP 6
(F) PMP1116

FE
1171
MAG

FE
2071
MAG

FE
2072
MAG

PIG LAUNCHER

CANAL OUTFALL
STRUCTURE

AIR
COMPRESSOR 1
ACP1301

AIR
COMPRESSOR 2
ACP1302

OVERALL P&ID

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SURFACE WATER SUPPLY PROJECT
RAW WATER PUMP STATION - PREDESIGN

OVERALL P&ID

JOB NUMBER
693-20-16-01

DRAWING NUMBER
I2

SHEET NUMBER
__ OF __

REVISION

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PROGRAMMABLE LOGIC CONTROLER PLC

MOTOR CONTROL CENTER MCC

FIELD CONTROL STATION FCS

FIELD

WETWELL A INLET GATE 1

OPEN POSITION Z1001U
CLOSE POSITION Z1001D
OPEN CONTROL ZC1001U
CLOSE CONTROL ZC1001D

OPEN POSITION Z1002U
OPEN CONTROL ZC1002U
CLOSE POSITION Z1002D
CLOSE CONTROL ZC1002D

WETWELL A INLET GATE 2 SIMILAR TO INLET GATE 1

OPEN POSITION Z1005U
OPEN CONTROL ZC1005U
CLOSE POSITION Z1005D
CLOSE CONTROL ZC1005D

WETWELL A BYPASS GATE SIMILAR TO INLET GATE 1

SUMP PUMP 1

RUN N1011
FAIL UST1011
AUTO Y1011
STT/STP X1011
MOISTURE MSH1011

RUN N1021
FAIL UST1021
AUTO Y1021
STT/STP X1021
MOISTURE MSH1021

SEDIMENT PUMP 1 SIMILAR TO SUMP PUMP 1 CONTROLS

WETWELL A LEVEL L1051
WETWELL A LO LO LEVEL LSLL1051

RUN (R) ETM
HS ~11 HOA B
FAIL (A)
HC ~11 RESET B

FS DWG E11

HC ~11 A LOS
I (1)

FCS1011

LOS HC ~21 A
I (1)

FCS1021

L/O/R O/S/C
HS ~01 HC ~01
I
R OPN
ZC ~01 G CLSD
E MO

L/O/R O/S/C
HS ~02 HC ~02
I
R OPN
ZC ~02 G CLSD
E MO

L/O/R O/S/C
HS ~05 HC ~05
I
R OPN
ZC ~05 G CLSD
E MO

ELECTRIC GATE OPERATOR (TYP)

DISC 1011

DISC 1021

FROM PRESSURE VESSELS I8 (E) 4"

INFILTRATION BAY 1 (E)

(E) 36" MOG1001

INFILTRATION BAY 2 (E)

(E) 36" MOG1002

MOG1005

TO INFILTRATION BAY 4 I4

FROM RAW WATER FLOWMETER I6

LT 1051 LSLL 1051

WETWELL A

TSH ~11 MSH ~11

SUMP PUMP 1 PMP1011 (E)

TSH ~21 MSH ~21

SEDIMENT PUMP 1 PMP1021

PUMP BAY 1
PUMP BAY 2
PUMP BAY 3

RAW WATER PUMPS SEE DWG I5

RAW WATER PUMP 1 PMP1111
RAW WATER PUMP 2 PMP1112
RAW WATER PUMP 3 (F) PMP1113

TO RAW WATER FLOWMETER I6

FROM RAW WATER PUMPS 4~6 I4

AREA PREFIX 10~

INLET CHANNEL A

NOTES: (1) MOISTURE/OVERTEMP RELAY SUPPLIED BY PUMP/MIXER SUPPLIER AND INSTALLED IN FCS BY MCC SYSTEM SUPPLIER.

(2) ISR => INTRINSIC SAFE RELAY.

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SURFACE WATER SUPPLY PROJECT
RAW WATER PUMP STATION - PREDESIGN

INLET CHANNEL A P&ID

JOB NUMBER 693-20-16-01
DRAWING NUMBER I3
SHEET NUMBER __ OF __
REVISION

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PROGRAMMABLE LOGIC CONTROLER PLC

MOTOR CONTROL CENTER MCC

FIELD CONTROL STATION FCS

FIELD

WETWELL B INLET GATE 1

OPEN POSITION Z1003U | CLOSE POSITION Z1003D | OPEN CONTROL ZC1003U | CLOSE CONTROL ZC1003D

OPEN POSITION Z1004U | OPEN CONTROL ZC1004U | CLOSE POSITION Z1004D | CLOSE CONTROL ZC1004D

WETWELL B INLET GATE 2 SIMILAR TO INLET GATE 1

SUMP PUMP 2

RUN N1012 | FAIL UST1012 | AUTO Y1012 | STT/STP X1012 | MOISTURE MSH1012

RUN R | ETM | HS ~12 HOA B | FAIL A | RESET HC ~12 B

FS DWG E11

HC ~12 LOS A

I ①

FCS1012

RUN N1022 | FAIL UST1022

AUTO Y1022 | STT/STP X1022 | MOISTURE MSH1022

SEDIMENT PUMP 2 SIMILAR TO SUMP PUMP 2 CONTROLS

LOS HC ~22 A

I ①

FCS1022

WETWELL B LEVEL L1052 | WETWELL B LO LO LEVEL LSLL1052

PLC

MCC

FCS

FIELD

L/O/R HS ~03 | O/S/C HC ~03

I

R OPN | G CLSD

ZC ~03 | E MO

ELECTRIC GATE OPERATOR (TYP)

L/O/R HS ~04 | O/S/C HC ~04

I

R OPN | G CLSD

ZC ~04 | E MO

DISC 1012

DISC 1022

MOG1005

LT 1052 | LSLL 1052

WETWELL B

FROM PRESSURE VESSELS I8 (E) 4"

INFILTRATION BAY 3 (E)

(E) 36" MOG1003

INFILTRATION BAY 4 (E)

(E) 36" MOG1004

TSH ~12 | MSH ~12

SUMP PUMP 2 PMP1012 (E)

TSH ~22 | MSH ~22

SEDIMENT PUMP 2 PMP1022

AIR RELEASE VACUUM VALVE

I3 FROM SUMP PUMP 1

PUMP BAY 4

PUMP BAY 5

PUMP BAY 6

RAW WATER PUMP 4 (F) PMP1114

RAW WATER PUMP 5 (F) PMP1115

RAW WATER PUMP 6 (F) PMP1116

FROM RAW WATER PUMPS 1~3 I3

RAW WATER PUMPS SEE DWG I5

I6 TO RAW WATER FLOWMETER

AREA PREFIX 10~

INLET CHANNEL B

NOTES: ① MOISTURE/OVERTEMP RELAY SUPPLIED BY PUMP/MIXER SUPPLIER AND INSTALLED IN FCS BY MCC SYSTEM SUPPLIER. ② ISR => INTRINSIC SAFE RELAY.

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SRWA STANISLAUS REGIONAL WATER AUTHORITY

SURFACE WATER SUPPLY PROJECT

RAW WATER PUMP STATION - PREDESIGN

INLET CHANNEL B P&ID

JOB NUMBER 693-20-16-01

DRAWING NUMBER I4

SHEET NUMBER __ OF __

REVISION

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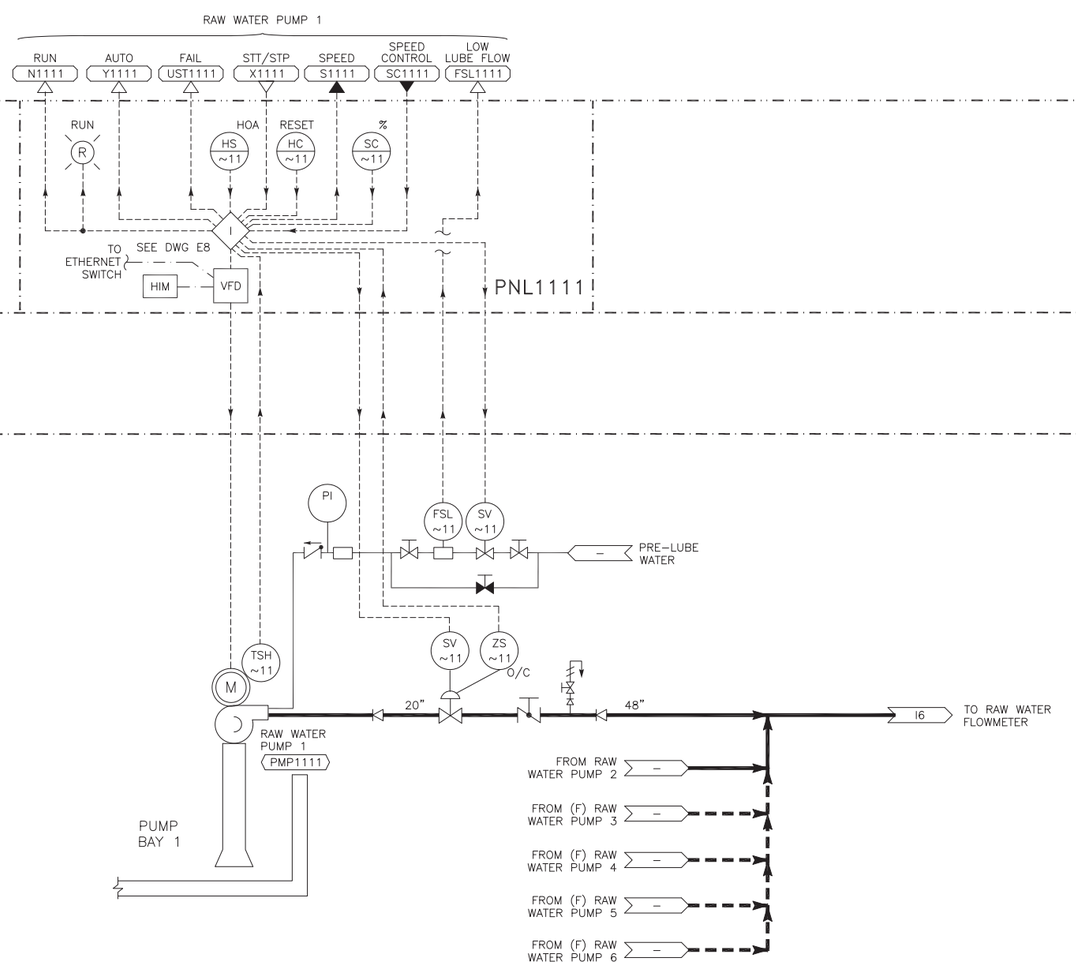
PROGRAMMABLE LOGIC CONTROLER PLC

MOTOR CONTROL CENTER MCC

FIELD CONTROL STATION FCS

FIELD



RAW WATER PUMPS (1)

NOTES: (1) TYPICAL FOR PUMPS PMP1111~1116. PUMPS PMP1113~1116 ARE FUTURE.

AREA PREFIX 11~

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SURFACE WATER SUPPLY PROJECT

RAW WATER PUMP STATION - PREDESIGN

TYPICAL RAW WATER PUMP P&ID

JOB NUMBER 693-20-16-01
DRAWING NUMBER **I5**
SHEET NUMBER __ OF __
REVISION

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PROGRAMMABLE LOGIC CONTROLER PLC

MOTOR CONTROL CENTER MCC

FIELD CONTROL STATION FCS

FIELD

RAW WATER FLOWMETER BYPASS VALVE

OPEN POSITION Z1131U | CLOSE POSITION Z1131D | OPEN CONTROL ZC1131U | CLOSE CONTROL ZC1131D

RAW WATER FLOW

TOTAL PULSE FQ1171 | FLOW F1171

PLC

MCC

FCS

FIELD

L/O/R

O/S/C

HS ~31

HC ~31

I

R OPN

G CLSD

ZC ~31

ELECTRIC GATE OPERATOR (TYP)

E MO

BYPASS TO WETWELL I3

PRESSURE REGULATING VALVE

24"

1 1/2" → I5 TO RAW WATER PUMP 1~6 SEAL WATER

1" → – TO UTILITY STATION 2

1" → – TO SAMPLING STATION

BYPASS

MGD

FIT 1171

FE 1171

MAG

M MOV1131

FROM RAW WATER PUMP STATION I5

48"

60" → I7 TO FLOW SPLIT VAULT

PIG LAUNCHER

3" → – TO IRRIGATION PUMP

1" → – TO UTILITY STATION 3

RAW WATER FLOWMETER

AREA PREFIX 11~

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SRWA STANISLAUS REGIONAL WATER AUTHORITY

SURFACE WATER SUPPLY PROJECT

RAW WATER PUMP STATION - PREDESIGN

RAW WATER FLOWMETER P&ID

JOB NUMBER	693-20-16-01
DRAWING NUMBER	I6
SHEET NUMBER	__ OF __
REVISION	

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PROGRAMMABLE LOGIC CONTROLER PLC

MOTOR CONTROL CENTER MCC

FIELD CONTROL STATION FCS

FIELD

PLC

MCC

FCS

FIELD

FLOW CONTROL VALVE 1

CONTROL ZC2001

POSITION Z2001

CLOSED ZSD2001A

FLOW CONTROL VALVE 2

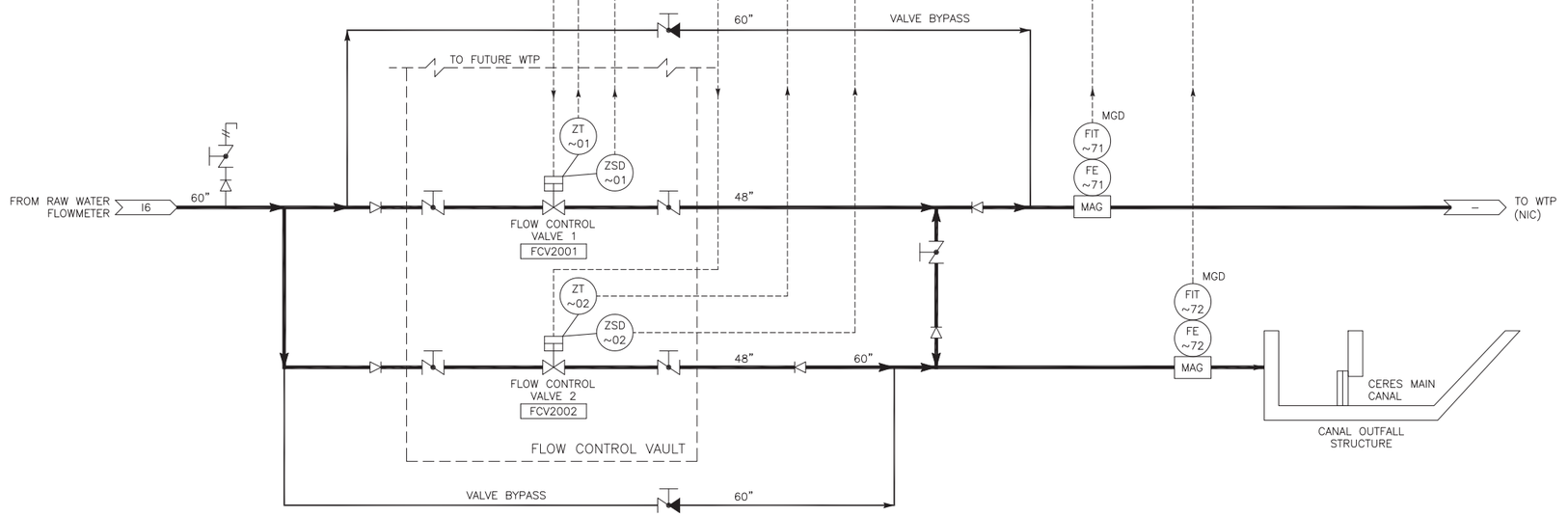
CONTROL ZC2002

POSITION Z2002

CLOSED ZSD2002A

FLOW F2071

FLOW F2072



FLOW SPLIT VAULT

AREA PREFIX 20~

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SURFACE WATER SUPPLY PROJECT
RAW WATER PUMP STATION - PREDESIGN

FLOW SPLIT VAULT P&ID

JOB NUMBER 693-20-16-01
DRAWING NUMBER I7
SHEET NUMBER __ OF __
REVISION

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PROGRAMMABLE LOGIC CONTROLER PLC

MOTOR CONTROL CENTER MCC

FIELD CONTROL STATION FCS

FIELD

AIR COMPRESSOR 1

FAIL UST1301 | RUN N1301 | STT/STP X1301 | HI PRESSURE PSH1301 | HI TEMP TSH1301

AIR COMPRESSOR 2

FAIL UST1302 | RUN N1302 | STT/STP X1302 | HI PRESSURE PSH1302 | HI TEMP TSH1302

AIR COMPRESSOR PRESSURE P1361

BAY 1 VALVE 1 OPN/CLS X1321 | BAY 1 VALVE 2 OPN/CLS X1322 | BAY 2 VALVE 1 OPN/CLS X1323 | BAY 2 VALVE 2 OPN/CLS X1324 | BAY 3 VALVE 1 OPN/CLS X1325 | BAY 3 VALVE 2 OPN/CLS X1326 | BAY 4 VALVE 1 OPN/CLS X1327 | BAY 4 VALVE 2 OPN/CLS X1328

PLC

MCC

FCS

FIELD

PSI

PIT ~61 | PI ~61 | CAL PORT

SV ~21 | SV ~22 | SV ~23 | SV ~24 | SV ~25 | SV ~26 | SV ~27 | SV ~28

I3 TO INFILTRATION BAY 1

I3 TO INFILTRATION BAY 1

I3 TO INFILTRATION BAY 2

I3 TO INFILTRATION BAY 2

I4 TO INFILTRATION BAY 3

I4 TO INFILTRATION BAY 3

I4 TO INFILTRATION BAY 4

I4 TO INFILTRATION BAY 4

PRESSURE VESSEL 1 — TNK1311

PRESSURE VESSEL 2 — TNK1312

PRESSURE VESSEL 3 — TNK1313

PRESSURE VESSEL 4 — TNK1314

E — AIR COMPRESSOR CONTROL PANEL — PNL1301

M — AIR COMPRESSOR 1 — ACP1301

E — AIR COMPRESSOR CONTROL PANEL — PNL1302

M — AIR COMPRESSOR 2 — ACP1302

OVERALL P&ID

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AREA PREFIX 13~

SRWA STANISLAUS REGIONAL WATER AUTHORITY

SURFACE WATER SUPPLY PROJECT

RAW WATER PUMP STATION - PREDESIGN

AIR COMPRESSOR & PRESSURE VESSELS P&ID

JOB NUMBER 693-20-16-01

DRAWING NUMBER **I8**

SHEET NUMBER __ OF __

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PROGRAMMABLE LOGIC CONTROLER PLC

MOTOR CONTROL CENTER MCC

FIELD CONTROL STATION FCS

FIELD

COMP IN AUTO Y1410

AIR COMP 1: TROUBLE UST1411, RUN N1411

AIR COMP 2: TROUBLE UST1412, RUN N1412

LO LO AIR PRESSURE PSLL1464

PLC

MCC

FCS

FIELD

AIR COMPRESSOR PNL1410 (3)

BOTH HOA IN AUTO

FAIL A

RUN G

ETM

HOA HS ~11

HOA HS ~12

LEAD START/STOP

LAG START/STOP

PSC ~60 B (3)

PSC ~60 A

PI ~63

PSLL ~64

AIR DRYER ADR1413

PRV1414 (1)

AIR DISTRIBUTION

VLV1400A

VLV1400B

TSH ~11

TSH ~12

PI ~61

PI ~62

PSI

SV (2)

AIR COMPRESSOR 1 ACP1411

AIR COMPRESSOR 2 ACP1412

AIR COMPRESSOR STATION

NOTES: (1) INTEGRAL FILTER REGULATOR WITH GAUGE.

(2) INTEGRAL TIMER CONTROLLED SOLENOID.

(3) PRESSURE SWITCHES & CONTROL PANEL SUPPLIED WITH AIR COMPRESSOR PACKAGE.

AREA PREFIX 14~

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SURFACE WATER SUPPLY PROJECT

RAW WATER PUMP STATION - PREDESIGN

AIR COMPRESSOR STATION P&I D

JOB NUMBER 693-20-16-01

DRAWING NUMBER **I9**

SHEET NUMBER __ OF __

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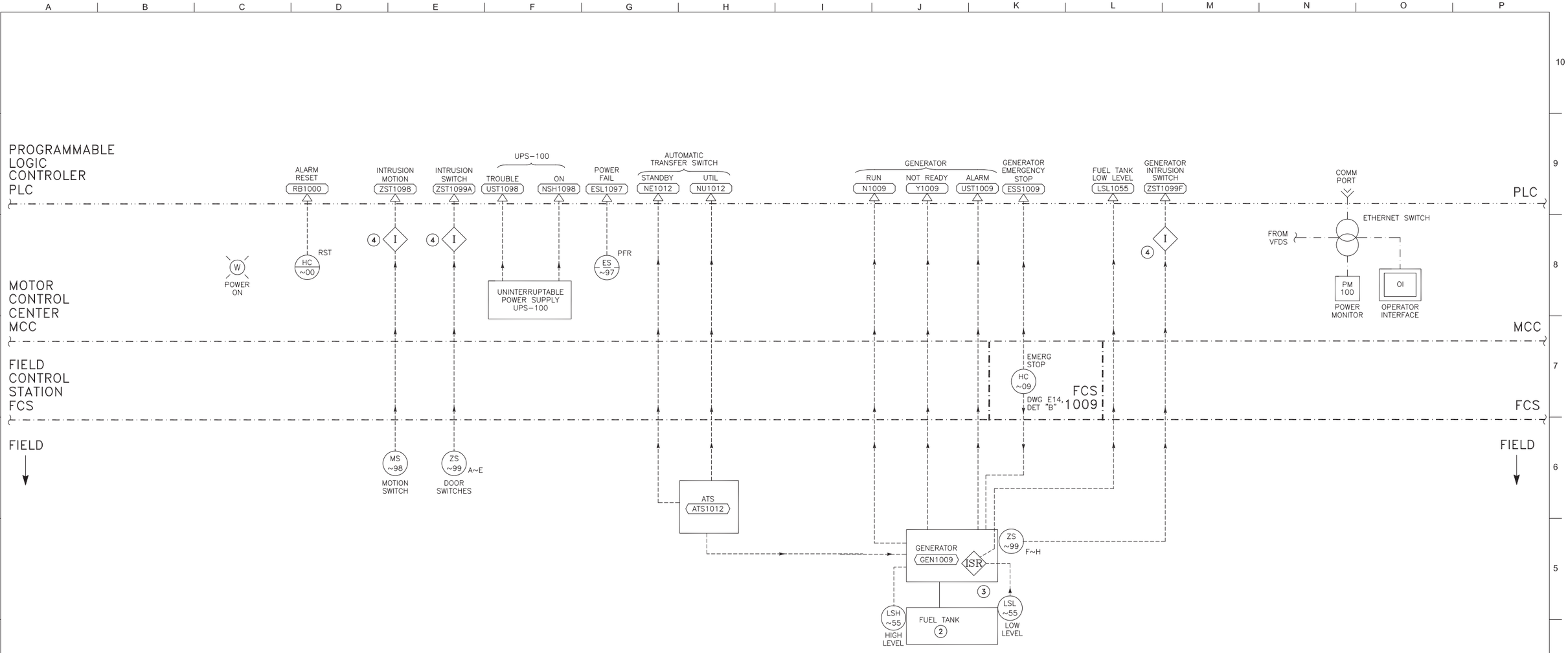

AUXILIARY SYSTEMS

NOTES:

1. AREA PREFIX PER OWNER'S INSTRUCTION.
2. DOUBLE WALLED SUB–BASE FUEL TANK WITH HIGH & LOW LEVEL SWITCHES.
3. PLACE INTRINSIC SAFE RELAYS (ISR) INSIDE PANELS TO ISOLATE SIGNALS.
4. WIRE SWITCHES IN SERIES ON TERMINAL BLOCKS.

AREA PREFIX
(1) 10~

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SURFACE WATER SUPPLY PROJECT
RAW WATER PUMP STATION - PREDESIGN

AUXILIARY SYSTEM P&ID

JOB NUMBER 693–20–16–01
DRAWING NUMBER **I10**
SHEET NUMBER __ OF __
REVISION

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ATTACHMENT D

Floway Pump Preliminary Selection and Budgetary Quote

G3 Engineering, Inc.

02 Mar 2018

West Yost Engineers
Davis, CA

Quotation number: 584406
Revision: 4

Attn: Ty Tadano

Project: Turlock ID-Stanislaus Regional Water Authority
Your reference:

We thank you for your above referenced inquiry, and are pleased to submit our quotation for your consideration.

The following is a firm price summary for this quotation. Please see item specific pages for more details.

Item number	Service	Size	Unit Price	Unit Freight	Qty	Extended Price
004	Raw Water	29JKL - 1 stage Product lube - Sump Pump	$ 133,013	$ 1,000	6	$ 804,078
					Grand Total	$ 804,078

COMMENTS:
-This quote is for budgetary purposes only.
-Quote assumes a 50' installation depth.
SHIPMENT AND FREIGHT TERMS: Shipment is quoted with freight term: Per the freight term listed in the Comments and Clarifications Section. Partial shipment allowed. Shipment & invoicing will occur upon shipment of equipment. Shipment schedules are based on factory loading at time of order. Should shipment be postponed due to project or site delays Weir Floway will invoice and hold the shipment. Shipment delays exceeding 30 days from the completed date may be subject to reasonable storage charges.

LEADTIME: Submittal will be approximately 8-10 weeks after order receipt, contingent upon order acceptance within 10 business days of receipt. Orders will be accepted subject to buyer's credit approval and subject to Weir Floway, Inc.'s Terms and Conditions of Sale.

Shipment lead time will be approximately 20-24 weeks after written release to manufacture. Shipment lead times are an estimate at time of quotation and subject to change based on quote validity.

SCOPE OF SUPPLY: Please note any requirements not outlined in the referenced specification sections as noted on the cover page of this quotation will not be the responsibility of Weir Floway. Any separate specifications made reference to within the noted specifications, whether in part or whole, will not be considered in this quotation.

Weir Floway, Inc. Terms and Conditions of Sale per attached will apply to this quotation. If this is not acceptable, mutually agreeable terms and conditions may be negotiated at time of order placement.

SPECIFICATIONS: Written request. No detailed specifications received.

VALIDITY: This offer is valid for 30 days from date issued. Quoted prices will be held firm thru shipment if order is released for manufacture within 60 days from order entry date. Otherwise, a price adjustment may be applied.
In the event that Weir Floway, Inc. is successful in the tender based on this Scope Letter, please issue the formal Purchase Order to the following address:
Weir Floway, Inc.
2494 S. Railroad Ave.
Fresno, CA 93706

PRICE: Quoted prices will be held firm through shipment if order is released for manufacture within 60 days from order entry date, and approved for shipment within the leadtime quoted. Otherwise, a price adjustment may be applied. Price quoted is for all items purchased and shipped at one time. In the event of a partial order, we will review and adjust the

freight price accordingly. Freight charges will be those in effect at time of shipment. Due to volatility in the commodities markets, Weir Floway reserves the right to add a material surcharge on pipe, plate, and other materials in line with the commodity indices. Cost surcharges must be agreed to prior to order acceptance.

PAYMENT TERMS: Orders & contracts are subject to approval by Weir Floway prior to acceptance. Standard terms for orders <= $150,000 are net thirty (30) days from date of invoice. For orders >=$150,000, progress payments will apply. Weir Floway's standard progress payment schedule is attached for consideration. Letter of Credit is applicable. Please note: L/C terms must be approved by Weir Floway's credit department prior to order acceptance. Letter of Credit must be irrevocable and confirmed by a U.S.A. Bank. Beneficiary must be Weir Floway, Inc. Confirmation charges should be paid by Buyer and L/C expiration date should be minimum 21 days after the latest shipment date.

PACKAGING: For domestic shipment via commercial carrier. Export boxing and documentation requirements are an option with price adder.

START-UP: Start-up/assistance by authorized Rep. included. Invoice for start-up services will be issued when services are complete or 8 weeks from pump shipment whichever occurs first.

QUALITY STANDARDS: All our manufacturing locations are ISO 9001-2008 certified.

TERMS AND CONDITIONS: This quotation is based solely upon the terms and conditions set forth herein including attachments. They supersede and reject any conflicting terms and conditions of Purchaser. Any other terms and conditions that Purchaser may propose are subject to requotation.

We hope you find our quotation in line with your requirements. However, if you have any questions, please do not hesitate to contact us.

Sincerely,
Mark Knudsen
G3 Engineering, Inc.

Item number	004	Size / Stages	29JKL / 1
Quote number	584406	Nominal pump speed	1180 rpm
Overall Pump Length	47.65 ft	Condition Point	9,028.0 USgpm @ 125.0 ft TDH

Pump

Qty	Description
6	*Units - 29JKL - 1 stage Product lube - Sump Pump*

Pump selection criteria

Speed operation: Constant speed operation

Lubrication type

Lubrication type: Product lube

Bowl Assembly - 1 Stage

Bowl size: 29JKL bowl assembly - 1 stage

Bowl Materials: Cast iron (ASTM A48 cl 30-epoxy lined)

Bowl connection type: Flanged

Bowl Bolting Material: 304SS (ASTM F593 Gr CW1), Floway material code - 106

Wear rings

Wear rings: Wear rings - Bowl and Impeller

Combination bowl and impeller wear ring materials: Bowl/Impeller wear ring materials - aluminum-bronze/aluminum-bronze (Alloy 954/Alloy 952) min. 50 BHN difference

Bowl bearing material: Bismuth tin bronze bowl bearings (UNS C89835)

Impeller Material: Aluminum bronze (ASTM B148 Alloy 952)

Impeller Balance: Dynamic balanced to ISO 1940 G6.3

Keyed impellers: Double keyed

Bowl Shaft Size: 3.6875" (Standard)

Bowl Shaft Material: 416SS (ASTM A582-88a Type 416)

Suction type: Suction bell

Suction type bearing: Bismuth tin bronze (UNS C89835)

Suction Strainer: Clip on basket strainer 29JK

Suction Strainer Material

Strainer material - 316SS

Bowl assembly type: Fully assembled

Column assembly - 2.25 x 18 in. - Flanged

Column

Column Size: Column 18" - (0- 20' and 3- 10' and 2- 5' and 1 - 3.04' Top)

Column pipe material: ASTM A53 Gr. B rolled and welded steel

Column pipe schedule: Floway standard .375" wall thickness

Column Connection Type: Flanged (75#)

Flange Bolt Material: Column flange bolting - 304SS bolts (ASTM F593-Gr.CW1), nuts (ASTM F594-Gr.CW1) - Floway material code 106/247

Bearing Retainer material: Ductile iron (ASTM A536-84 Gr 60-40-18)

Lineshaft

Lineshaft Size: 2.25"

Lineshaft Material: 416SS (ASTM A582-88a Type 416)

Lineshaft Coupling Material: 416SS (ASTM A582-88a Type 416)

Line shaft bearing material: Styrene Butadiene Rubber(SBR) (Qty 5 per pump)

Discharge head assembly - 20x24.5 "FR"

Discharge head material: Steel (A36 plt, A105 flg, A53-Gr B pipe)

Pump

Qty	Description
	Discharge Head Size: 20x24.5 "FR"
	Discharge size: 20"
	Discharge Connection Type/Rating: 150# flange (Stl. std.)
	Shaft sealing arrangement: Standard stuffing box
	Top Line Shaft Straightness: Floway Standard
	Stuffing box / Seal housing bearing material: Bismuth tin bronze stuffing box bearing (UNS C89835)
	Head shaft couplings: Type CPAT flanged adjustable non-spacer coupling
	Coupling guard material / construction: Aluminum
	Prelube assembly
	Automatic prelube valve
	Protective coatings
	Protective coating - Discharge head: Carboguard 891 epoxy coating - Disch. head - interior and exterior
	Protective coating - Column: Carboguard 891 epoxy coating - Column - interior and exterior
	Protective coating - Bowl assembly: Carboguard 891 epoxy coating - Bowls, exterior only
	Protective coating - Soleplate: Carboguard 891 epoxy coating - Soleplate top side only
	Miscellaneous coating options
	NSF certified
	Assembly type - Unit
	Assembly type - Unit: Factory assembled (bowl and head assembly only)
	Start-up/Overage
	Start-up options
	Start up by G3 Engineering
	Packaging and Shipping
	Packaging options
	Domestic packaging

Testing

Qty	Description
6	**Testing and Inspection options**
	Factory performance test acceptance criteria for rated condition per: ANSI/HI 14.6 grade 1U (Floway standard)
	Performance test options
	Bowl assembly performance test - 6 units
	Performance test witnessing
	Non-witnessed
	Test approval options: Submit test results for approval - 6 units
	Hydro testing
	Hydrotest - Discharge Head options: Non witnessed hydrotest - discharge head - 6 units
	Inspection and Analysis
	Analysis
	Seismic analysis of anchorage
	Structural natural frequency analysis (head/motor only), stamped by Floway P.E. - 1 units

Sole Plate

Qty	Description
6	**Discharge head assembly - 20x24.5 "FR"**
	Soleplate type: Fabricated steel
	Soleplate size: 48"x48"x1.50"

Anchor Bolt

Qty	Description
6	**Discharge head assembly - 20x24.5 "FR"**
	Soleplate anchor bolts with nuts: No soleplate anchor bolts

Driver

Qty	Description
6	**Driver**
	Electric motor driver
	Motor size selection: US 400HP 460v/3ph/60hz 1200 RPM WPI
	Motor efficiency type: Premium efficient
	Motor shaft
	Motor shaft type: Motor vertical solid shaft
	Reference head shaft diameter: For reference:2.25" Top line shaft diameter
	Motor thrust design
	High thrust
	Motor bearing life options: 1 yr. min. / 5 yr. average
	Motor enclosure: WPI
	Motor service factor: 1.15
	Starting method: Across the line starting
	Motor BD: Motor BD 20 in.
	Non-reverse device: Non-reverse coupling on motor
	Motor space heater: 115/1/60 Motor space heater
	Motor winding RTD's: Motor winding RTD's - 100 Ohm, Precision Platinum - set of 6
	Conduit box size: Standard conduit box (size 2)
	Elevation: Motor suitable for elevation <= 3300'
	Ambient temperature: Motor suitable for ambient temperature <= 104 F (40 C)
	UL labeled motor: Not UL labeled
	Motor packaging options: Motor domestic packaging
	Driver design: NEMA
	Driver shipping options: Motor NOT to be shipped to Floway factory

Pump Performance Datasheet

Customer	: West Yost Engineers	Quote number	: 584406
Customer reference	:	Size	: 29JKL
Item number	: 004	Stages	: 1
Service	: Raw Water	Based on curve number	: 29JKL 1180 Rev. 0
Quantity	: 6	Date last saved	: 02 Mar 2018 1:23 PM

Operating Conditions

Flow, rated	: 9,028.0 USgpm
Differential head / pressure, rated (requested)	: 125.0 ft
Differential head / pressure, rated (actual)	: 125.2 ft
Suction pressure, rated / max	: 0.00 / 0.00 psi.g
NPSH available, rated	: Ample
Frequency	: 60 Hz

Performance

Speed, rated	: 1180 rpm
Impeller diameter, rated	: 19.20 in
Impeller diameter, maximum	: 21.29 in
Impeller diameter, minimum	: 16.87 in
Efficiency (bowl / pump)	: 84.24 / 81.33 %
NPSH required / margin required	: 21.84 / 0.00 ft
Ns (imp. eye flow) / Nss (imp. eye flow)	: 2,588 / 10,896 US Units
MCSF	: 4,427.4 USgpm
Head, maximum, rated diameter	: 204.4 ft
Head rise to shutoff (bowl / pump)	: 58.58 / 63.50 %
Flow, best eff. point (bowl / pump)	: 8,853.4 / 8,536.1 USgpm
Flow ratio, rated / BEP (bowl / pump)	: 101.97 / 105.76 %
Diameter ratio (rated / max)	: 90.18 %
Head ratio (rated dia / max dia)	: 76.93 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Selection status	: Acceptable

Liquid

Liquid type	: Water - Potable
Additional liquid description	:
Solids diameter, max	: 0.00 in
Solids concentration, by volume	: 0.00 %
Solids concentration, by weight	: 0.00 %
Temperature, max	: 68.00 deg F
Fluid density, rated / max	: 1.000 / 1.000 SG
Viscosity, rated	: 1.00 cP
Vapor pressure, rated	: 0.00 psi.a

Material

Material selected	: Cast Iron/Bronze

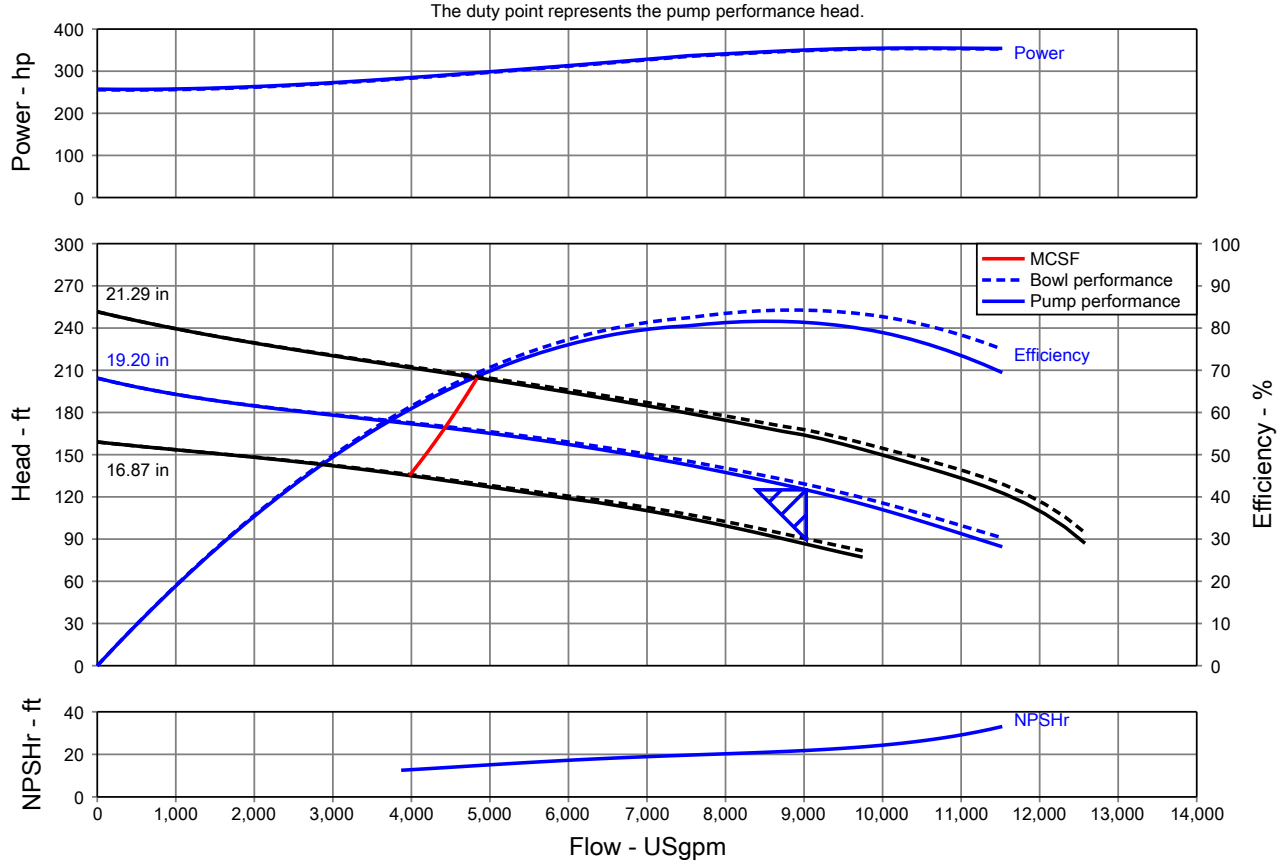
Pressure Data

Maximum working pressure	: See the Additional Data page
Component pressure limit	: See the Additional Data page
Maximum allowable suction pressure	: N/A
Hydrostatic test pressure	: See the Additional Data page

Driver & Power Data (@Max density)

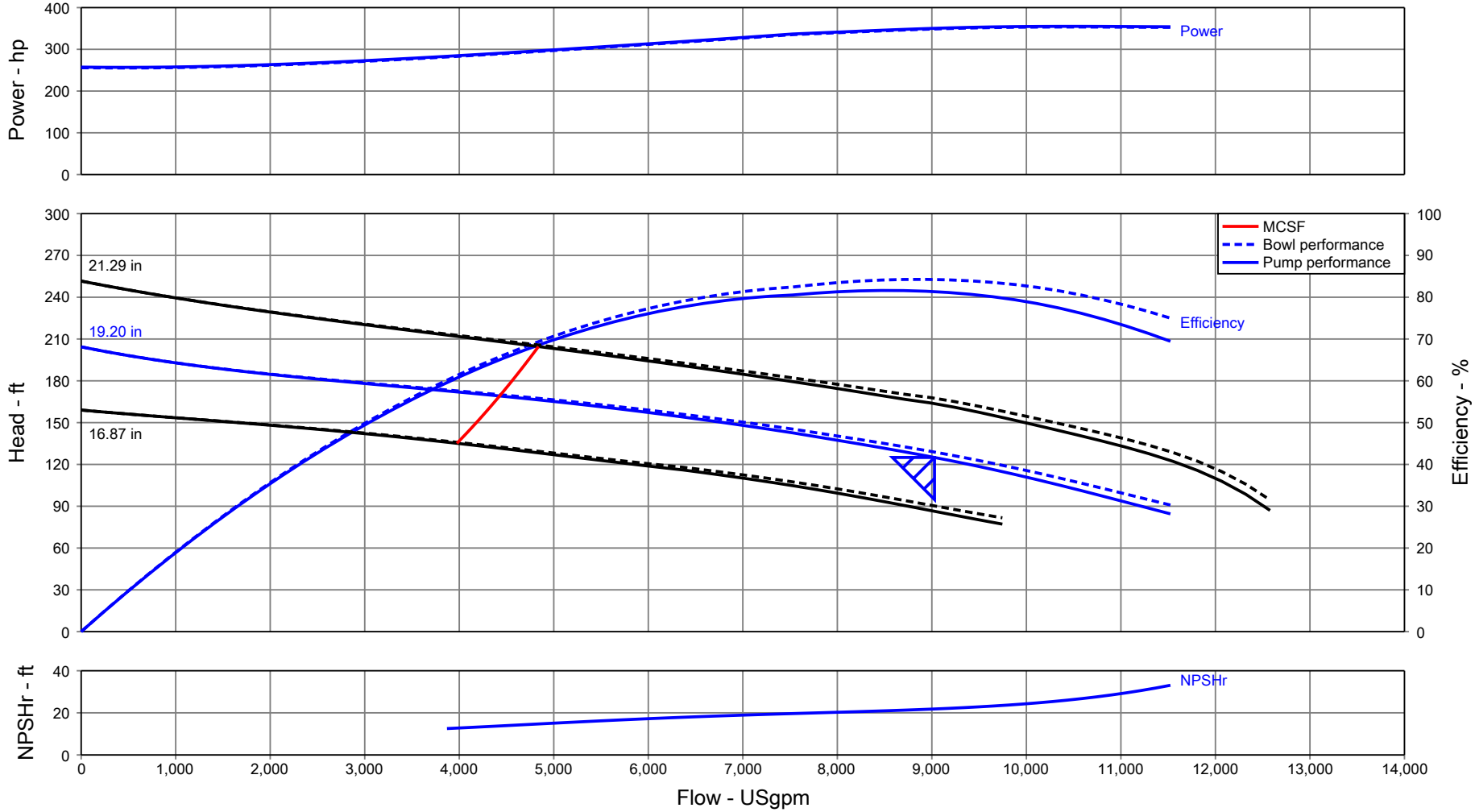
Driver sizing specification	: Max power + 4%
Margin over specification	: 0.00 %
Service factor	: 1.15
Power, hydraulic	: 294 hp
Power (bowl / pump)	: 349 / 350 hp
Power, maximum, rated diameter	: 355 hp
Minimum recommended motor rating	: 400 hp / 298 kW

Pump and bowl (dashed) performance. Bowl adjusted for construction and viscosity.
Pump further adjusted for friction and power losses of lineshaft and thrust bearings. Pump is not adjusted for any static lift.
The duty point represents the pump performance head.



Pump Performance Curve

Pump and bowl (dashed) performance. Bowl adjusted for construction and viscosity.
Pump further adjusted for friction and power losses of lineshaft and thrust bearings. Pump is not adjusted for any static lift.
The duty point represents the pump performance head.



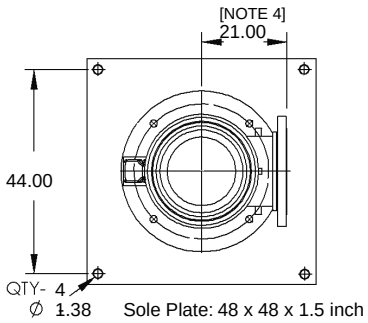
Customer	: West Yost Engineers	Pump Type	: 29JKL	Quote number	: 584406
Address	: , Davis, CA	# of Stages	: 1	Customer PO #	:
Location	:	Quantity	: 6	CO #	:
Project	: Turlock ID-Stanislaus Regional Water Authority	Flow	: 9,028.0 USgpm	Item #	: 004
Tag	:	Head	: 125.0 ft	JOL #	:
Bowl/Pump	:	Speed	: 1180 rpm	Serial #	:
Eff (bowl / pump)	: 84.24 / 81.33 %	Fluid Density	: 1.000 / 1.000 SG	Drawing #	:
Power (bowl / pump)	: 349 / 350 hp	Viscosity	: 1.00 cP	Drawn By	:
NPSH required	: 21.84 ft	Impeller Trim	: 19.20 in	Last Modified	: 02 Mar 2018 1:23 PM

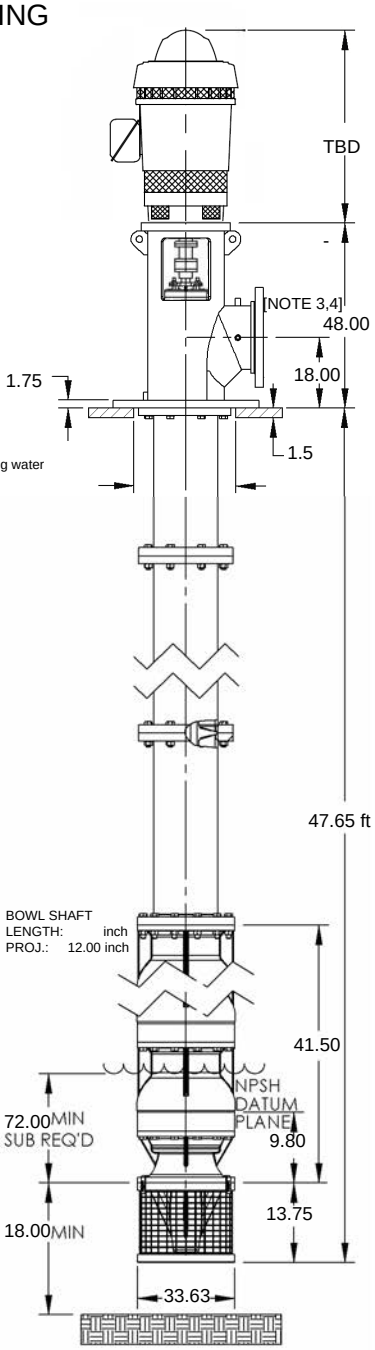
The head and power may be different than that shown in accordance with Hydraulic Institute / API 610 Standards

Additional Notes:

NOT TO BE USED FOR CONSTRUCTION UNLESS CERTIFIED.

GENERAL ARRANGEMENT DRAWING
VERTICAL TURBINE PUMP
29JKL ASSEMBLY





COATING:
Option 2: Surfaces coated with Carboline Carboguard 891 VOC. Suitable for water service and NSF compliant (i.e. potable water and drinking water applications). (Bowl OD, Column pipe OD & ID, Discharge head OD & ID, if applicable)

MATERIALS	
DISCHARGE HEAD:	A36 plt, A105 flg, A53-Gr B pipe
PACKING BOX-SEAL HSG:	ASTM A48-90 Cl.30
SHAFT PACKING:	JC 1340
SOLE PLATE:	A516-Gr 70
COLUMN PIPE:	ASTM A53 Gr. B rolled and welded
BEARING RETAINER:	ASTM A536-84 Gr 60-40-18
LINESHAFT BEARING:	Styrene Butadiene Rubber(SBR)
LINESHAFT:	ASTM A582-88a Type 416
BOWL SHAFT:	ASTM A582-88a Type 416
BOWL:	ASTM A48 cl 30-epoxy lined
IMPELLER:	(ASTM B148 Alloy 952)
IMPELLER WEAR RING:	ASTM B505-91 Alloy 954
BOWL BEARING:	UNS C89835
BOWL WEAR RING:	ASTM B505-91 Alloy 954
STRAINER:	316 SS
BOLTING:	ASTM F593 Gr CW1

PUMP	
HEAD TYPE:	FR
HEAD SIZE:	20x24.5FR
SEAL ARRANGEMENT:	Pkg box
LINESHAFT DIAMETER:	2.25 in
COLUMN SIZE:	18.00 in (Nominal)
ENCLOSING TUBE SIZE:	N/A (Nominal)
LUBRICATION TYPE:	Product
BOWL MODEL:	29JKL
NUMBER OF STAGES:	1 STAGE TYPE 29JKL
RATED BOWL HEAD:	128.9 ft
RATED RATE OF FLOW:	9,028.0 USgpm
NPSHR AT RATED FLOW:	21.84 ft
IMPELLER TYPE:	Enclosed
STRAINER TYPE:	Clip on basket type / 29JK

LIQUID	
LIQUID:	
SPECIFIC GRAVITY:	1.000 SG
VISCOSITY:	1.00 cP
TEMPURATURE:	68.00 deg F

WEIGHTS	
MOTOR:	3,300.0 lb
DISCHARGE HEAD:	2,250.0 lb
SOLE PLATE:	600.0 lb
BARREL:	-
COLUMN ASSY:	3,710.7 lb
BOWL ASSY:	1,881.0 lb
TOTAL:	11,741.7 lb

DISCHARGE FLANGE	
SIZE AND TYPE:	20 in. 150#RF - ANSI Flange
FLANGE DIAMETER:	27.5 in. Dia. Flange
HOLE QTY-DIAMETER:	20 - 1.25 in. Dia. holes
BOLT CIRCLE DIA:	25 in. Bolt circle

MOTOR	
MAKE:	US
ENCLOSURE:	WPI
TYPE:	VSS
POWER:	400 hp
RPM:	1200 rpm
VOLTAGE-PHASE-FREQ:	460v/3ph/60hz
FRAME NUMBER:	5009P
COUPLING TYPE:	Non spacer CPAT 2625

NOTES:
1. DRAWING NOT TO SCALE.
2. ALL DIMENSIONS IN INCHES UNLESS NOTED OTHERWISE.
3. FINAL HEAD HEIGHT WILL BE DETERMINED BASED ON INTERNAL ANALYSIS AND SPECIFICATION REVIEW.
4. TYPICAL LOCATION FOR DISCHARGE NOZZLE.

CUSTOMER: West Yost Engineers
CUSTOMER REFERENCE:
PROJECT TITLE: Turlock ID-Stanislaus Regional Water Authority
CURVE NO.:29JKL 1180

WEIR MINERALS
FLOWAY® PUMPS
Vertical Turbine Pumps

QUOTE NO.: 584406
ITEM NO.: 004
DATE: 02 Mar 2018
SIZE B
PUMPGA16