

CRESCENTA VALLEY WATER DISTRICT

2700 FOOTHILL BOULEVARD
LA CRESCENTA, CALIFORNIA

Agenda for the Meeting of the Engineering Committee
of the Crescenta Valley Water District

To be held on

March 16, 2017 at 9:00 AM

Posted March 15, 2017 at 10:00 am

Call to Order

Adoption of Agenda

Information Items

1. Status of Groundwater Wells and Well Capacity
 - Status of Well 8 – Pump Failure
2. Advertise for Quotes – New Motor Control Center for CVWD's Well 2 and Related Facilities, Project E-956
3. Discussion of FY 17/18 Capital Improvement Project Program

Public Comments

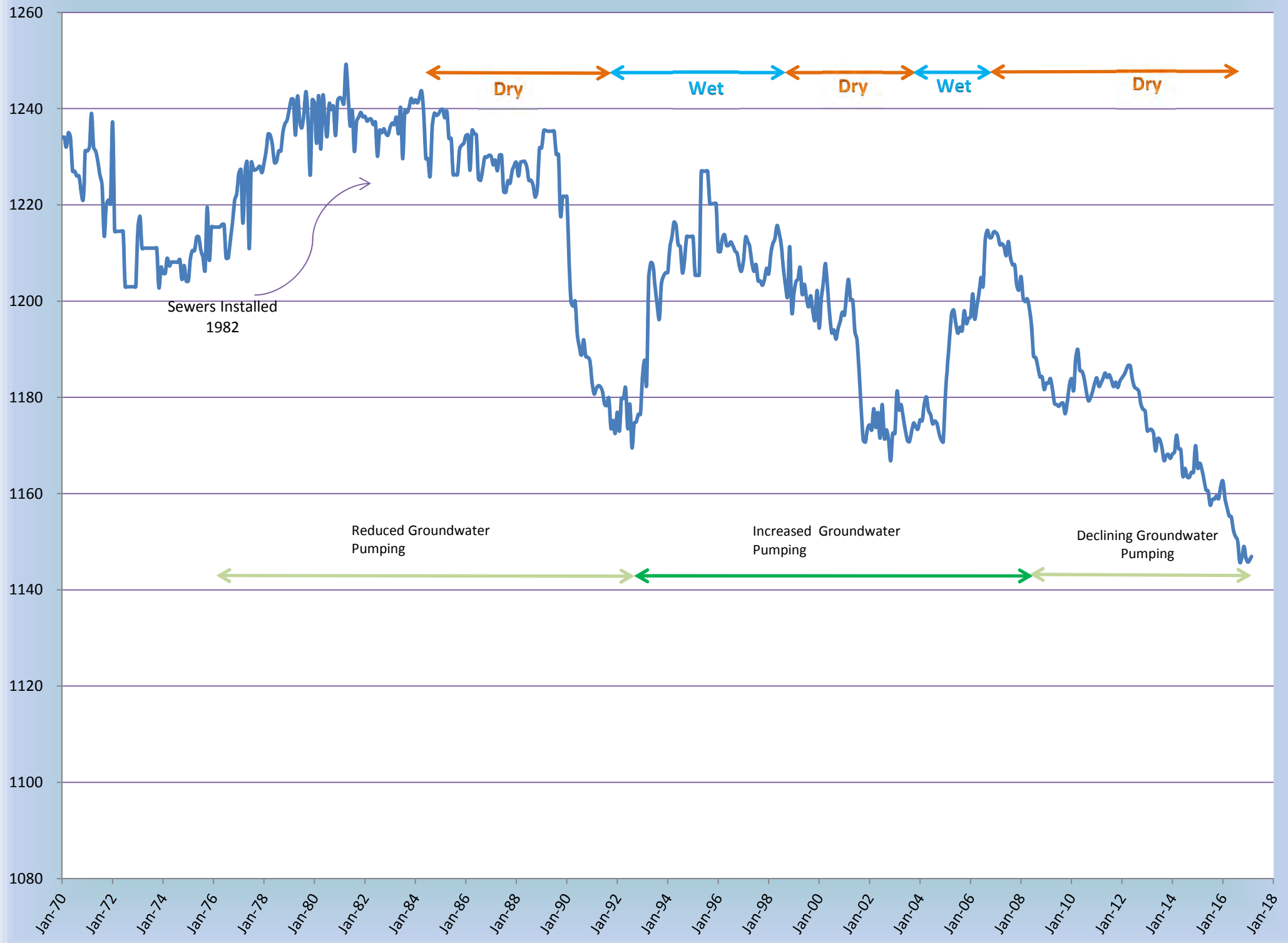
At this time, members of the public shall have an opportunity to address the Committee on items of interest that are within the subject matter jurisdiction of this Committee. This opportunity is non-transferable and speakers are limited to three (3) minutes each.

Committee Member's Request for Future Agenda Items

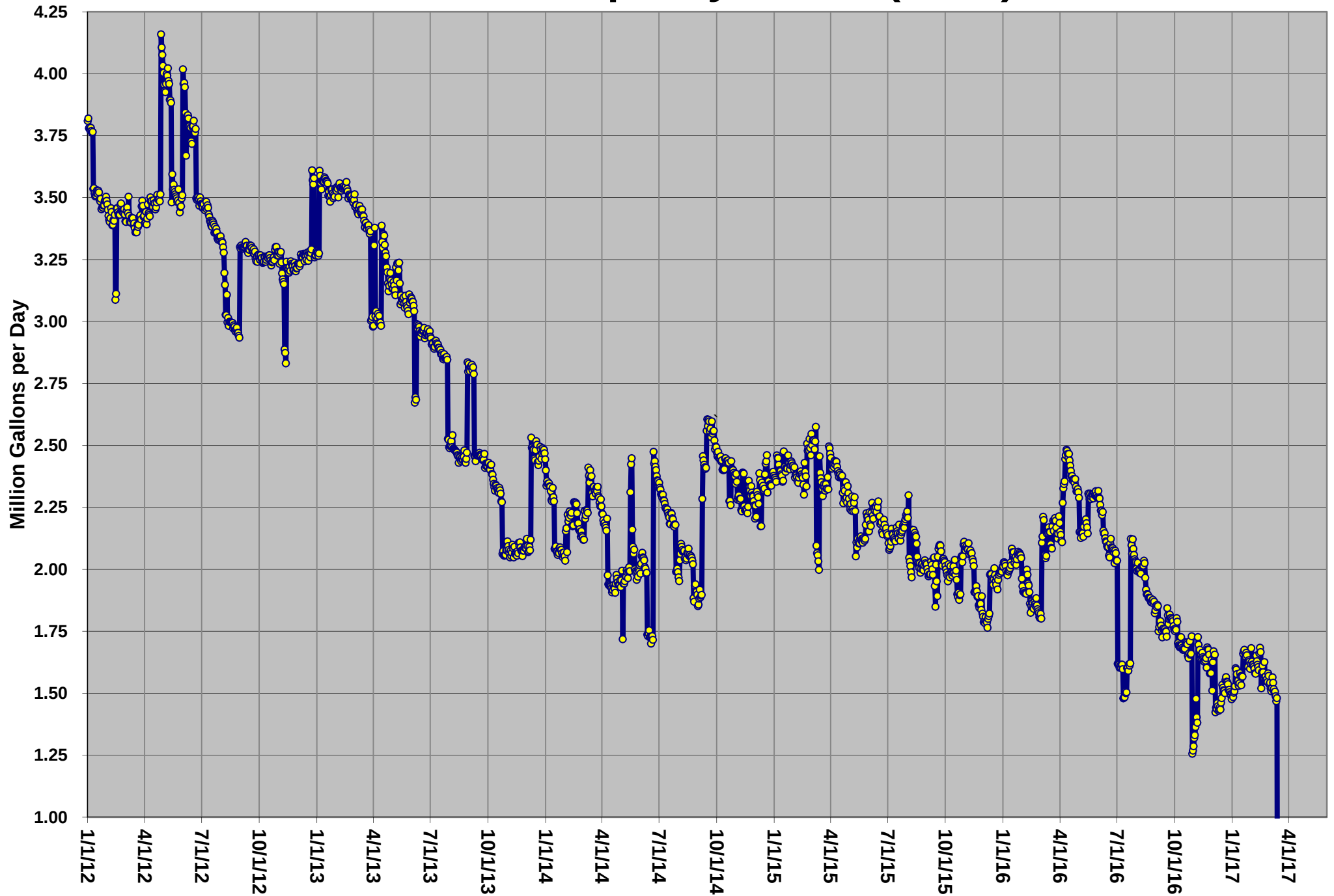
Next Engineering Committee Meeting – April 20, 2017

Adjournment

Verdugo Basin Groundwater Elevation



Crescenta Valley Water District 2012-17 Well Capacity Status (MGD)



CRESCENTA VALLEY WATER DISTRICT

STAFF REPORT

To: Engineering Committee
From: Brook Yared, M.S., P.E. – Associate Engineer
Subject: Recommendation to Proceed with Rehabilitation of Well 8

Information Item No. 2
March 16, 2017

INFORMATION ITEM:

Advertisement for Bids - Well 8 Rehabilitation, Project E-979 – Consideration and motion to authorize the General Manager to advertise for bids for the Rehabilitation of Well 8 including refurbishing the pump and motor assembly as well as rehabilitation of the well casing and liner at an estimated cost of \$60,900.

BACKGROUND:

Well 8 was rehabilitated and returned to service on August 14, 2014 by Best Drilling and Pump, Inc. (Best). Other than for minor maintenance, Well 8 has been operating on a 24/7 basis ever since. Due to concerns about aquifer levels, the well pump was throttled at the gate valve to prevent damage to the pump. While operating under these conditions, the pump failed during operation.

DISCUSSION:

Well 8 was taken out of service due to a mechanical failure on February 16, 2017. Staff contacted Best and had the pump assembly, column piping and motor removed for inspection on March 3, 2017. Prior to Best removing the well pump assembly, staff spent several days testing the well to make sure that it was not taken out of service unnecessarily.

Water Well Redevelopers was on site the following week on March 9, 2017 to perform a video inspection of the well casing. The video of the well casing showed that the louvered well liner is plugged with what appears to be mineral deposits. A well screen being plugged is a leading indicator that the casing behind it is also similarly plugged which reduces well efficiency.

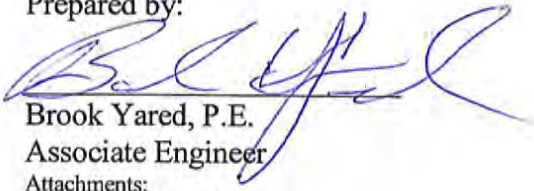
Best has since completed the tear down and inspection of the pump and motor assembly. Best found that the thrust bearing on the pump assembly had failed, which staff is attributing to the throttled operation of the pump.

RECOMMENDATION:

Staff recommends that the well liner and casing be rehabilitated using a high energy method such as sonar jetting or hydro jetting in tandem with chemical treatment, mechanical development, and brushing. The existing pump and bowl assembly did not sustain any major damage that would require purchasing a brand new pump. The 40 Hp motor is still in working order when the pump was removed from service. In order to reduce the amount of time the well is out of service, staff also recommends that the pump assembly for Well 8 to be refurbished and fit with new bearings and returned to service.

It is staff's goal to complete the rehabilitation of Well 8 by the beginning of May 2017 to maximize groundwater well production going into this summer. The project, as staff has recommended, is estimated to cost \$60,900. Staff would like to bring this project to the board for approval to advertise for bids at the March 21, 2017 meeting, so we may begin rehabilitation of the well as soon as possible.

Prepared by:

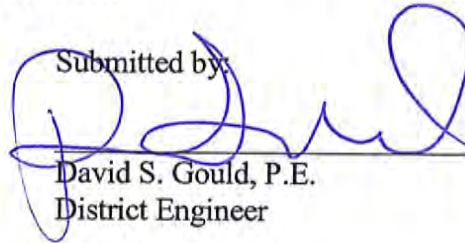


Brook Yared, P.E.
Associate Engineer

Attachments:

1 – Location Map

Submitted by:



David S. Gould, P.E.
District Engineer



WELL 8 LOCATION MAP

CRESCENTA VALLEY WATER DISTRICT

STAFF REPORT

Information Item No. 2
March 16, 2017

To: Engineering Committee
From: David S. Gould, P.E. – District Engineer
Subject: **Request to Advertise for Quotes** - New Electrical Motor Control Center and Switch Board as part of the Well 2 and Related Facilities Project E-965

INFORMATION ITEM:

CVWD's Well 2 and Related Facilities, Project E-956 – Request to Advertise for Quote for the New Electrical Motor Control Center and Switch Board as part of the Well 2 and Related Facilities Project E-965.

BACKGROUND:

CVWD received a grant from the Department of Water Resources (DWR) to reactivate Well 2 and construct a new nitrate removal treatment facility. The project will utilize a local water resource, increase CVWD's ability to use its adjudicated rights within the Verdugo Basin, reduce CVWD's dependence on imported water from MWD and reduce nitrates levels within the Verdugo Basin.

SA and Associates and staff have been working on the design of the project, which should be completed by the end of April 2017. The bidding process and approvals from the City of Glendale should be completed by the middle of July 2017. It is anticipated that construction will begin in late September 2017 and be completed by April 2018. (See attached project schedule)

DISCUSSION:

Staff requests to pre-purchase the electrical motor control center (MCC) and switchboard to meet the project schedule since this item has a long lead time for delivery. Pre-purchasing the equipment will necessitate preparing a Request for Quote (RFQ) which will include the requirements and a time limit for delivery of MCC.

The new MCC will be an Allen-Bradley CENTERLINE 2100 IntelliCENTER, which is the same MCC that CVWD recently installed at Eagle Canyon, Oak Creek and Well 16. The Allen-Bradley distributor in our area is Royal Wholesale Electric in Chatsworth, therefore this RFQ will be sole sourced to Royal Wholesale. The new switch board will be manufactured by Cutler-Hammer, which is the same manufacture for the recent projects listed above and is also provided by Royal Wholesale Electric.

Staff and SA and Associates have prepared the RFQ (see attached). The cost estimate for this equipment will be approximately \$152,000 and will need to be approved by the Board of Directors to proceed with the purchase at a future Board Meeting.

RECOMMENDATION:

Staff recommends the Engineering Committee approve sending the RFQ to Royal Wholesale for the new MCC and switchboard. The RFQ will be due on April 12, 2017 and placed on the April 18, 2017 Board agenda.

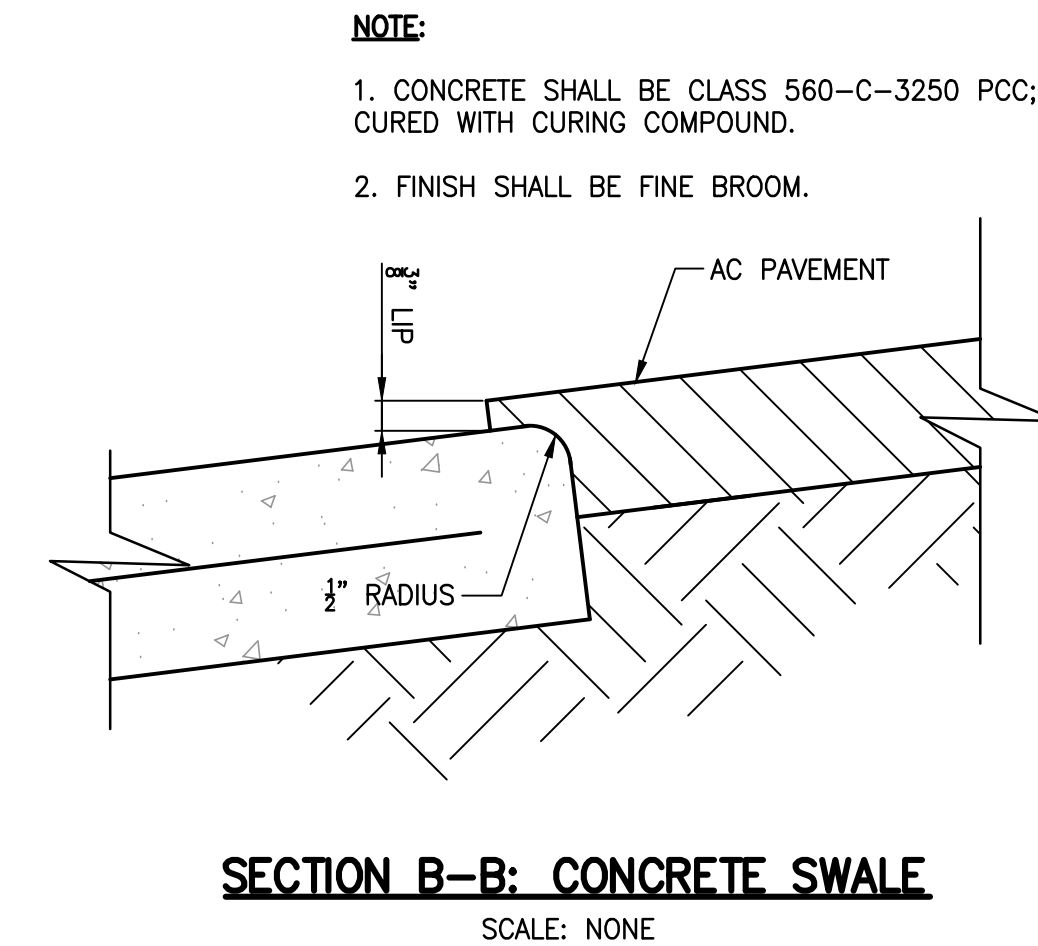
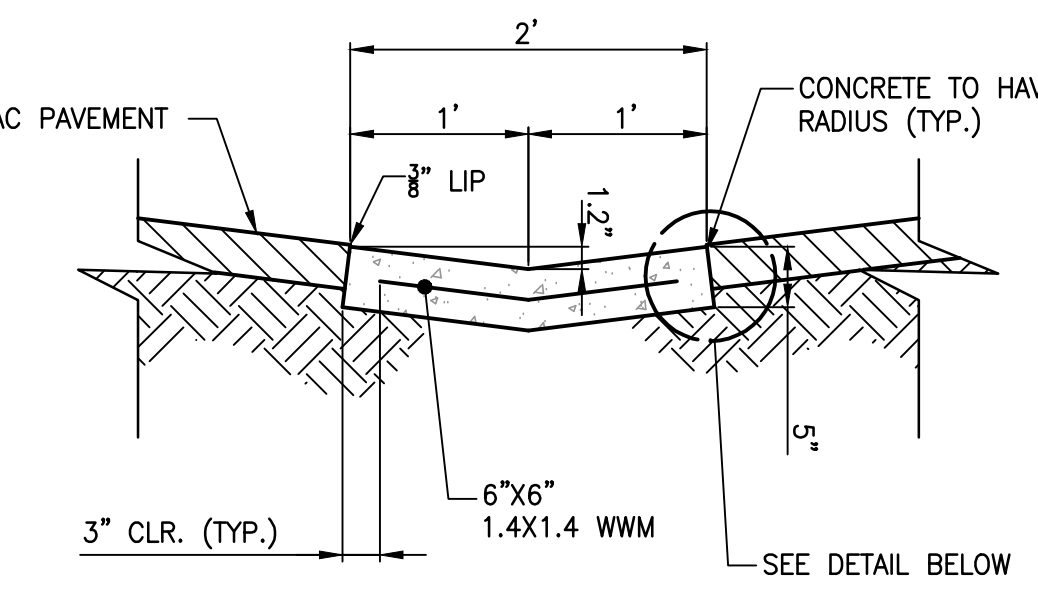
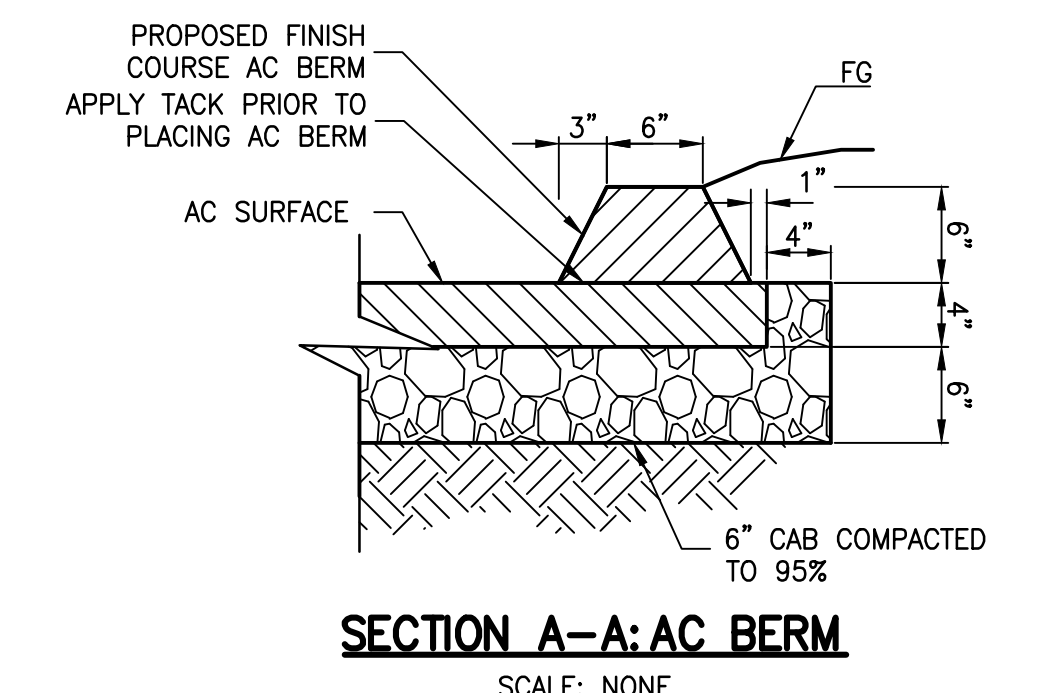
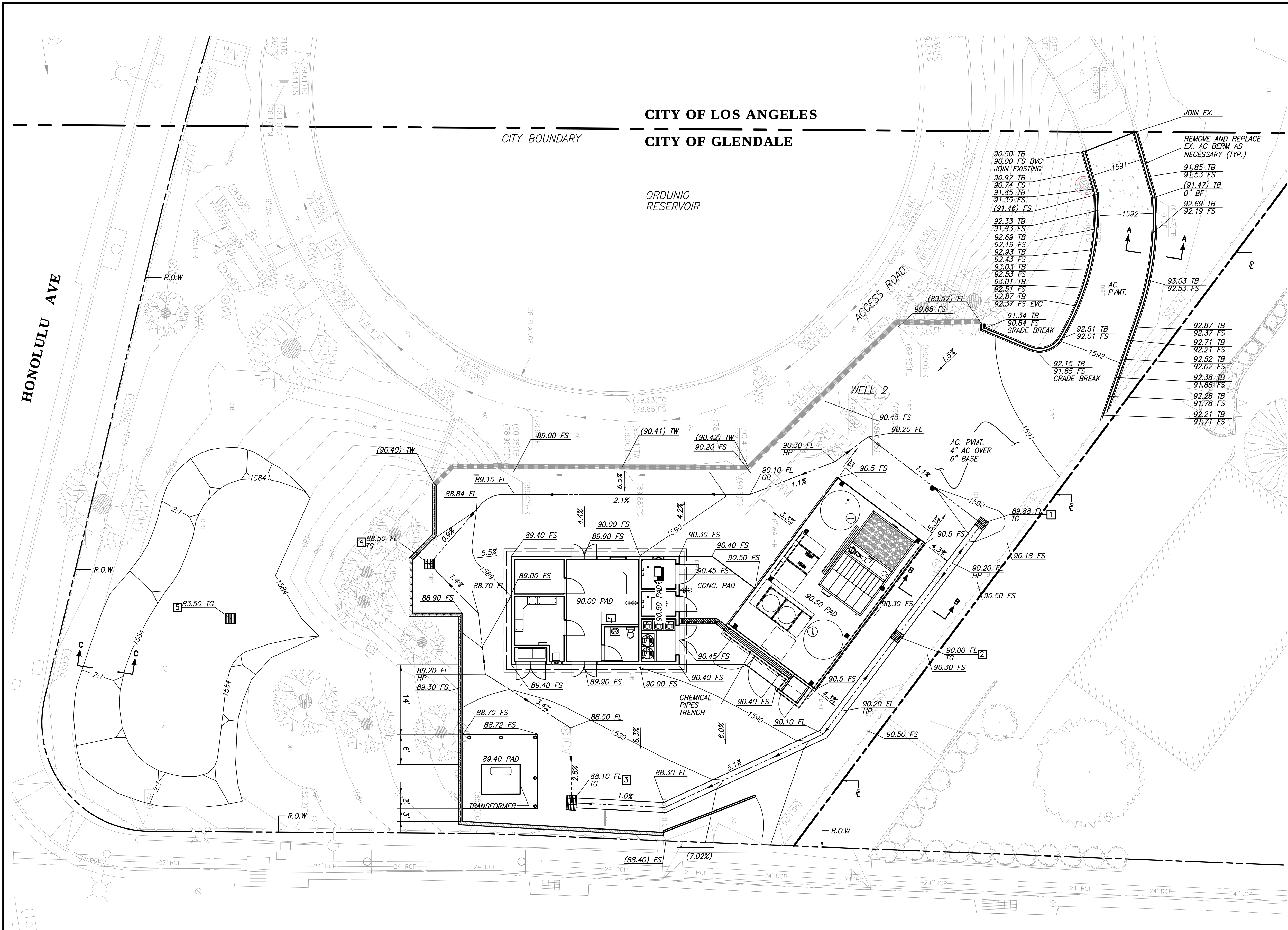
Prepared & Submitted by:



David S. Gould, P.E.
District Engineer

Attachments:

1. Well 2 – Site Plan
2. Well 2 – Project Schedule
3. Request for Quote for New MCC and Switchboard



CATCH BASIN TABLE			
#	CATCH BASIN TYPE	TOP OF GRATE ELEV.	INVERT ELEV.
1	1818-CB-DIC	89.88	87.38
2	1818-CB-DIC	90.00	87.50
3	CALTRANS D73, TYPE G1	88.10	85.10
4	1818-CB-DIC	88.50	83.50
5	1818-CB-DIC	83.50	80.00

PHONE No. 811
DIG ALERT

PLAY IT SAFE
CALL BEFORE
YOU DIG

AT LEAST TWO
WORKING DAYS
PRIOR TO EXCAVATING

SA
ASSOCIATES

CONSULTING ENGINEERS

1661 N. Raymond Ave., Suite 100, Anaheim, CA 92801
714 871-9083

REGISTERED PROFESSIONAL ENGINEER
No. 75632
Exp. 06/30/18
CIVIL
STATE OF CALIFORNIA

REV.

DATE

REVISION

REV. BY

CKD. BY

APP'D

DISCLAIMER

Approval by C.V.W.D. does not constitute a representation as to the accuracy of design or the existence and location of underground utilities, structures, and conditions within the limits of this project.

SCALE: AS SHOWN

DRAWN BY: PT / JL

CHECKED BY: JL

APPROVED: -----

AS BUILT:

DATE

DATE

DATE

CRESCENTA VALLEY WATER DISTRICT

WELL NO. 2

PRECISE GRADING, PAVING PLAN & DETAILS

SHT. 7 OF 30 SHTS.

COMPLETION DATE:

JOB NO. E-956

LINEAR FT. -----

FILE NO.

0' 10'

90% SUBMITTAL - 02/24/17

Crescenta Valley Water District

Nitrate Removal Treatment Facility at Well 2 Project

Project Schedule - Updated 3/15/17

Task	Revised Start Date	Revised End Date	Days	Comments
Glendale - Permit Submit & Approval	2/24/17	4/24/17	59	
Design 90% Submittal - CVWD Review	2/24/17	3/10/17	14	
SA Assoc - Final Submittal	3/10/17	4/28/17	49	
APT Design - Final Submittal	3/10/17	4/28/17	49	
CVWD - Final Review - All Plans	4/28/17	5/8/17	10	
CVWD - Engineering Committee Approval	5/8/17	5/11/17	3	
Staff Report	5/11/17	5/12/17	1	
CVWD Board Meeting - Advertise For Bid	5/16/17	5/16/17	0	
Pre-Bid Meeting	5/17/17	6/21/17	35	
Bid Opening	6/21/17	7/12/17	21	
CVWD - Engineering Committee Approval	7/12/17	7/13/17	1	
Staff Report	7/13/17	7/14/17	1	
CVWD Board Meeting - Award of Contract	7/18/17	7/18/17	0	
Pre-Order - MCC & Switchboard & Pre-Fab Buildings				
RFQ - MCC/Switchboard - Plans & Specs	1/5/17	3/11/17	65	
CVWD - Review RFQ - MCC/Switchboard - Plans & Specs	3/11/17	3/14/17	3	
CVWD - Engineering Committee Approval	3/14/17	3/16/17	2	
Staff Report - Complete RFQ MCC/Switchboard - Plans & Specs	3/16/17	3/17/17	1	
CVWD Board Meeting - Advertise For Bid	3/21/17	3/21/17	0	
RFQ Due	3/21/17	4/12/17	22	
CVWD - Engineering Committee Approval	4/12/17	4/14/17	2	
Staff Report - Award of Contract RFQ MCC/Switchboard	4/14/17	4/15/17	1	
CVWD Board Meeting - Award of Contract	4/18/17	4/18/17	0	
Motor Control Center	4/18/17	6/2/17	45	6 Weeks to submit shop drawings
Shop Drawing Review	6/2/17	6/23/17	21	3 Week - CVWD Review
Shop Drawing Resubmit	6/23/17	7/17/17	24	2 Weeks - Resubmit

Crescenta Valley Water District

Nitrate Removal Treatment Facility at Well 2 Project

Project Schedule - Updated 3/15/17

Task	Revised Start Date	Revised End Date	Days	Comments
Fabrication	7/17/17	10/9/17	84	12 Weeks - Fabrication
Delivery	10/9/17	10/16/17	7	1 Week - Delivery to Site
CONSTRUCTION	Revised Start Date	Revised End Date	Days	Comments
Shop Drawing Review	7/18/17	8/29/17	42	6 Weeks -shop drawing Approvals
Fabrication	8/29/17	9/25/17	27	4 Weeks - Fabrication
Construction - Mobilization	9/25/17	9/29/17	4	
Grading/Piping/Wall	9/29/17	10/27/17	28	4 weeks
Concrete Slabs	10/27/17	11/10/17	14	
Install MCC	11/10/17	11/17/17	7	MCC - Ready - 10/16/17
Install Bldg & Carport	11/17/17	12/15/17	28	
Install Piping & Power Upgrade from GWP	12/15/17	1/14/18	30	
Install - APT Water	12/15/17	2/13/18	60	
Install Equipment & New Well Pump	12/15/17	1/14/18	30	
Site Improvements & Paving	1/14/18	2/28/18	45	
Testing	2/13/18	4/1/18	47	
Project Close Out & Demobilization	4/1/18	4/15/18	14	
DDW - Approval	12/5/16	4/1/18	482	
Well 2 - Put into Service	4/1/18	4/20/18	19	
Draft Completion Report	4/15/18	6/14/18	60	
Final Completion Report	6/14/18	7/14/18	30	



CRESCENTA VALLEY WATER DISTRICT

Request for Quotes

Procurement of the New Electrical Motor Control Center and Switchboard for Well No. 2 and Related Facilities Project E-956

Date: March 21, 2017

Proposal Documents:

Contractors shall quote on providing labor, materials, and equipment for manufacturing and delivery of a new electrical motor control center (MCC) and switchboard per the following provisions. The project site is located at 4029 Lowell Avenue, Glendale, 91214.

Contractors are required to include this page and the following bid proposal when submitting their quote. The attachments provided are the bid proposal, technical provisions and appendices shall be used by the Contractor in providing this quote.

One (1) copy of the quote should be submitted as a PDF file and emailed to David Gould at dgould@cvwd.com before 12:00 p.m. **Thursday, April 11, 2017**, and originals sent via U.S. Mail to the Crescenta Valley Water District at 2700 Foothill Boulevard, La Crescenta, California 91214, Attention: David Gould.

If you have any questions before opening of this quote, please contact Jorge Lovo at SA Associates (714) 871-9083 or email to jlovo@saassociates.net

Sincerely,

CRESCENTA VALLEY WATER DISTRICT

David S. Gould, P.E.
District Engineer

CRESCENTA VALLEY WATER DISTRICT

Procurement of the New Electrical Motor Control Center and Switchboard for Well No. 2 and Related Facilities Project E-956

SPECIAL PROVISIONS

SCOPE OF WORK

Contractors shall quote on providing all materials, labor, equipment and work necessary to carry out the work as specified below on Well 2 located at 4029 Lowell Avenue, Glendale, 91214.

The work to be done under this contract will include the following:

Bid Item No. 1 - New MCC: The cost for this bid item shall include all labor, equipment and incidentals necessary for the procurement of a new MCC. The bid shall include the delivering of the assembly to the project site when instructed by CVWD. Contractor shall notify CVWD when the assembly is ready for delivery and allow CVWD to inspect the assembly at the contractor's yard.

Bid Item No. 2 - New Switchboard: The cost for this bid item shall include all labor, equipment and incidentals necessary for the procurement of a new switchboard. The bid shall include the delivering of the assembly to the project site when instructed by CVWD. Contractor shall notify CVWD when the assembly is ready for delivery and allow CVWD to inspect the assembly at the contractor's yard.

DATE OF BID OPENING

One (1) copy of the quote should be submitted as a PDF file and emailed to David Gould at dgould@cvwd.com by **Thursday, April 11, 2017 at 12:00 p.m.**, and originals sent via U.S. Mail to the Crescenta Valley Water District at 2700 Foothill Boulevard, La Crescenta, California 91214, and Attention: David Gould.

AWARD OF CONTRACT

The Owner reserves the right, after opening bids, to reject any or all bids, or to make award to lowest responsible bidder and reject all other bids. A good faith determination by the Owner as to whether a bid is responsive or whether a bidder is responsible shall be final, conclusive and binding, and shall not be the basis of a claim for lost profits or other damages by a bidder to whom the contract is not awarded.

BID PROPOSAL

Crescenta Valley Water District
2700 Foothill Boulevard
La Crescenta, California 91214

Sir or Madam:

The undersigned declares that he or she has carefully examined the location of the work, has read the Proposal, has examined the General Provisions, Technical Provisions and appendices, and hereby proposes to furnish all materials, labor and equipment to complete the bid proposal in accord with these contract documents, and will take in full payment therefore the following unit prices for the material, complete and in place, to wit:

NOTE: All applicable sales taxes, State and/or Federal, and any other special taxes, patent rights or royalties shall be included in the prices quoted in this proposal.

Item No.	Approximate Quantity	Description	Unit Price	Total
1	Lump Sum	Motor Control Center	\$	\$
1	Lump Sum	Switchboard	\$	\$

TOTAL PRICE IN WRITTEN WORDS (Bid item)

_____ Dollars
_____ and
_____ Cents \$ _____

Contractor's Name _____

Contractor's Address _____

Contractor's Telephone No. _____

Contractor's License No. _____

Date

Authorized Signature

CRESCENTA VALLEY WATER DISTRICT
Procurement of the
New Electrical Motor Control Center and Switchboard
for Well No. 2 and Related Facilities
Project E-956
GENERAL PROVISIONS

(1) LOCATION OF WORK

The project takes place at the Well No. 2 located at 4029 Lowell Avenue, Glendale, 91214.

(2) BOUNDARIES OF WORK

All work shall take place within the boundaries of the District property at 4029 Lowell Ave.

(3) TIME OF COMPLETION

The Contractor shall complete and notify CVWD that the MCC and Switchboard are ready for delivery to the project site within twenty-three (23) weeks after the date set forth in the Notice to Proceed. The delivery date will be determined by CVWD. The successful Contractor shall be completed with the project and delivery to the site by **October 16, 2017**.

(4) LIQUIDATED DAMAGES FOR DELAYS

It will be impractical or extremely difficult to fix the actual damages that may result from any delays in completion of the work beyond the date agreed upon. It is therefore stipulated and agreed that if all the work included in the contract is not completed on or before the date of completion as provided in Section 3 entitled Time of Completion or within such extensions of time as may be granted, the Contractor shall pay to the Owner as agreed, fixed and liquidated damages for each calendar days delay until said work is satisfactorily completed or until the Owner may reasonably procure the completion thereof by another contract, or complete the same itself, the sum of \$1,000.00 per calendar day.

(5) PERMITS, CERTIFICATES, AND LICENSES

Contractors submitting a proposal shall possess, at the time the contract is awarded, the following classes of contractor's license issued pursuant to Division 3, Chapter 9, of the Business and Professions Code of the State of California: A and/or C-10. The Contractor shall certify that the license(s) specified are the classification(s) of contractor's license required by law to enable the Contractor to perform the Work contemplated under the Contract Documents. Contractor shall provide Owner with their Contractor's license number and expiration date as provided in the Proposal, and shall present satisfactory evidence that they are licensed in good standing.

(6) SHOP DRAWINGS AND SUBMITTALS

Shop drawings are drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data which are prepared by the Contractor or any subcontractor, manufacturer, supplier, or distributor and which illustrate some portion of the Work.

The Contractor shall review, mark as approved, and submit for review by the District, shop drawings as called for in the Special Provisions or requested by the District. Two (2) copies of the submittals or one emailed pdf formatted copy shall be delivered to the District or the Engineer and be accompanied by a letter of transmittal listing the drawings and specifications that are included. Drawings shall show the name of the project, the name of the Contractor, and, if any, the names of suppliers, manufacturers, and subcontractors. Shop drawings shall be submitted with promptness and in orderly sequence so as to cause no delay in prosecution of the Work.

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Project E-956

Shop drawings shall be complete in all respects. If the shop drawings show any deviations from the requirements of the plans and specifications because of standard shop practices or other reasons, the deviations and the reasons therefore shall be set forth in the letter of transmittal.

By submitting shop drawings, the Contractor represents that material, equipment, and other work shown thereon conform to the plans and specifications, except for any deviations set forth in the letter of transmittal.

Within 5 days after receipt of said drawings, the District or the Engineer will return two of the copies or one pdf formatted copy of the drawings to the Contractor with any comments noted thereon. If so noted by the District or the Engineer, the Contractor shall correct the drawings and resubmit them in the same manner as specified for the original submittal. The Contractor in the letter of transmittal accompanying resubmitted shop drawings shall direct specific attention to revisions other than the corrections requested by the District or the Engineer on previous submittals.

The review by the District or the Engineer is for the limited purpose of ensuring general conformity with the design concept of the project, and general compliance with the plans and specifications only, and shall not be construed as relieving the Contractor of the full responsibility for providing materials, equipment, and work required by the Contract; the proper fitting and construction of the Work; the accuracy and completeness of the shop drawings; selecting fabrication processes and techniques of construction; and performing the Work in a safe manner.

No portion of the Work requiring a shop drawing submittal shall be commenced until the submittal has been reviewed by the District or the Engineer and returned to the Contractor with a notation indicating that re-submittal is not required.

If the Contractor believes that any shop drawing or communication relative thereto calls for changes in the Work for which the contract amount or time for completion should be changed, they shall not proceed with the changes in the Work so called for and shall promptly submit to the District a written estimate of the changes in the contract amount and time for completion the Contractor believes to be appropriate. No payment for changes in Work will be made and no change in the time for completion by reason of changes in the Work will be made, unless the changes are covered by a written change order approved by the District prior to commencement of changed Work.

(7) EXAMINATION OF CONTRACT DOCUMENTS

The bidder represents that they have carefully examined the Contract Documents and the site locations where the work is to be performed and that they have familiarized themselves with all local conditions and federal, state and local laws, ordinances, rules, and regulations that may affect in any manner the performance of the work. The bidder further represents that they have studied all surveys and investigation reports about subsurface and latent physical conditions pertaining to the area affected by the work, including the location of underground facilities, that they have performed such additional surveys and investigations as they deem necessary to complete the work at their bid price, and that they have correlated the results of all such data with the requirements of the Contract Documents. The submittal of a bid shall be conclusive evidence that the bidder has investigated and is satisfied as to the conditions to be encountered, including locality, uncertainty of weather and all other contingencies, and as to the character, quality, quantities, and scope of the work.

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The specifications for the work show subsurface conditions or otherwise hidden conditions as they are supposed or believed by the Owner to exist; but it is not intended or to be inferred that the conditions as shown thereon constitute a representation that such conditions are actually existent. Except as otherwise specifically provided in the Contract Documents, the Owner, the Engineer, and their consultants shall not be liable for any loss sustained by the Contractor as a result of any variance of such conditions as shown on the plans and the actual conditions revealed during the progress of the work or otherwise.

Where the Owner or the Engineer or their consultants have made investigations of subsurface conditions in areas where the work is to be performed, such investigations were made only for the purpose of study and design. The conditions indicated by such investigations apply only at the specific location of each boring or excavation at the time the borings or excavations were made. Where such investigations have been made, bidders or Contractors may inspect the records as to such investigations subject to and upon the conditions hereinafter set forth. The inspection of the records shall be made at the office of the Engineer.

The records of such investigations are not a part of the contract and are shown solely for the convenience of the bidder or Contractor. It is expressly understood and agreed that the Owner, and their consultants assume no responsibility whatsoever in respect to the sufficiency or accuracy of the investigations; the records thereof; or of the interpretations set forth therein or made by the Owner's consultants, the Engineer or its consultants in the use thereof by the Engineer, and there is no warranty or guarantee, either express or implied, that the conditions indicated by such investigations or records thereof are representative of those existing throughout such areas, or any part thereof, or that unlooked-for developments may not occur, or that materials other than, or in proportions, densities, or other characteristics different from, those indicated may not be encountered.

The availability or use of information described in this Section is not to be construed in any way as a waiver of the provisions of the first paragraph in this Section and a bidder or Contractor is cautioned to make such independent investigations and examination as they deem necessary to satisfy themselves as to conditions to be encountered in the performance of the work.

No information derived from such inspection of records of investigations or compilation thereof made by the Owner, the Engineer, or their consultants will in any way relieve the bidder or Contractor from any risk or from properly fulfilling the terms of the contract nor entitle the Contractor to any additional compensation.

(8) INSPECTION

All material furnished by the Contractor shall be subject to inspection, and no material shall be used until it has been inspected and accepted by the District. The Contractor shall furnish the District with full information as to the progress of the work. The District or a District's representative will inspect all work with respect to conformance to these special provisions and manufacturers recommendations.

(9) AUTHORITY OF THE OWNER'S REPRESENTATIVE

The Owner's Representative shall decide any and all questions which may arise as to the

CRESCENTA VALLEY WATER DISTRICT
Procurement of the
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for Well No. 2 and Related Facilities
Project E-956

interpretation of the plans and specifications and shall have authority to disapprove or reject materials and equipment furnished and work performed which, in his opinion, is not in accordance with the Contract Documents, and his decision shall be binding and conclusive.

(10) SAFETY

In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work, and the Contractor shall fully comply with all state, federal and other laws, rules, regulations, and orders relating to safety of the public and workers.

The right of the Owner or the Owner's Representative to conduct construction review or observation of the Contractor's performance will not include review or observation of the adequacy of the Contractor's safety measures in, on, or near the construction site.

However, in the event that the Owner determines that the Contractor has failed to ensure the safety of the public and the workers, the Owner shall give the Contractor 72-hours written notice to take appropriate action to ensure their safety.

In the event the Contractor fails to comply, and the Owner takes such steps as are reasonably necessary to ensure the safety of the public and the workers, the Contractor shall pay the cost and expenses incurred in taking such action. Should the Contractor fail to pay, the Owner may deduct the costs and expenses incurred in taking such action from any amounts then due or that may become due to the Contractor. In event, such costs and expenses exceed amounts deducted by the Owner. The Contractor shall be responsible for paying balance thereof.

(11) ONE-YEAR GUARANTEE

Besides the additional warranty required in the Technical Provisions elsewhere, the Contractor shall and hereby does guarantee the work for a period of one year after the date of acceptance of the work by the Owner. The Contractor shall repair or remove and replace any and all such work, together with any other work which may be displaced in so doing, that is found to be defective in workmanship and/or materials within said one year period, without expense whatsoever to the Owner, ordinary wear and tear and unusual abuse or neglect excepted. In the event of a failure to comply with the above-mentioned conditions within seven (7) days after being notified in writing, the Owner is hereby authorized to proceed to have the defects remedied and made good at the expense of the Contractor who hereby agrees to pay the cost and charges therefor immediately on demand. Such action by the Owner will not relieve the Contractor of the guarantees required by this article or elsewhere in the Contract Documents. The performance bond and the payment bond shall continue in full force and effect for the guarantee period.

(12) CONTRACT AGREEMENT

The Contractor shall enter into a contractual agreement with the District in accordance with the attached sample agreement (See Appendix A), along with providing the proper insurance certificates as described herein.

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for Well No. 2 and Related Facilities
Project E-956

(13) INSURANCE

The Contractor shall provide to the Owner with certificates of insurance for worker's compensation and employer's liability, comprehensive commercial liability for at least \$1,000,000 per occurrence and comprehensive automobile liability for at least \$1,000,000 per occurrence for this project. Before work may begin, if necessary, street use permits shall be provided to additionally insured agencies. In addition, the Owner shall be named as additional insured on the insurance certificates.

(14) CHANGES IN THE WORK

The Owner may require changes in, additions to, or deductions from the work, including complete termination thereof. Adjustment, if any, in the amounts to be paid to the contractor by reason of any such change, addition, or deduction shall be determined as set forth in Section 23 hereof, entitled PAYMENT FOR CHANGES IN THE WORK.

The Owner's Representative may order minor changes in the work not involving an increase or decrease in the contract amount, not involving a change in the time for completion, and not inconsistent with the purposes for which the work is being constructed.

Any dispute between the Owner and the Contractor regarding payment for changes in the work or a change in the time for completion shall proceed in accordance with the procedures set forth in Section 22 entitled CLAIMS.

(15) PROTESTS

If the Contractor considers any work required by the Owner to be outside the requirements under the Contract Documents, or if he considers any record or ruling of the Owner, the Owner's Representative or any governmental inspector to be unfair, he shall immediately upon such work being demanded or such record or ruling being made, ask for written instructions or decision, and within ten (10) days after receipt thereof file a written protest with the Owner, stating clearly and in detail his objections and the reason therefor. The Contractor shall, whether or not a written protest will be filed, immediately upon receipt of written instructions or decision proceed without delay to perform the work or conform to the record or ruling. Except for such grounds of protest or objections as are made of record in the manner specified and within the time stated herein, the Contractor hereby waives all grounds for protests or objections to the records, rulings, instructions, or decisions of the Owner or the Owner's Representative, and hereby agrees that as to all matters not included in such protests the records, instructions and decisions of the Owner or Owner's Representative shall be final and conclusive. Such protests shall proceed in accordance with the procedures set forth in Section 22 entitled CLAIMS.

(16) CLAIMS

As provided in Article 1.5 of Chapter 1 of Part 3 of Division 2 of the Public Contract Code, claims by the Contractor shall be in writing and include the documents necessary to substantiate the claim. Claims must be filed with the Owner on or before the date of final payment.

For claims of less than \$50,000, Owner shall respond in writing to any written claim within forty-five (45) days of receipt of the claim, or may request, in writing, within 30 days of receipt of the claim any additional documentation supporting the claim or relating to defenses to the claims the

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Owner may have against the Contractor. If additional information is thereafter required, it shall be requested and provided pursuant to this section, upon mutual agreement of Owner and Contractor.

The Owner's written response to the claim, as further documented, shall be submitted to the Contractor within 15 days after receipt of the further documentation or within a period of time no greater than that taken by the Contractor in producing the additional information, whichever is greater

For Claims of over fifty thousand dollars (\$50,000) and less than or equal to three hundred seventy-five thousand dollars (\$375,000), the Owner shall respond in writing to all written claims within 60 days of receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim the Owner may have against the Contractor.

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

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

If following the meet and confer conference the claim or any portion remains in dispute, the Contractor may file a claim pursuant to Government Code Section 900 et seq. and a lawsuit on the claim may be filed in the appropriate state court. The court is to order non-binding mediation, (unless waived by both parties) under strict time constraints (within 60 days following the filing of responsive pleadings). The parties are to select a mediator within 15 days and the mediation must be commenced within 30 days of the submittal to mediation.

If the matter remains in dispute, the case shall be submitted to judicial (non-binding) arbitration pursuant to Code of Civil Procedure Section 1141.10 et seq. If either party objects to the arbitrator's award, the matter can then go to trial de novo in the trial court, subject to the usual rules of litigation.

Should the party requesting trial de novo fail to obtain a more favorable judgment than that received through arbitration, such party shall, in addition to the payment of costs and fees under the arbitration provision of the Code of Civil Procedure, pay the attorney's fees arising out of trial de novo.

(17) PAYMENT FOR CHANGES IN THE WORK

Changes in, additions to, or deductions from the work, including increases or decreases in the quantity of any item or portion of the work, shall be set forth in a written change order executed

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by the Owner and by the Contractor which shall specify the following:

- The changes, additions, and deductions to be made.
- The increase or decrease in compensation due the Contractor, if any.
- Adjustment in the time of completion of the project, if any.
- Adjustment in the compensation due Contractor shall be determined by one or more of the following methods in the order of precedence per the unit prices contained in the bid proposal or a mutually agreeable lump sum or unit prices.

If requested by the Owner's Representative, the Contractor shall furnish an itemized breakdown of the quantities and prices used in computing proposed lump sum and unit prices.

Any disputes regarding payment for changes in the work or for extra work, or regarding extensions of time, shall proceed in accordance with the procedures set forth in Section 22 entitled CLAIMS.

(18) PROGRESS PAYMENTS

The Contractor shall, on or before the tenth day of each calendar month after the CVWD has been notified that the assembly is ready for delivery and CVWD has inspected the assembly at the contractors yard, cause an estimate in writing to be made and submitted to the Owner's Representative of the 50% of the value of the assembly by the Contractor.

The Owner shall retain ten percent (50%) of such estimated value as part security for the fulfillment of the contract by the Contractor and shall within thirty (30) days of the date which the estimate is received pay to the Contractor the balance of such estimated value after deducting therefrom all previous payments and all sums to be kept or retained under the terms of the contract.

The payment request shall be reviewed by the Owner as soon as practicable after receipt for the purpose of determining that the payment request is proper. Any payment request determined not to be proper shall be returned to the Contractor not later than seven (7) days after receipt by the Owner's Representative. Such returned requests shall be accompanied by a written explanation of the reasons why the payment request is not proper.

(19) FINAL ESTIMATE AND PAYMENT

When the assembly has been delivered and the Owner's Representative finds the assembly meeting the specifications will recommend to the Owner that the final 50% if the bid price be paid therefor under the terms of the contract. If the Owner finds the work has been completed according to the contract, he shall accept the work, shall file a notice of completion, and shall pay the entire sum so found to be due after deducting therefrom all previous payments and all amounts to be retained under the provisions of the contract. All prior progress estimates and payments shall be subject to correction in the final estimate and payment. Final payment shall not be due and payable until expiration of thirty-five (35) days from date of filing a notice of completion of work by Owner.

It is mutually agreed between the parties to the contract that no certificate given or payment made under the contract shall be conclusive evidence of performance of the contract and no payment shall be construed to be an acceptance of any defective work or improper materials. The

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Contractor further agrees that the payment of the final amount due under the contract shall release the Owner, the Owner's Representative, and their consultants, and each of their directors, officers, employees, and agents from any and all claims or liability arising out of the contract.

(20) TERMINATION FOR BREACH

If the Contractor refuses or fails to prosecute all or any part of the Work with such diligence as will ensure its completion within the time specified herein, or any extension thereof, or fails to complete such work within such time, or if the Contractor is adjudged a bankrupt, or makes a general assignment for the benefit of their creditors, or if a receiver is appointed on account of their insolvency, or if they file a petition to take advantage of any debtor's Act, or if the Contractor or any of their subcontractors violate any of the provisions of the contract, or refuse or fail to supply enough properly skilled workers or proper materials to complete the Work in the time specified, as adjusted by any time extensions granted, or they fail to make prompt payment to subcontractors or for material or labor, or if the Contractor disregards any laws or ordinances, or instructions given by Owner or Owner's Representative, the Owner may, without prejudice to any other right or remedy, serve written notice upon the Contractor and their surety of its intention to terminate the contract.

Such notice by the Owner shall set forth the reasons for the intended termination of the contract, and unless within ten days after the service of such notice such violations shall cease and satisfactory arrangements for the corrections thereof be made, the contract shall upon the expiration of said ten days cease and terminate. In such case, the Contractor shall not be entitled to receive any further payment until the Work is finished.

Upon termination as provided above, the Owner shall immediately give written notice to the surety and the Contractor, and the surety shall have the right to take over and perform the contract; provided, however, that if the surety within fifteen (15) days after receipt of a notice of termination does not notify the Owner in writing of its intention to take over and perform the contract, or does not commence performance of the contract within thirty (30) days from the date of serving said notice, the Owner may take over the Work and prosecute the same to completion by contract or by any other method it may deem advisable for the account and at the expense of the Contractor, and their surety shall be liable to the Owner for any excess cost or other damage occasioned the Owner thereby, and in such event the Owner may, without liability for so doing, take possession of and utilize in completing the Work such materials, appliances, plants, and other property belonging to the Contractor that may be on the site of the Work or on any other property of Owner and be necessary for the Work.

For any portion of such work that Owner elects to complete by furnishing its own employees, materials, tools, and equipment, the Owner shall be compensated for such in accord with the schedule of compensation for cost-plus work in Section 23, entitled PAYMENT FOR CHANGES IN THE WORK. If the unpaid balance of the contract price exceeds the direct and indirect costs of completing the Work, including, but not limited to, all costs to Owner arising from professional services and attorneys' fees and all costs generated to insure or bond the work of substituted contractors or subcontractors utilized to complete the Work, such excess shall be paid to Contractor.

If such costs exceed the unpaid balance, Contractor shall pay the difference to Owner promptly

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upon demand; on failure of Contractor to pay, the Surety shall pay on demand by Owner. Any portion of such difference not paid by Contractor or surety within thirty (30) days following the mailing of a demand for such costs by Owner shall earn interest at the rate of ten percent (10%) per annum or the maximum rate authorized by California law, whichever is lower.

The foregoing provisions are in addition to and not in limitation of any other rights or remedies available to the Owner.

(21) NOTICE AND SERVICE THEREOF

Any notice required or given under the contract shall be in writing, be dated, and signed by the party giving such notice or their duly authorized representative, and be served as follows:

- If to the Owner, by personal delivery or by deposit in the United States mail.
- If to the Contractor, by personal delivery to the Contractor or to their authorized representative at the site of the project or by deposit in the United States mail.
- If to the surety or any other person, by personal delivery to said surety or other person or by deposit in the United States mail.

All mailed notices shall be in sealed envelopes, shall be sent by certified mail with postage prepaid, and shall be addressed to the addresses in the Contract Documents or such substitute addresses which a party designates in writing and serves as set forth herein.

Any notice served in accordance with this section, shall be deemed received by the addressee seventy-two (72) hours after deposited, postage prepaid, in the United States mail.

(22) ATTORNEYS' FEES

In any action, at law or in equity, including an action for declaratory relief, seeking to interpret or enforce the terms of the Contract, the prevailing party shall be entitled to recover a reasonable amount as attorneys' fees and costs incurred in prosecuting or defending such action, including a dispute submitted to arbitration, in addition to any other relief to which such party is entitled.

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TECHNICAL PROVISIONS

- (1) SEE SPECIFICATION SECTIONS 16010, 16030, 16280, 16310, 16400, 16450, and 16480
- (2) SEE DRAWING: SINGLE LINE DIAGRAM, MCC & SWITCHBOARD

APPENDIX A

SAMPLE STANDARD CONTRACT AGREEMENT

CRESCENTA VALLEY WATER DISTRICT

2700 Foothill Boulevard

La Crescenta, California 91214

Telephone (818) 248-3825 – FAX (818) 248-1659

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Some of the important terms of this Agreement are printed on Page 2. For your protection make sure that you read and understand all provisions before signing. The terms on Page 2 are incorporated in this document and will constitute a part of the Agreement between the parties when signed.

TO: **Contractor Name** DATE: MM/DD/YYYY

Company Name

Street Address

City, State, Zip

The undersigned Contractor offers to furnish the following:

To provide all work necessary for the project including providing labor, materials, and equipment for manufacturing and delivery of a new electrical motor control center (MCC) and switchboard at 2740 Hermosa Ave., La Crescenta, CA, 91214 as per Crescenta Valley Water Districts Request for Quote titled "Procurement of the new electrical Motor Control Center and Switchboard for Well No. 2 and Related Facilities dated March 21, 2017.

Contract price: Not to Exceed \$_____ unless approved by General Manager

Completion date: July 31, 2017

Instructions: Sign and return original. Upon acceptance by the Crescenta Valley Water District, a copy will be signed by its authorized representative and promptly returned to you. Insert below the names of your authorized representatives(s).

Accepted:

Contractor:

Crescenta Valley Water District

By _____

By _____

Title _____

Title _____

Authorized Representative

Authorized Representative

Contractor agrees with Crescenta Valley Water District that:

- a) To the fullest extent permitted by law, Contractor will defend, indemnify and hold harmless Crescenta Valley Water District, its directors, officers, employees or authorized volunteers from all claims and demands of all persons arising out of the performance of the work or the furnishing of materials; including but not limited to, claims by the Contractor or Contractor's employees for damages to persons or property except for the sole negligence or willful misconduct or active negligence of Crescenta Valley Water District, its directors, officers, employees, or authorized volunteers.
- b) By his/her signature hereunder, Contractor certifies that he/she is aware of the provisions of Section 3700 of the California Labor Code which requires every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and he/she will comply with such provisions before commencing the performance of the work of this Agreement. Contractor and sub-contractors will keep workers' compensation insurance for their employees in effect during all work covered by this Agreement and shall file with Crescenta Valley Water District the certificate required by Labor Code Section 3700.
- c) Contractor will file with Crescenta Valley Water District before beginning work, certificates of insurance and policy endorsements satisfactory to the Crescenta Valley Water District evidencing general liability coverage, of not less than \$1,000,000 per occurrence (\$2,000,000 general and products-completed operations aggregate (if used) for bodily injury, personal injury and property damage; auto liability of at least \$1,000,000 for bodily injury and property damage each accident limit; workers' compensation (statutory limits) and employer's liability (1,000,000) (if applicable); requiring 30 days (10 days for non-payment of premium) notice of cancellation to Crescenta Valley Water District. Any insurance, self-insurance or other coverage maintained by Crescenta Valley Water District, its directors, officers, employees, or authorized volunteers shall not contribute to it. The general liability coverage shall give Crescenta Valley Water District, its directors, officers, employees, or authorized volunteers insured status using ISO endorsement CG2010, CG2033, or equivalent. Coverage is to be placed with a carrier with an A.M. Best rating of no less than A-VII, or equivalent, or as otherwise approved by the Crescenta Valley Water District. In the event that the Contractor employs other contractors (sub-contractors) as part of the work covered by this Agreement, it shall be the Contractor's responsibility to require and confirm that each sub-contractor meets the minimum insurance requirements specified above.
- d) Contractor shall not accept direction or orders from any person other than the General Manager or persons who are designated as "other authorized representatives."
- e) Payment, unless otherwise specified on Page 1, is to be 30 days after acceptance of Crescenta Valley Water District.
- f) Permits required by governmental authorities will be obtained by Contractor and at Contractor's expense, and Contractor will comply with local, state and federal regulations and statutes including the Cal/OSHA requirements.
- g) Any change in the scope of the work to be done, method of performance, nature of materials or price thereof, or to any other matter materially affecting the performance or nature of the work will not be paid for or accepted unless such change, addition or deletion are approved in advance by Crescenta Valley Water District. Contractor's "authorized representative(s)" has the authority to execute such written change for contractor.

SECTION 16010
ELECTRICAL GENERAL PROVISIONS

PART 1. -- GENERAL

1.1 THE REQUIREMENT

A. General:

1. Any conflicts between these sections of the specifications and the construction drawings the more stringent requirement shall prevail or as decided by the ENGINEER or INSPECTOR. Such conflicts must be brought to the ENGINEER or INSPECTOR prior to purchase of equipment or devices and prior to installation. The construction drawings are not intended to violate any code requirements. If such violation is found Contractor must bring it to the attention of the ENGINEER or INSPECTOR.
2. The CONTRACTOR shall review all the drawings for code compliance and constructability and immediately bring to the attention of the Engineer any deficiencies prior to purchase of equipment or devices and prior to installation. Failure to comply with this requirement will void any claims for change order for such deficiencies.
3. The CONTRACTOR shall provide all tools, supplies, materials, equipment, and all labor necessary for the furnishing, construction, installation, testing, and operation of all electrical work and appurtenant work necessary to provide a complete and operable system, all in accordance with the requirements of the Contract Documents.
4. The CONTRACTOR shall allow for minor changes or adjustment in location of equipment or devices without additional cost to the owner. Minor adjustment entails up to five feet in any direction.
5. The provisions of this Section shall apply to all electrical items specified in the various Sections of Division 16 and all other Divisions specifying electrical items of these Specifications, except where otherwise specified or shown in the Contract Documents.

B. Responsibility:

1. The CONTRACTOR shall be responsible for:
 - a. Complete systems in accordance with the intent of these Contract Documents.
 - b. Coordinating the details of facility equipment and construction for all Specification Divisions which affect the work covered under Division 16,

Electrical.

- c. Furnishing and installing all incidental items not actually shown or specified, but which are required by good practice to provide complete functional systems.

C. Existing Conditions:

1. The electrical drawings were developed from past record drawings and information supplied by CVWD.
2. Carry out any work involving the shutdown of existing services to any piece of equipment now functioning or the tie-in of equipment to the existing system at such time as to provide the least amount of downtime and inconvenience to CVWD. Do such work when directed by the ENGINEER or the INSPECTOR.
3. After award of Contract, confer with ENGINEER/INSPECTOR to verify at each area of construction activity the location of existing underground utilities. Protect all existing underground utilities during construction.
4. NO work shall be started that involves the existing electrical system without first obtaining and completing all coordination forms required by the facility. All such coordination forms shall be submitted with drawings and procedures showing information about what, where, why and how the work will be done in accordance with the GENERAL REQUIREMENTS.

D. Intent of Drawings:

1. Electrical plan drawings show only general locations of equipment, devices, and raceway, unless specifically dimensioned. The CONTRACTOR shall be responsible for the proper routing of raceway, subject to the approval of the ENGINEER.

E. Work Included in Division 16, Electrical:

1. Electrical - General Provisions
2. Basic Materials and Methods
3. Raceways
4. Conductors
5. Grounding
6. Electrical Service and Distribution
7. Low Voltage Motor Control
8. Electrical Tests

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. The work of the following Divisions or Sections applies to the Work of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this work.
1. Section 02201 Earthwork
 2. Section 09902 Painting (Short Form).
 3. Division 11 Equipment
 4. Division 15 Mechanical
 5. Division 17 Controls and Instrumentation
 6. Work Specified Under Other Divisions:
 - a. Components for air conditioning systems, including conductors for control wiring, unless specifically shown on Electrical Drawings.
- B. Materials and equipment furnished and installed under other divisions with raceway and electrical conductors furnished, installed, and connected under Division 16, Electrical.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Without limiting the generality of other requirements of these specifications, all work specified herein shall conform to or exceed the applicable requirements of the National Electric Code (NEC); provided, that where a local code or ordinance is in conflict with the NEC, the provisions of said local code ordinance shall take precedence.
- B. All work specified herein shall conform to or exceed the applicable requirements of the referenced portions of the following publications to the extent that the provisions thereof are not in conflict with other provisions of these specifications.

1. Codes and Standards:

NEC	National Electrical Code, latest adopted edition.
CEC	California Electrical Code, latest adopted edition.

2. Commercial Standards: All material, equipment, and construction, installation, and testing procedures shall conform to applicable standards of NEMA, ANSI, and IEEE except where modified or supplemented by these Specifications. All equipment and materials shall be in accordance with the applicable requirements of the California Code of Regulations (CCR), Title 8.

- C. All equipment furnished by the CONTRACTOR shall be listed by and shall bear the label of Underwriters' Laboratories, Incorporated, (UL) or of an independent testing laboratory acceptable to CVWD.
- D. The construction and installation of all electrical equipment and materials shall comply with all applicable provisions of the Cal OSHA Safety orders (Title 8, CCR), State Building Standards, and applicable local codes and regulations.

1.4 CONTRACTOR SUBMITTALS

- A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS and Section 1300 Submittals.
- B. The CONTRACTOR shall submit complete material lists for the work of this Section. Such lists shall state manufacturer and brand name of each item or class of material. The CONTRACTOR shall also submit shop drawings for all grounding work.
- C. Shop drawings are required for materials and equipment listed in this and other sections. Shop drawings shall provide sufficient information to evaluate the suitability of the proposed material or equipment for the intended use, and for compliance with these Specifications. The following shall be included:
 - 1. Front, side, and rear elevations, footprints and top views, with dimensions
 - 2. Component data
 - 3. Connection diagrams, terminal diagrams, schematic wiring diagrams, conductor size, and type, etc.
 - 4. Finish.
 - 5. Nameplates
 - 6. Temperature limitations, as applicable
 - 7. Rating of equipment as per specifications and drawings
 - 8. Approved listing.
- D. Catalog data shall be submitted to supplement all shop drawings. Catalog cuts, bulletins, brochures, or the like or photocopies of applicable pages thereof shall be submitted for mass produced, non-custom manufactured material. These catalog data sheets shall be stamped to indicate the project name, applicable Specification section and paragraph, model number, and options. This information shall be marked in spaces designated for

such data in the stamp.

- E. Materials and Equipment Schedules: The CONTRACTOR shall deliver to the ENGINEER a complete list of all materials, equipment, apparatus, and fixtures which it proposes to use. The list shall include sizes, names of manufacturers, catalog numbers, and such other information required to identify the items.
- F. Manuals: The CONTRACTOR shall furnish manuals as specified under GENERAL REQUIREMENTS.
- G. Record Drawings: The CONTRACTOR shall maintain a marked-up set of drawings indicating "As-Built" conditions, which shall show all variations between the work as actually constructed and as originally shown on the Drawings. Show depths and routing of all concealed below-grade electrical installations. Said set of record drawings shall be available to the ENGINEER and the INSPECTOR during construction. After final inspection, the CONTRACTOR shall provide an electronic copy of the as-built drawings to CVWD.
- H. Manufacturer's Drawings: One set of equipment manufacturer's drawings shall be submitted to the ENGINEER for its records.
- I. The CONTRACTOR shall obtain and submit from the manufacturer a list of suggested spare parts for each piece of equipment according to the provisions of the GENERAL REQUIREMENTS. After approval, CONTRACTOR shall furnish such spare parts suitably packaged, identified with the equipment number, and labeled. CONTRACTOR shall also furnish the name, address, and telephone number of the nearest distributor for each piece of equipment. All spare parts are intended for use by CVWD, only. Any spare parts which the ENGINEER permits the CONTRACTOR to use for startup activities shall be replaced by the CONTRACTOR prior to CVWD's acceptance of beneficial use of the equipment.
 - 1. During the term of this Contract the CONTRACTOR shall notify the ENGINEER in writing about any manufacturer's modification of the approved spare parts, such as part number, interchangeability, model change or others. If the ENGINEER determines that the modified parts are no longer applicable to the supplied equipment, the CONTRACTOR at its expense shall provide applicable spare parts.
- J. The CONTRACTOR shall coordinate all necessary material and equipment inspection and testing with CVWD as specified under TESTING AND FABRICATION INSPECTION.
- K. The CONTRACTOR shall clearly state deviations from the specifications and/or drawings on the first page of the submittal. When deviations are taken but not specifically noted CVWD has the option and the right to have any or all items which deviated from the plans and specifications replaced at the contractors expense. Liquidated damages, if enforced, shall also apply.

1.5 QUALITY ASSURANCE

A. General:

1. Field Control of Location and Arrangement: The Drawings diagrammatically indicate the desired location and arrangement of outlets, conduit runs, equipment, and other items only. Exact locations shall be determined by the CONTRACTOR in the field based on the physical size and arrangement of equipment, finished elevations, required clearances and other obstructions. Locations shown on the Drawings, however, shall be adhered to as closely as possible.
2. All conduit and equipment shall be installed in such a manner as to avoid all obstructions and to preserve head room and keep openings and passageways clear. Where equipment is installed without instruction and must be moved, it shall be moved without additional cost to CVWD.
3. Workmanship: All materials and equipment shall be installed in accordance with printed recommendations of the manufacturer which have been reviewed by the ENGINEER and INSPECTOR. The installation shall be accomplished by workmen skilled in this type of work and installation shall be coordinated in the field with other trades so that interferences are avoided.
4. All work, including installation, connection, calibration, testing, and adjustment, shall be accomplished by qualified, experienced personnel working under continuous, competent supervision. The completed installation shall display competent work, reflecting adherence to prevailing industrial standards and methods.
5. Protection of Equipment and Materials: The CONTRACTOR shall provide adequate means for and shall fully protect all finished parts of the materials and equipment against damage from any cause during the progress of the work and until acceptable by the ENGINEER and the INSPECTOR.
6. All materials and equipment, both in storage and during construction, shall be covered in such a manner that no finished surfaces will be damaged, marred, or splattered with water, foam, plaster, or paint. All moving parts shall be kept clean and dry.
7. The CONTRACTOR shall replace or have refinished by the manufacturer, all damaged materials or equipment, including face plates of panels and switchboard sections, at no expense to CVWD.
8. Tests: The CONTRACTOR shall make all tests required by the ENGINEER or the INSPECTOR or other authorities having jurisdictions as per applicable standards. All such tests shall be performed in the presence of the ENGINEER or the INSPECTOR. The CONTRACTOR shall furnish all necessary testing equipment and pay all costs of tests, including all replacement parts and labor necessary due to damage resulting from damaged equipment or from test and correction of faulty installation.

Operational testing shall be performed on all equipment furnished and/or connected in other Sections of Division 16. Electrical and all other divisions specifying electrical items including furnishing of support labor for testing.

9. Standard test reports for mass-produced equipment shall be submitted along with the shop drawing for such equipment. Test reports on testing specifically required for individual pieces of equipment shall be submitted to the ENGINEER and the INSPECTOR for review prior to final acceptance of the project.
10. Any test failure shall be corrected in a manner satisfactory to the ENGINEER and INSPECTOR.

B. Area Designations:

1. General: For purposes of delineating electrical enclosure and electrical installation requirements of this project, certain areas have been classified in the Contract Documents as defined below. Electrical installations within these areas shall conform to the referenced code requirements for the area involved.
 - a. General Purpose Locations: Electrical work installed in areas which are not otherwise specifically classified shall be "General Purpose." Workmanship and enclosures shall comply with the general requirements of these Specifications. Enclosures shall be NEMA Type 1.
 - b. Outdoor Locations: In outdoor locations, raceway shall be rigid galvanized steel conduit; entrances shall be threaded; and fittings shall have gasketed covers. Provisions shall be made to drain the fitting or conduit system. Threaded fastening hardware shall be stainless steel. Mounting brackets shall be galvanized. Attachments or welded assemblies shall be galvanized after fabrication. Instruments and control cabinets, panels, switchboards and motor control centers shall be "Weatherproof NEMA Type 3R" except as noted on the drawings. Enclosures shall be mounted at least 1/4-inch from walls to provide an air space, unless specifically shown otherwise.
 - c. Damp Location: Locations which are indoors and 2 feet below grade elevation or are inside an underground vault shall conform to the requirements for outdoor locations; except, that the air space from walls may be less than 1/4-inch and enclosures shall be NEMA Type 4. All rooms housing liquid handling equipment are also classified as damp locations regardless of grade elevation.

C. Cleanup:

1. All parts of the materials and equipment shall be thoroughly cleaned. Exposed parts shall be thoroughly clean of cement, plaster, and other materials. All oil and grease spots shall be removed with a non-flammable cleaning solvent. Such surfaces shall be carefully wiped and all cracks and corners scraped out.

2. During the progress of the work, the CONTRACTOR shall clean the premises and shall leave the premises and all portions of the site free of debris.

D. Shop Inspection:

1. All electrical materials and equipment shall be subject to shop inspection by the INSPECTOR or representative of a Testing Agency.

PART 2. -- PRODUCTS

2.1 GENERAL

- A. Unless otherwise indicated, provide all first-quality, new materials and equipment, free from any defects, in first-class condition, and suitable for the space provided. Provide materials and equipment listed by UL wherever standards have been established by that agency.
- B. Where two or more units of the same class of material or equipment are required, provide products of a single manufacturer. Component parts of materials or equipment of the same manufacturer are preferred.
- C. All electrical equipment shall be approved by a testing laboratory recognized by CVWD and shall conform to all applicable requirements of CVWD. This shall include the plant preferred list of equipment and components specified in the plans and specifications. The recommended use of a product in these specifications in no way implies approval by CVWD and acceptance of non-UL listed products. Shop drawings acceptance by the ENGINEER shall in no way invalidate the requirements of the UL for listed equipment.

2.2 STANDARD PRODUCTS

- A. Unless otherwise indicated, provide materials and equipment which are the standard products of manufacturers regularly engaged in the production of such materials and equipment. Provide the manufacturers' latest standard design that conforms to these Specifications.

2.3 EQUIPMENT FINISH

- A. Provide materials and equipment with manufacturers' standard finish system, in accordance with Division 9 Finishes. Provide manufacturers' standard finish color, except where specific color is indicated. If manufacturer has no standard color, finish equipment in accordance with Division 9 Finishes with ANSI No. 61, light gray color.

2.4 SPECIAL TOOLS

- A. The CONTRACTOR shall provide all special tools required for operation and maintenance of the equipment. The tools shall be considered as part of the product and become the property of CVWD.

PART 3. -- EXECUTION

3.1 GENERAL

- A. Install materials and equipment in a workmanlike manner utilizing craftsmen skilled in the particular trade. Provide work which has a neat and finished appearance. Carry out work in accordance with NECA Standard of Installation unless otherwise specified.
- B. Coordinate electrical work with ENGINEER and the INSPECTOR and work of all other trades to avoid conflicts, errors, delays, and unnecessary interference with operation of the plant during construction.

3.2 PROTECTION DURING CONSTRUCTION

- A. Throughout this Contract, provide protection for materials and equipment against loss or damage in accordance with provisions elsewhere in these Contract Documents. Throughout this Contract, follow manufacturers' recommendations for storage. Protect everything from the effects of weather. Prior to installation, store items in clean, dry, indoor locations. Store in clean, dry, indoor, heated locations items subject to corrosion under damp conditions, and items containing electrical insulation, such as transformers, conductors, motors, and controls. Provide temporary heating, sufficient to prevent condensation, in transformers, switchgear, switchboards, motors, and motor control centers which do not have space heaters.
- B. Following installation, protect materials and equipment from corrosion, physical damage, and the effects of moisture on insulation. When equipment intended for indoor installation is installed at the CONTRACTOR's convenience in areas where it is subject to dampness, moisture, dirt, or other adverse atmosphere until completion of construction, ensure that adequate protection from these atmospheres is provided that is acceptable to the ENGINEER and the INSPECTOR. Cap conduit runs during construction with manufactured seals. Keep openings in boxes or equipment closed during construction. Energize all space heaters furnished with equipment.

3.3 MATERIAL AND EQUIPMENT INSTALLATION

- A. Follow manufacturers' installation instructions explicitly, unless otherwise indicated. Wherever any conflict arises between the manufacturers' instructions, codes and regulations, and these Contract Documents, follow ENGINEER's decision. Keep copy of manufacturers' installation instructions on the jobsite available for review at all times.
- B. Use appropriate conduit and conductor entry fittings with enclosures which maintain the

specified enclosure environmental capability after proper installation.

3.4 REMOVAL OR RELOCATION OF MATERIALS AND EQUIPMENT

- A. Where existing materials and equipment are removed or relocated, remove all materials no longer used such as studs, straps, conduits, and wires. Remove or cut off concealed or embedded conduit, boxes, or other materials and equipment to a point at least 24 inches below the final finished surface. Such removal shall be coordinated with the Owner.
- B. Repair affected surfaces to conform to the type, quality, and finish of the surrounding surface in a neat and workmanlike manner. Follow any specific instructions given under Division 9, Finishes. Utilize skilled craftsmen of the trades involved.

3.5 CUTTING AND PATCHING

- A. Lay out work carefully in advance. Do not cut or notch any structural member or building surface without specific approval of ENGINEER or the INSPECTOR. Carefully carry out any cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, paving, or other surfaces required for the installation, support, or anchorage of conduit, raceways, or other electrical materials and equipment. Following such work, restore surfaces neatly to original condition. Utilize skilled craftsmen of the trades involved.

3.6 LOAD BALANCE

- A. The Drawings and Specifications indicate circuiting to electrical loads and distribution equipment. Balance electrical load between phases as nearly as possible on switchboards, panelboards, motor control centers, etc.

3.7 PHASING SEQUENCE

- A. Coordinate motor phasing inspections with the ENGINEER/INSPECTOR and the CONTRACTOR responsible for the driven equipment. Submit a written report to the ENGINEER for each motor verifying that phasing has been checked and corrected.

3.8 CLEANING AND TOUCHUP PAINTING

- A. Keep the premises free from accumulation of waste material or rubbish. Upon completion of work, remove all materials, scraps, and debris from premises and from interior and exterior of all devices and equipment. Touch up scratches, scrapes, or chips in interior and exterior surfaces of devices and equipment with finishes matching as nearly as possible the type, color, consistency, and type of surface of the original finish. If extensive damage is done to equipment paint surfaces, refinish the entire equipment in a manner that provides a finish equal to or better than the factory finish, that meets the requirements of the Specifications, and that is acceptable to the ENGINEER and the INSPECTOR.

3.9 INSPECTION

- A. Allow materials, equipment, and workmanship to be inspected at any time by the ENGINEER or the INSPECTOR. Correct work, materials, or equipment not in accordance with these Contract Documents or found to be deficient or defective in a manner satisfactory to the ENGINEER and the INSPECTOR.

3.10 SERVICE CONTINUITY

- A. Maintain continuity of electric service to all functioning portions of the process or buildings during hours they are normally in use. Temporary outages will be permitted during cutover work at such times and places as can be prearranged with ENGINEER and the electric utility company providing service to the facility. Such outages shall be kept to a minimum number and minimum length of time. Make no outages without prior written authorization of the ENGINEER and notification of the INSPECTOR. Include all costs for temporary wiring and overtime work required in the Contract price. Remove all temporary wiring at the completion of the work.

3.11 CHECKOUT AND STARTUP

- A. During checkout and startup of the various plant systems, provide a crew of skilled craftsmen to be available for checkout and troubleshooting activities as required by the ENGINEER. Since coordination with other crafts and CONTRACTORS will often be required, the craftsmen assigned to checkout must be available outside normal working hours when necessary.

3.12 TESTS

- A. General: Carry out tests specified hereinafter and as indicated under individual items of materials and equipment specified in other sections.
- B. Operations: After the electrical system installation is completed and at such time as the ENGINEER or the INSPECTOR may indicate, conduct an operating test for approval. Demonstrate that the equipment operates in accordance with the requirements of these Specifications and Drawings. Demonstrate that protective functions are operating properly and are properly incorporated in control system, circuit breaker, and motor control center circuitry. Perform the test in the presence of the ENGINEER and the INSPECTOR. Furnish all instruments and personnel required for the tests.

-- END OF SECTION --

SECTION 16030

ELECTRICAL TESTS

PART 1 **GENERAL**

1.1 SECTION INCLUDES

- A. Provide the services of a qualified Electrical Testing Agency (ETA) to perform the functions described below:
 - 1. Acceptance tests, inspections, and system function tests of certain electrical systems, equipment, components, and material (SSCs) installed under the scope of this Project; refer to Part 3 of this Section.
 - 2. System function tests after completion of acceptance tests on certain electrical SSCs installed under the scope of this Project.
 - 3. The following power system studies based on the installed electrical SSCs:
 - a. Final short circuit study
 - b. Final coordination study
 - c. Arc-flash hazard analysis

1.2 REGULATORY REQUIREMENTS

- A. Make inspections and tests in accordance with the following codes and standards:
 - 1. InterNational Electrical Testing Association - NETA ATS-current edition, Acceptance Testing Specifications (ANSI). NETA ATS forms a part of this specification to the extent referenced.
 - 2. National Fire Protection Association – NFPA
 - a. NFPA 70: *National Electrical Code* (ANSI) (NEC)
 - b. NFPA 70B: *Recommended Practice for Electrical Equipment Maintenance* (ANSI)
 - c. NFPA 70E: *Standard for Electrical Safety in the Workplace* (ANSI).
 - 3. Institute of Electrical and Electronics Engineers - IEEE
 - a. IEEE Std 242: *IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems*
 - b. IEEE Std 399: *IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis*
 - c. IEEE Std 1584: *IEEE Guide for Performing Arc-Flash Hazard Calculations*

1.3 QUALITY ASSURANCE

- A. The ETA shall be an independent testing organization which shall function as an unbiased testing authority, professionally independent of the manufacturers, suppliers, and installers of the equipment or systems to be evaluated.
- B. The ETA shall be regularly engaged in the testing of electrical equipment devices, installations, and systems.
- C. The ETA shall have a documented quality assurance program, documented inspection and test and procedures, and a documented electrical safety program.
- D. The ETA shall have successfully completed not less than ten acceptance testing, inspection and calibration projects of similar scope to this project.
- E. The ETA shall have a calibration program, and test instruments used shall be calibrated in accordance with NETA ATS.
- F. Each ETA technician performing testing, inspection, calibration, and adjustments shall be a “qualified person” as defined by NFPA 70E and the NEC.
 - 1. Technicians performing these electrical tests and inspections shall be trained and experienced concerning the apparatus and systems being evaluated.
 - 2. Technicians shall be capable of conducting the tests in a safe manner with complete knowledge of the hazards involved and the appropriate safety-related work practices.
 - 3. Technicians shall be qualified to evaluate the test data and make a judgment on the serviceability of the specific equipment.
- G. Testing, inspection, calibration, and adjustments shall be performed or supervised on the Project site by an ETA employee with the following minimum qualifications:
 - 1. A minimum of 5 years' experience inspecting, testing, and calibrating electrical distribution and generation equipment, systems, and devices, and
 - 2. One of the following certifications/registrations:
 - a. An engineering technician certified to at least Level III in accordance with ANSI/NETA ETT *Standard for Certification of Electrical Testing Technicians* (ANSI), or
 - b. An engineering technician certified to at least the NICET ET-grade in Electrical Testing Engineering Technology, or

1.4 SUBMITTALS

- A. Submit the following in accordance with Section 1300 Submittal Procedures and Section 16010:
 - 1. Certifications: Submit name and qualifications of the ETA.

2. Certifications: Submit quality assurance program of the ETA.
3. Certifications: Submit instrument calibration program of the ETA.
4. Certifications: Submit electrical safety program of the ETA.
5. Certifications: Submit name and qualifications of the lead engineer or engineering technician performing the required testing services. Include a list of three comparable jobs performed by the individual with specific names and telephone numbers for reference.
6. Test Plans: Submit acceptance and system functions test plan for each item of equipment or system to be field tested at least 45 days prior to planned testing date. Include applicable procedures, forms, and lists of test equipment. Do not perform testing until test plan and procedures have been approved.
7. Test Reports: Submit certified copies of inspection reports, test reports, and system function tests. Reports shall include certification of compliance with specified requirements including test instrument calibration, identification of deficiencies, and recommendation of corrective action when appropriate. Type and neatly bind test reports to form a part of the final record. Submit test report not more than 10 days after each test is completed.
8. Calculations: Submit certified copies of power system studies listed below. Calculations shall include certification of compliance with specified requirements, identify deficiencies, and recommend corrective action when appropriate. Type and neatly bind Calculations to form a part of the final record. Submit power system studies in paper format and also in electronic format transmitted on a CD-ROM.
 - a. Final short circuit study
 - b. Final coordination study
 - c. Arc-flash hazard analysis

1.5 COORDINATION

- A. Schedule the project to allow adequate time for electrical acceptance testing BEFORE equipment or system is energized.
 1. Notify the ETA when equipment becomes available for acceptance inspections and tests.
 2. Coordinate work to expedite inspections and tests.
- B. Notify CVWD at least 14 days in advance scheduled acceptance tests, inspections, and system function tests.
 1. Notify CVWD again approximately 24 hours before start of testing.
 2. CVWD will arrange for witnessing of the tests and inspections by appropriate CVWD personnel when required by the Test & Inspection Plan, the applicable

codes and consensus Standards or when deemed appropriate by CVWD Design Authority.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.1 GENERAL

- A. Tests shall be performed by a third party testing company. Electrical Contractor shall submit a testing company for approval by CVWD prior to bid. If no testing company is submitted prior to bid CVWD shall determine and assign the testing company to be employed by the Electrical Contractor at no additional to CVWD. Acceptable testing companies are Power Engineers, Inc. (714) 507-2700, Industrial Tests, Inc. (888) 809-8550 or Halco Testing Services (800) 300-5773. Companies listed may not provide all the testing and may employ more than one company.
- B. Perform the installation insulation-resistance, continuity, and rotation tests for electrical SSCs described in each Section of these Specifications before, and in addition to, tests performed by the ETA that are specified in this Section.
- C. Supply suitable and stable electrical power, adequate lighting, and heating or ventilation as required at each test site for the ETA to perform the specified acceptance testing.
- D. Supply one set of the following to ETA prior to the performance of any final testing:
 - 1. Preliminary short-circuit analysis
 - 2. Preliminary coordination study and protective device setting table
 - 3. Complete set of electrical Drawings, Specifications, and any pertinent Change Orders
 - 4. Approved construction submittal documents for material and equipment
 - 5. Site specific hazard notification and safety training.
 - 6. Other information necessary for a safe and accurate test and inspection of the system.

3.2 INSPECTION AND TEST PROCEDURES

- A. The ETA shall perform the acceptance tests and inspections.

- B. The ETA shall use test methods, follow procedures, and evaluate test values in accordance with the applicable sections of the NETA ATS, the manufacturer's recommendations, and each applicable specification section.
- C. Tests identified as optional in NETA ATS are not required unless specified.
- D. Place equipment in service only after completion of required tests and evaluation of the test results.
- E. The ETA shall perform acceptance tests and inspections on electrical SSCs as identified in the following paragraphs. Perform tests and inspections as specified in the applicable clauses of the NETA ATS and as modified by the following paragraphs:
1. Section 16120 –Conductors.
 - a. Test low-voltage conductors using the graded approach indicated in Table 1 of this Section.

TABLE 1 - Low Voltage Electrical Power Conductors (Management Level (ML) as determined by AP-341-502)	• ML-1 SSCs • ML-2 SSCs					• ML-3 SSCs (Note 1) • ML-4 SSCs				
	Service	Feeder	Branch >6 AWG	Branch ≤6 AWG	Control > 120V	Service >800 A	Feeder > 800 A	Branch >6 AWG	Branch ≤6 AWG	Control > 120V
Inspection or Test per NETA ATS										
Compare conductor data with drawings and specifications.	X	X	X	X	X	X	X			
Inspect for physical damage and correct connections.	X	X	X	X	X	X	X			
Inspect connections for high resistance.	X	X	X	X	X	X	X			
Inspect compression applied connections for correct cable match and indentation.	X	X	X	X	X	X	X			
Inspect for correct identification and arrangements.	X	X	X	X	X	X	X			
Inspect jacket insulation.	X	X	X	X	X	X	X			
Test connections for high resistance using low-resistance ohmmeter.	X	X	X	X	X	X	X			
Perform insulation-resistance test on each conductor to ground and other conductors.	X	X	X	X	X	X	X			
Perform continuity tests to insure correct connections.	X	X	X	X	X	X	X			
Verify uniform resistance of parallel conductors.	X	X	X			X	X			
Note 1: For ML-3 systems CVWD Design Authority may invoke more rigorous electrical acceptance testing requirements.										

2. Section 16450 – Grounding.
 - a. ML-1 or ML-2 low-voltage systems: Test grounding and bonding for each system and circuit.
3. Section 16800 – Electric Motors
 - a. ML-1 or ML-2 motors: Test each motor rated more than 3/4 hp and perform a vibration baseline test on each motor rated 10 hp and greater.

TABLE 2 - Molded Case Circuit Breakers (Management Level (ML) as determined by AP-341-502)	- ML-1 SSCs - ML-2 SSCs			- ML-3 SSCs (Note 1) - ML-4 SSCs			
	Circuit Breaker Type/Size	Main C/B	Feeder C/B	Branch Circuit C/B	C/B > 800 A Frame	If C/B is part of a switchboard, panelboard, MCC or busway rated >800 A.	
Inspection or Test per NETA ATS					C/B ≥ 400 A Frame	C/B ≥ 150A Frame	C/B < 150A Frame
Compare nameplate data with drawings and specifications		X	X	X	X	X	X
Inspect physical and mechanical condition.		X	X	X	X	X	X
Inspect anchorage and alignment.		X	X	X	X	X	
Verify the unit is clean.		X	X	X	X	X	
Operate the circuit breaker to assure smooth operation.		X	X	X	X	X	
Inspect connections for high resistance.		X	X	X	X	X	
Inspect compression applied connections for correct cable match and indentation.		X	X	X	X	X	
Measure resistance through connections with a low-resistance ohmmeter.		X	X	X	X	X	
Measure insulation-resistance on each pole phase-to-phase and phase-to-ground with the circuit breaker closed and across each open pole.		X	X	X	X	X	
Measure contact/pole resistance.		X	X	X	X	X	
Perform insulation resistance tests on all control wiring,		X	X	X	X	X	
Perform adjustments for final setting in accordance with coordination study.		X	X	X	X	X	
Determine long-time pickup and delay by primary current injection.		X	X	X	X	X	
Determine short-time pickup and delay by primary current injection.		X	X		X	X	
Determine ground fault pickup and delay by primary current injection.		X	X	X	X	X	
Determine instantaneous pickup by primary current injection.		X	X	X	X	X	
Verify correct operation of auxiliary functions.		X	X	X	X	X	

Note 1: For ML-3 systems CVWD Design Authority may invoke more rigorous electrical acceptance testing requirements.

4. Section 16400 – Electrical Service and Distribution (Switchboard)
 - a. ML-1 or ML-2 switchboards: Test each switchboard and each included circuit breaker.
 5. Section 26 2419 – Motor Control Centers
 - a. ML-1 or ML-2 motor control centers: Test each motor control center and each included circuit breaker. Verify that motor overload protection in each controller is appropriate for the application.
 - b. ML- 4 motor control centers: Test each motor control center with more than 200 hp total connected load. Test included molded case circuit breakers using the graded approach indicated in Table 2 of this Section. Verify that motor overload protection in each controller is appropriate for the application.
 - c. ML-1 or ML-2 transformers: Test each transformer.
 - d. ML-1 or ML-2 panelboards: Test each panelboard and each included circuit breaker.
 6. Section 26 3623 – Automatic Transfer Switches
 - a. ML-1 or ML-2 automatic transfer switches: Test each automatic transfer switch.
 - b. ML-4 automatic transfer switches:
 - (1) Test each automatic transfer switch associated with an NFPA 110 Level 1 engine-generator system.
 - (2) Test each automatic transfer switch associated with an NFPA 111 Level 1 UPS system.
 - (3) Test each automatic transfer switch associated with an NFPA 110 Level 2 engine-generator system rated more than 150 kW.
 - (4) Test each automatic transfer switch associated with an NFPA 111 Level 2 UPS system rated more than 150 kW.
- F. Tests and inspections on the following equipment and systems will be performed by either the installing firm or CVWD and are excluded from the scope of this Section:
1. Instrumentation and controls systems
 2. Revenue-type electricity metering
 3. Security system
 4. Telecommunications system

3.3 SYSTEM FUNCTION TESTS

- A. The ETA shall develop and perform system function tests on the following SSCs in accordance with NETA ATS after completion of the inspection and test procedures described above.
 - 1. Section 16400 – Electrical Service and Distribution
 - a. Verify proper operation of main circuit breaker.
 - b. Verify proper operation of arc-flash reduction maintenance switch.
 - c. Verify proper operation of branch breakers.
 - 2. Section 16480 – Motor Control Centers
 - a. Verify proper operation of circuit breakers, starters, drives, controllers, relays and safety devices.
 - b. Verify proper operation of power monitor, transformers, panelboard and circuit breakers.
 - c. Verify proper operation of interlock systems.

3.4 POWER SYSTEM STUDIES

- A. The ETA shall provide power system studies described below based on the installed electrical distribution system and equipment in accordance with procedures described in NETA-ATS and the referenced codes and standards.
 - 1. Include in the study the effect of all portions of the electrical distribution system including alternate sources of power.
 - 2. Address normal system operating configuration plus any plausible alternate configurations and operations that could result in maximum fault condition.
- B. Final Short-Circuit Study. Perform final short circuit calculations using procedures outlined in IEEE Std 242.
 - 1. As a minimum, calculate the short-circuit momentary and interrupting duty on the basis of maximum available fault current at each bus in the distribution system down to the following points in the low-voltage system:
 - a. 480 volt system where available short circuit current is less than 14,000 amperes RMS symmetrical.
 - b. 208 or 240 volt system where available short circuit current is less than 10,000 amperes RMS symmetrical.
 - 2. Include on-site emergency power systems and standby power systems if present.
 - 3. Include, if present, battery systems with storage capacity greater than 1 kWh or a float voltage greater than 100 volts.

4. Extend the short-circuit study to include the branch-circuit overcurrent protective devices for the following systems if present:
 - a. Safety Class Systems
 - b. Safety Significant Systems
 - c. Emergency Systems (NEC Article 700)
- C. Final Coordination Study. Perform final coordination study using procedures outlined in IEEE Std 242.
 1. As a minimum, include in the coordination study all voltage classes of equipment from the utility incoming line protective device(s) down to and including each low voltage load protective rated 100 amperes and larger.
 2. Include on-site emergency power systems and standby power systems if present.
 3. Include, if present, battery systems with storage capacity greater than 1 kWh or a float voltage greater than 100 volts.
 4. Extend the coordination study to include the branch-circuit overcurrent protective devices for the following systems if present:
 - a. Safety Class Systems
 - b. Safety Significant Systems
 - c. Emergency Systems (NEC Article 700)
- D. Arc-Flash Hazard Analysis. Perform arc-flash hazard analysis and shock hazard analyses based on the final short-circuit study and the final coordination study. Use procedures outlined in IEEE Std 1584 and NFPA 70E. Provide the following information in tabular form for the arc-flash warning labels described in Section 26 0553, *Identification for Electrical Systems*:
 1. Flash hazard boundary (inches) calculated in accordance with IEEE Std 1584 or NFPA 70E.
 2. Arc-flash incident energy (cal/cm²) calculated in accordance with IEEE Std 1584 or NFPA 70E.
 3. Working distance (inches) selected from IEEE Std 1584 or NFPA 70E (Annex D) based on equipment type.
 4. Hazard/risk category number from NFPA 70E Table 130.7(C)(9) for operations with doors closed and covers on
 5. System phase-to-phase voltage
 6. Condition that exposes worker to electrical shock hazard
 7. Limited Approach Boundary from NFPA 70E Table 130.2(C) based on nominal system phase-to-phase voltage.

8. Restricted Approach Boundary from NFPA 70E Table 130.2(C) based on nominal system phase-to-phase voltage.
 9. Prohibited Approach Boundary from NFPA 70E Table 130.2(C) based on nominal system phase-to-phase voltage.
 10. Class for insulating gloves based on system voltage (e.g. Class 00 for up to 500 volts).
 11. Voltage rating for insulated or insulating tools based on system voltage (e.g. 1000 volts).
 12. Equipment ID code based on Drawings and including TA number, building number, and system identifier.
 13. Date that hazard analysis was performed.
 14. “Served from” circuit directory information including the serving equipment ID code, location (e.g. room number), circuit number, and circuit voltage/phases/wires.
 15. If applicable, “serves” circuit directory information including the served equipment ID code, location (e.g. room number), circuit number, and circuit voltage/phases/wires.
- E. Load Flow Study. Perform load flow study using procedures outlined in IEEE Std 399.
- F. Stability Study. Perform stability study using procedures outlined in IEEE Std 399.
- G. Harmonic Analysis Study. Perform harmonic analysis study using procedures outlined in IEEE Std 399.

1.1 TEST REPORT

- A. The ETA shall include the following information in the final test report:
1. Summary of project.
 2. Description of equipment inspected and tested.
 3. Description of inspections and tests.
 4. Data record resulting from each inspection and test.
 5. Results of system function tests.
 6. Power system studies.
 7. Analysis of the tests, identification of deficiencies, and recommendations for corrective action.
- B. Include the following minimum information in each data record:

1. Identification of the ETA.
 2. Equipment identification: Equipment ID code based on Drawings and including TA number, building number, and system identifier.
 3. Humidity, temperature, and other conditions that may affect the results of the tests or calibration of test equipment.
 4. Date inspection, test, or function test was performed.
 5. Identification and signature of the testing technician.
 6. Description of inspections, tests, maintenance, and function tests performed and recorded.
 7. Test equipment used and references to calibration records.
 8. Indication of as-found condition and as-left results.
- C. Submit six copies of the complete report to CVWD STR.

1.2 FIELD QUALITY CONTROL

- A. Report to CVWD STR, within three working days, any SSC or construction that is found defective based on acceptance tests or inspections by the ETA.
- B. Within 15 days of direction from CVWD STR, rework, repair or replace any SSC or construction that is found defective based on acceptance tests or inspections.
- C. The ETA shall retest any SSC or construction that did not pass acceptance tests or inspections.

-- END OF SECTION --

SECTION 16280
SHORT CIRCUIT AND COORDINATION REPORT

PART 1 GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall prepare a power system analysis of short circuit calculations, a protective device coordination study and a harmonic analysis in accordance with the requirements of these Specifications and as shown. Engineer's review of submittals and shop drawings does not alleviate the Contractor's responsibility for complying with these specifications. Equipment and devices that do not function as required shall be replaced by the Contractor at his own expense.
- B. The studies shall include all portions of the electrical distribution system for normal and standby power sources down to and including the (120/240 V) distribution system.
- C. The work to be provided by the CONTRACTOR shall include protection studies for motors supplied with solid state overload and overcurrent protection devices.
- D. The work to be provided by the CONTRACTOR shall include an evaluation of harmonic distortion and the furnishing and installation of filters and any other equipment as may be required for harmonic suppression.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. The Work of the following Sections applies to the work of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this work.
 - 1. Section 16030 Electrical Testing Requirements.
 - 2. Section 16010 General Electrical Requirements
 - 3. Section 16250 Electrical Service and Distribution
 - 4. Section 16340 Low Voltage Motor Control

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Comply with the current provisions of the following codes and standards.
 - 1. Codes:

CEC

California Electrical Code, latest adopted edition,

2. Commercial Standards:

ANSI/IEEE 141	Recommended Practice for Electrical Power Distribution for Industrial Plants
ANSI/IEEE 242	Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.
ANSI C 37.010	Standard Application Guide for AC High-Voltage Circuit Breakers
ANSI C 37.5	Calculations of Fault Currents for Application of Power Circuit Breakers
ANSI C-37.13	Low-Voltage AC Power Circuit Breaker (600-Volt Insulation Class)
IEEE 519	Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems

1.4 CONTRACTOR SUBMITTALS

- A. Submittals shall be made in accordance with Section 16010 General Electrical Requirements and as specified herein.
- B. The power system analysis shall be submitted to the ENGINEER prior to receiving final approval of the distribution equipment shop drawings and/or release of equipment for manufacture; approval from the ENGINEER may be obtained for a preliminary submittal of sufficient detail to ensure that device selection will be adequate. Preliminary submittal shall indicate the computer program for use in performing the work of this Section.
- C. Studies for harmonic current, voltage and line notching test results shall be forwarded to the ENGINEER prior to acceptance testing of the project and subsequent to the installation of all harmonic generating and harmonic-sensitive equipment.
- D. Submittals for solid state motor protective devices shall be forwarded to the engineer prior to loading the motor.
- E. Final settings of Protective device shall be approved by the ENGINEER prior to project acceptance and shall be based on the results of the power system analysis.
- F. The CONTRACTOR shall indicate in the submittal, changes to the protection scheme or equipment selection that will result in improved system reliability and safety.

1.5 QUALITY ASSURANCE

A. Organization's Qualifications:

1. Short circuit studies, protective device evaluation studies, and protective device coordination studies shall be performed by the low voltage switchgear manufacturer or by an electrical testing service regularly engaged in the short circuit and protective device coordination studies for a period of at least 15 years. The study shall utilize proven computer programs for power system analysis. **The studies shall be signed by the professional electrical engineer, registered in the State of California, responsible for the studies.**

PART 2 -- PRODUCTS

2.1 GENERAL

- A. The organization of the study shall include a single-line and an impedance diagram of the power system. This diagram shall identify all components considered in the study and the ratings of all power devices (this includes, but is not limited to: transformers, circuit breakers, relays, fuses, busses, and cables). The resistance and reactances of all cables shall be identified in the impedance diagram. The study shall contain, from the service utility company, all written data regarding maximum available short circuit current, voltage, and X/R ratio of the utilities' power system.

2.2 SHORT CIRCUIT STUDY

- A. The short circuit study shall be performed with the aid of a digital computer program and shall be in accordance with ANSI C 37.5, IEEE Standard 242, and IEEE Standard 141.

2.3 PROTECTIVE DEVICE EVALUATION STUDY

- A. A protective device evaluation study shall be performed to determine the adequacy of circuit breakers, molded case switches, automatic transfer switches, and fuses. Any problem areas or inadequacies in the equipment due to prospective short-circuit currents shall be promptly brought to the ENGINEER's attention.

2.4 PROTECTIVE DEVICE COORDINATION STUDY

- A. A protective device coordination study shall be performed to provide the necessary calculations required to select or check the selection of power fuse ratings, protective relay characteristics and settings, ratios and characteristics of associated current transformers, and low-voltage breaker trip characteristics and settings. The results of the study shall govern the final selection of the protective devices.

2.5 TIME/CURRENT COORDINATION CURVES

- A. As a minimum, the time/current coordination curves for the power distribution system shall include the following on 5-cycle log-log graph paper:
1. Time/current curves for each protective relay or fuse showing graphically that the settings will provide protection and selectivity within industry standards. Each curve shall be identified, and tap and time dial settings shall be specified.
 2. Time/current curves for each device shall be positioned to provide the maximum selectivity to minimize system disturbances during fault clearing.
 3. Time/current curves and points for cable and equipment damage.
 4. Circuit interrupting device operating and interrupting times.
 5. Indicate maximum fault values on the graph.
 6. Sketch of bus and breaker arrangement.
 7. Magnetizing inrush points of transformers.
 8. All restrictions of the ANSI and LAEC shall be adhered to and proper coordination intervals and separation of characteristics curves shall be maintained.

2.6 HARMONIC MEASUREMENT

- A. The CONTRACTOR shall prepare a report of the distribution system, at all voltage levels, which shall indicate the harmonic currents anticipated at each voltage level. This report shall indicate sources of harmonic currents, voltages, and line notching of all equipment. The report shall state the tolerance of sensitive equipment to harmonics.
- B. CONTRACTOR shall measure harmonics present in the output of harmonic-generating equipment and at the input terminals of sensitive equipment. Install filters to prevent equipment malfunction, due to harmonics. Harmonic measurements shall be performed and documented after the filter installations.
- C. All equipment which is required to conform to IEEE 519 shall be measured to determine output harmonic content. The CONTRACTOR shall take the corrective action necessary to attain compliance with IEEE 519, Table. Measurements and documentation shall be performed to demonstrate compliance with the standards.

2.7 MOTOR PROTECTION

- A. Overload protection as phase overcurrent for medium voltage motors is specified in other Sections of these Specifications to be solid-state protective modules. The CONTRACTOR shall adjust these modules with respect to actual installed motor torque, current and thermal characteristics so that the best possible motor protection will result.

Protective settings shall be submitted, and approved, before respective motors are run under load.

PART 3 -- EXECUTION

3.1 PROTECTIVE DEVICE TESTING, CALIBRATION AND ADJUSTMENT

- A. The CONTRACTOR shall provide the services of a qualified field engineer and necessary tools and equipment to test, calibrate, and adjust the protective relays and circuit breaker trip devices as recommended in the power system analysis. The qualifications of the field engineer shall be subject to review and approval by the ENGINEER.

3.2 STUDY REPORTS

- A. The results of the power system analysis shall be submitted summarized in a final report. The report shall include, but not limited to the following:
 - 1. Single-line diagram
 - 2. Impedance diagram
 - 3. Tabulation of all protective devices, which shall be identified on the single-line diagram
 - 4. Time/current coordination curves
 - 5. Computerized fault current calculations
 - 6. Specific recommendations, if any
 - 7. Test instrumentation, condition and connections, as applicable, for each study

END OF SECTION

SECTION 16310
VARIABLE FREQUENCY DRIVE UNITS

PART 1 GENERAL

1.1 THE REQUIREMENT

- A. General: The CONTRACTOR shall furnish and install all variable frequency drive (VFD) units shown and specified, complete with necessary accessories and controls, to provide a complete and workable system, in accordance with the requirements of the Contract Documents.
- B. Scope of Work: The variable frequency drive units shall be integrated, all solid state systems, designed to operate at 460-volt ac, 3-phase, 60 Hz, in an ambient temperature of 40 degrees C. The variable speed control system supplied shall control the speed of the driven equipment motor with a 1.15 service factor, without derating and without requiring any motor modifications.
- C. Coordination: The equipment furnished under this Section shall be required to operate the electric motor driver with the driven equipment, as furnished under the equipment Specification. The CONTRACTOR'S attention is specifically directed to the need for proper coordination of the work under this Section, and the work under the equipment Section, with the work under Division 17, "Instrumentation and Control," and Section 16490, "Electric Motors."

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 11000 Equipment General Provisions.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Comply with the applicable reference specifications as specified in the GENERAL REQUIREMENTS.

1.4 CONTRACTOR SUBMITTALS

- A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS.
- B. The CONTRACTOR shall submit complete information, drawings, and technical data for all the equipment as follows:
 - 1. Manufacturer's statement accepting five-year warranty responsibility.
 - 2. Any exception to this Specification, along with justification for each exception. All items shall be in bold letters and underlined.

3. Catalog cuts and catalog data.
4. Written descriptions explaining ladder diagram operation, system operation, and analog signal processing.
5. System block diagram.
6. Enclosure outline.
7. Factory test data certifying compliance of similar equipment of this manufacturer with this Specification.
8. System schematic diagrams.
9. Interconnection diagrams.
10. All equipment and work shall comply with the latest applicable standards of ANSI, NEMA, IEEE, and the National Electric Code.
11. Seismic Requirements: Design certifications and anchorage sketches, as required in Section 11000, "Equipment General Provision."
12. The shop drawing submittal shall include the following specific information:
 - a. Name of drive manufacturer.
 - b. Type and model.
 - c. Assembly drawing and nomenclature.
 - d. Temperature rise and class of insulation.
 - e. Maximum heat dissipation capacity in horsepower.
 - f. Normal field excitation at full load.
 - g. Percent slip of unit at maximum output speed when transmitting a load equal to nameplate rating of driving motor with normal field excitation applied to unit as well as guaranteed overall efficiency for same load condition.
 - h. Complete bearing selection data and calculations for 100,000 hours minimum life by B-10 calculations.

- C. Spare Parts: The CONTRACTOR shall obtain and submit from the manufacturer a list of suggested spare parts for each piece of equipment according to the provisions of SPARE

PARTS of the GENERAL REQUIREMENTS. After approval, CONTRACTOR shall furnish such spare parts suitably packaged, identified with the equipment number, and labeled. CONTRACTOR shall also furnish the name, address, and telephone number of the nearest distributor for each piece of equipment. All spare parts are intended for use by the City, only, after expiration of the guaranty period. Any spare parts which the ENGINEER permits the CONTRACTOR to use for startup activities shall be replaced by the CONTRACTOR prior to the City's partial acceptance of beneficial use of the equipment.

1. During the term of this Contract the CONTRACTOR shall notify the ENGINEER in writing about any manufacturer's modification of the approved spare parts, such as part number, interchangeability, model change or others. If the ENGINEER determines that the modified parts are no longer applicable to the supplied equipment, the CONTRACTOR at its expense shall provide applicable spare parts.
2. At a minimum, the following spare parts shall be furnished to the City at the job site:
 - a. One set of 3 spare fuses of each size.
 - b. Two spare lamp lenses of each color.
 - c. Two dozen pilot lamps.
 - d. One of each type of electronic circuit boards used.
 - e. One of each power diode and SCR.
 - f. Set of tools required for maintenance of VFD units.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: It is the intent of this Specification to provide a complete, reliable, fully tested, adjustable speed drive system suitable for manned or unmanned operation. The CONTRACTOR shall cause the equipment to be furnished under this Section to be the product of a firm regularly engaged in the design and manufacture of this type of item for a period of at least ten years, and possessing sufficient technical competence, skill, resources, and ability to complete the work specified under this Section with the requisite degree of quality in a timely and efficient manner. The CONTRACTOR shall cause the equipment specified herein to be designed and furnished by a single adjustable frequency drive manufacturer. This provision, however, shall not be construed as relieving the CONTRACTOR of its overall responsibility for this portion of the work.

1.6 PREQUALIFICATION REQUIREMENTS

- A. All potential variable frequency drive (VFD) subcontractors shall qualify for bidding by applying in writing to the ENGINEER at least 21 days prior to the bid opening date. Each

applicant for prequalification will be evaluated based on ability to meet the following minimum criteria:

1. Provide a list of at least ten projects successfully completed in which the VFD subcontractor performed system engineering, including harmonic filter calculations, system fabrication and installation, documentation (including schematic, wiring and panel assembly drawings), field testing, calibration and startup, operator instruction, and maintenance training. In addition, list the following information for each project:
 - a. Name of plant, owner, contact name, and telephone number.
 - b. Name of manufacturer for the speed controller furnished.
 - c. Type of equipment furnished (i.e., voltage source, current source, pulse width, diode rectifier, etc.).
 2. Name the individual person who will be responsible for office engineering and management of this project, and the individual who will be responsible for field testing, calibration, start-up and operator training. Include references of recent projects of these individuals.
 3. Provide a letter attesting that these persons in charge have read and studied the contract specifications and drawings and agreed that all features required in the contract specifications and drawings are workable and can be manufactured.
 4. Document that the VFD subcontractor's company has been actively involved in the VFD system business (under the same corporate name) for a minimum of ten years.
- B. Notification: Each application will be thoroughly examined, investigated, and then judged as to the competency and willingness to execute the scope of work required on this project. Each applicant will be notified within 10 days prior to the bid opening date, as to his approval or disapproval for qualification.
- C. Certification by Variable Frequency Drive System Subcontractor: At the time of quoting to prospective contractors prior to bid opening, the prospective VFD subcontractor shall execute and submit a written certification of intent to assume full responsibility for the complete requirements of the Contract Documents. A signed copy thereof shall be supplied to each prospective contractor for inclusion with the bidding documents. Failure by a bidding VFD system supplier to provide this written certification shall be treated by the prospective contractor as NO BID and that VFD subcontractor will not be acceptable. Each prospective contractor shall include with its proposal the certification, required above, only for the VFD subcontractor for whom they have inserted a price in the bidding documents. The certification shall be on the named VFD subcontractor's letterhead, it shall be signed by his authorized responsible representative, and it shall include the following statements:
1. (Corporate name of variable frequency drive system subcontractor) hereby certifies intent to assume and execute full responsibility to select, furnish, install, connect, test,

calibrate, and place into operation all specified speed controllers, control boards, and all assemblies, components, and accessories needed to place into service complete operating VFD's, and control systems, all in full compliance with the requirements of the Contract Documents.

2. In addition, it is certified that drawings and data will be prepared and submitted, specified field service will be performed by qualified personnel, the CITY's operating and maintenance personnel will be instructed, and technical manuals will be prepared and submitted.
3. Finally, it is certified that the quotation offered provides for full and complete compliance with the requirements of the Contract Documents without exception.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Components: The adjustable frequency drive system shall consist of a converter, inverter, programmable controller, and main breaker, as follows:
 1. The molded case circuit breaker shall be sized to provide a short circuit interrupting capacity of 65,000 symmetrical amps. The input breaker shall be mechanically interlocked with the power unit enclosure door.
 2. Converter section consisting of a three-phase full wave phase controlled rectifier to convert incoming ac power to variable voltage dc.
 3. DC bus capacitors and/or inductors necessary to filter rectification ripple.
 4. Three-phase full wave inverter to construct an ac wave form, with minimum harmonic content, at any frequency between zero and 60 Hz to control motor speed. Motor terminal voltage shall be controlled in proportion to output frequency such that the voltage to frequency ratio remains essentially constant.
 5. All electrical components shall be sized for continuous operation of the driven equipment or pump motors specified herein at 15 percent above rated full load. The minimum VFD efficiency shall be 95 percent at 100 percent speed and 85 percent at 50 percent speed. The power factor of VFD unit shall be 92 percent minimum at 100 percent speed without using any power factor correction capacitor. If capacitors are deemed absolutely necessary, tuning reactors shall be provided to eliminate surges which are harmful to the drive system.
 6. Cable from VFD to motor shall be VFD rated, braided and foil shielded type cable.
- B. Performance: The VFD shall vary both the ac voltage and frequency simultaneously to provide the constant volt/Hz necessary to operate the ac motor at the desired variable speed.

The VFD shall be specifically designed for use with variable torque equipment or pumping loads, fully capable of at least a 3:1 infinitely adjustable speed range. The control shall vary the output frequency between 20 and 60 Hz. Soft-start control circuitry shall limit inrush current, not to exceed 100 percent of motor full load current, under all manual and automatic operating conditions. When power outage occurs, the drive system shall shut down in an orderly manner. Upon restoration of ac power, the motor shall restart sequentially and run at a rate depending upon the reference requirements, by the sequencing logic controller.

- C. Protection: The VFD controller shall be provided with integral circuitry capable of protecting itself and the connected motors against the following conditions. Amber lights are to be provided for each of the following faults:
1. Input line monitor to protect against single phasing, power outages, and reverse phase rotation.
 2. Undervoltage - restart upon restoration of normal voltage.
 3. Motor overvoltage.
 4. Instantaneous over-current trip to continuously monitor peak current at output and input. It shall provide instantaneous shutdown without fuse failure to protect the machine and drive during adverse starting and running conditions.
 5. Inverter fault shutdown circuit.
 6. Short-circuit protection without isolation transformer.
 7. Thermal overload protection for motors.
 8. Logic power supply failure.
 9. Overtemperature: Thermal detectors mounted on semiconductor heat sinks shall detect high temperature caused by excessive current or loss of cooling air and cause controller shutdown.
 10. Overfrequency.
 11. Phase-to-phase ground faults without the need for isolation transformer.

2.2 VFD MANUFACTURERS

1. Allen-Bradley PowerFlex 523, or equal.

PART 3 EXECUTION

3.1 INSTALLATION

- A. All equipment furnished hereunder shall be installed and aligned under the supervision of a factory-trained service engineer.
- B. Conduit stub-ups for interconnected cables and remote cables shall be located and terminated in accordance with the drive manufacturer's recommendations.
- C. The CONTRACTOR shall have the manufacturer examine/investigate the Contract Documents as to the operating environment that the adjustable frequency drive will be subjected to, and advise the ENGINEER prior to bidding of any potential problems, which could prevent the drive from functioning as intended, and its recommendations for correcting/preventing expected problems.
- D. The CONTRACTOR shall include in the bid a minimum of three 8-hour days of a qualified manufacturer's service engineer's time. This time will be used to ensure proper connection and functioning of the equipment prior to startup and to train City personnel in the use of the equipment.

3.2 FIELD TESTING

- A. The variable speed drive system test shall be completed at the manufacturer's plant under simulated conditions at the load range expected. All level points shall be programmed and the system run with motors of similar characteristics.
- B. Testing, checkout, and startup of the variable frequency drive equipment in the field shall be performed under the technical direction of the manufacturer's service engineer. Under no circumstances are any portions of the drive system to be energized without authorization from the manufacturer's representative.
- C. The CONTRACTOR shall instruct the manufacturer of the drive to provide the services of a competent engineer to assist in placing the equipment into operation and provide instruction as required to the equipment operating personnel.

END OF SECTION

SECTION 16400
ELECTRICAL SERVICE AND DISTRIBUTION

PART 1-- GENERAL

1.1 SCOPE

- A. Contractor shall immediately contact Glendale Water and Power (GWP) to coordinate installation of service. Any delay as a result of not coordinating with GWP immediately shall be the responsibility of the Contractor.
 - 1. GWP contact is Mr. Paul Meza and can be reached at (818) 548-3921 or Mr. Clay Carman at the same number.
- B. Work Included: Not limited to the following:
 - 1. Fabricate, provide and install service switchboard as indicated on the Contract Drawings and hereinafter specified.
 - 2. Comply with the General Conditions, the General Requirements and the requirements of Section 16010 of this Division 16, concerning definitions, guarantees, submittals, as-builts, clean-up, etc. as applicable to the Work of this Section.
 - 3. Comply with EUSERC's and GWP's requirements.
 - 3. Examine all other Sections for work related to those Sections which are required to be included as Work under this Section.

1.2 RELATED WORK

- A. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Section 16010 Electrical General Provisions
 - 2. Section 16030 Electrical Tests
 - 3. Section 16450 Grounding.

1.3 QUALITY ASSURANCE

- A. Conform to applicable provisions of Sub-Section 1.5 of Section 16010.
- B. Conform to applicable Codes and NEMA, ANSI and IEEE Standards.

1.4 SUBMITTALS

- A. Conform to applicable provisions of Section 01300 Submittals of Division 1 - General Requirements and of Sub-Section 1.4 of Section 16010.
- B. Shop Drawings shall show and contain the following information:
 - 1. Plans showing top and bottom of switchboards.
 - 2. Front, rear and side elevations of switchboards.
 - 3. Schematic Wiring Diagrams showing the following:
 - a. One-line diagram with each circuit numbered.
 - b. Schedule showing circuit number, description and rating of protective device(s).
 - c. Complete short circuit availability of bus.
 - 4. 1/2" - 1'-0" scale drawings of electrical rooms or areas overall dimensions for equipment layout including space available for conduits and protective devices.

PART 2 -- PRODUCTS

2.1 MATERIALS

- A. Each switchboard shall be U.L. listed deadfront, deadrear, completely self-supporting, with the required number of vertical sections bolted together to form one floorstanding switchboard. Construction shall be NEMA Class II with line and load and main bus connections accessible from the front. Provide switchboards of 1000 amperes or greater rating with line and load insulated bus bars. Overcurrent protective devices shall be grouped in convertible type construction. Vertical sections shall have full height bussing and where space for future devices is indicated on the Drawings all the necessary mounting hardware shall be furnished. Switchboards shall include all protective devices and other equipment indicated on the Contract Drawings with the necessary interconnections, instrumentation, and control wiring. Bus shall be copper with plated joints, or tin plated aluminum. Bus bars shall be mounted on supports of high impact-resistant, non-tracking insulating material, and braced to withstand the maximum available fault current as indicated on the Contract Drawings. Other ratings shall be as indicated on the Contract Drawings. Series-connected or "integrated equipment" short circuit ratings shall not be applied in lieu of, or to comply with, short circuit and interrupting capacity ratings indicated on the Drawings, unless specifically approved by CVWD Engineer. Switchboards shall be as manufactured by Cutler-Hammer (Eaton).
- B. Service and distribution sections shall contain circuit breakers, fusible switches, and

combination motor starters, with shunt trips, motor operators, ground fault protection, and other accessories, as indicated on the Drawings, as well as provisions for utility metering in accordance with the serving electric utility requirements. Each disconnecting means shall be provided with a means for individual padlocking. Switches shall be heavy-duty, quick-make and quick-break, and horsepower rated through 200 HP. Switches rated over 600 amperes shall be bolted pressure contact type. Ratings of disconnecting means and overcurrent protective devices shall be as indicated on the Drawings. Combination motor controllers shall comply with applicable requirements of Section 16480 for Low Voltage Motor Control Centers.

- C. Finish: Interior finish shall be a gray lacquer or enamel; exterior finish shall be a gray baked-on enamel or lacquer. Apply all finish coatings over a rust-inhibiting metal primer.
- D. Identification: Each switchboard shall have an engraved laminated plastic nameplate identifying the switchboard as designated and located on the Contract Drawings, and indicating voltage, phase, and number of system conductors. For example, "Switchboard MS 277/480V, 3Ø, 4W. Lettering shall be white on black finish and 1/4-inch high minimum. Nameplates shall be affixed by a minimum of two escutcheon pins or screws. Each device on the switchboard shall be provided with an engraved plastic nameplate as specified in Section 16480, 2.4A.

PART 3 -- EXECUTION

3.1 GENERAL INSTALLATION

- A. Switchboard(s) shall be securely bolted to the flooring or structure. Final attachment means shall be in compliance with the seismic requirements of governing authority. Shop Drawings indicating the bolt down requirements shall be provided by the manufacturer along with all necessary calculations and shall be submitted with the Shop Drawings of the switchboard equipment. Refer to other Sections of the Specifications related to seismic requirements.
- B. Switchboard(s) shall be installed on a level floor, with shims provided where necessary to attain both horizontal and vertical "plumb" conditions.
- C. Switchboard(s) equipment shall be protected during construction in such a manner to prevent plaster, paint, dust, etc. from defacing the finish of equipment. Prior to final acceptance of the equipment, the interior of the equipment shall be cleaned of all foreign materials and debris. Any blemishes or defects on the exterior of the equipment shall be repaired by painting the equipment with paint supplied by the manufacturer of the equipment to match the factory finishes.
- D. No operating handles in any switchboard shall be located above 6-foot 6-inches above finish floor. Code clearances on all sides of the switchboard equipment shall be maintained.

- E. Switchboards shall be mechanically grounded to the grounding system.
- F. Furnish ammeters, voltmeters, current and potential transformers, test blocks, control switches, fuses and circuit breakers, and other devices as indicated on the Drawings. Meters shall be switchboard type semi-flush mounted, with phase selector switches. The height of all devices shall comply with Code and utility company requirements with the switchboard installed on a 2-inch high concrete pad.
- G. For solidly grounded "wye" services of more than 150 volts to ground, but not exceeding 600 volts, phase to phase, provide ground fault protection of equipment for each service disconnecting means for services rated 1000 amperes or more, without a single main disconnecting means. Provide ground fault protection of equipment for other systems as indicated on the Drawings.
- H. Ground fault sensors shall be zero sequence type unless indicated otherwise on the Drawings. Trip settings shall be as indicated on the Drawings or as directed by CVWD Engineer.
- I. Protection: Keep switchboards covered during construction operations. Clean interior and exterior after all connections are completed. Factory connections shall be checked and re-torqued tight as required. Damage shall be field or factory repaired to a condition acceptable to CVWD Engineer at no added cost to CVWD.
- J. Operational Test of the ground fault protection system using the primary current injection method shall be performed by qualified personnel with suitable testing/recording equipment in the presence of CVWD Engineer. Provide CVWD Engineer with a "Certified Test Report" including test parameters.

3.2 COMMISSIONING OF SWITCHBOARD ASSEMBLIES

A. General:

1. Inspect for physical damage.
2. Compare equipment nameplate information with latest single line diagram and report discrepancies.
3. Inspect for proper alignment, anchorage and grounding.
4. Check tightness of accessible bolted bus joints by calibrated torque wrench method. Refer to manufacturer's instruction for proper foot pound levels.
5. Spot check breaker settings against Short Circuit Study.
6. Key interlock systems shall be physically tested to insure proper function.

- a. Closure attempt shall be made on locked open devices. Opening attempt shall be made on locked closed devices.
 - b. Key exchange shall be made with devices operated in off-normal positions.
7. All doors, panels and sections shall be inspected for paint, dents, and scratches.

END OF SECTION

SECTION 16450 GROUNDING

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall furnish all tools, equipment, materials, and supplies and shall perform all labor required to complete the work as indicated on the Drawings and specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. The work of the following Divisions and Sections applies to the work of this Section. Other Division and Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this work.
 - 1. Division 11 Equipment, applicable sections.
 - 2. Division 15 Mechanical, applicable sections.
 - 3. Division 16 Electrical, applicable sections.
- B. Materials, equipment and devices furnished and installed under other Divisions with raceway and electrical conductors furnished, installed, and connected under Division 16, Electrical.

1.3 REFERENCED SPECIFICATIONS, CODES AND STANDARDS

- A. All work specified herein shall conform to or exceed the applicable requirements of the referenced portions of the following publications to the extent that the provisions thereof are not in conflict with other provisions of these specifications.
- B. Comply with the current provisions of the following Codes and Standards.
 - 1. Codes and Standards:

NEC CEC	National Electrical Code, latest adopted edition. California Electrical Code, latest adopted edition.
California Code of Regulations	Title 8, Industrial Relations, Subchapter 5, Electrical Safety Orders.
 - 2. Commercial Standards:

ANSI/UL 467

Safety Standard for Grounding and Bonding Equipment.

IEEE 142

Grounding of Industrial and Commercial Power Systems

- C. All equipment furnished by the CONTRACTOR shall be listed by and shall bear the label of Underwriters' Laboratories, Incorporated, (UL) or of an independent testing laboratory acceptable to CVWD.
- D. The construction and installation of all electrical equipment and materials shall comply with all applicable provisions of the CAL OSHA Safety orders. (Title 8 CCR, as applicable), State Building Standards, and applicable local codes and regulations.

1.4 CONTRACTOR SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of Section 16010 Electrical General Provisions.
- B. General Provisions - Submittals shall conform to the requirements of Section 16030 Electrical Tests, Section 16120 Conductors and additional requirements specified herein. Submittals shall be made for, but not be limited to the following:
 - 1. Catalog literature for all products.
 - 2. Certified copies of ground test results.
 - 3. Field test procedures including lists of test equipment to be used.

1.5 QUALITY ASSURANCE

- A. Quality assurance shall be in accordance with the requirements of Section 16010 Electrical General Provisions and Section 16030 Electrical Tests.

PART 2 -- PRODUCTS

2.1 GROUND RODS

- A. Provide copper-clad steel ground rods not less than 5/8-inch in diameter, 10-feet long driven full length into the earth. Special requirements shall be as shown and as specified herein.

2.2 GROUND CONDUCTORS

- A. Provide grounding conductors of the size shown and the type specified in Section 16120, "Conductors". In no case shall the size of any grounding conductor be less than that stipulated by the NEC for that specific application.

- B. All grounding conductors furnished shall be composed of material resistant to any existing corrosive conditions or shall be suitably protected against such conditions.

2.3 GROUND CONNECTIONS

- A. For below grade connections, provide exothermic-welded connectors.
- B. For above grade connections, provide bolted connectors.

2.4 GROUND WELL

- A. Provide a ground rod well as shown on the drawings. If none is shown on the drawings provide at least one ground rod well near the main switchboard.

PART 3 -- EXECUTION

3.1 GENERAL

- A. Except where specifically indicated otherwise, ground all exposed noncurrent-carrying metallic parts of electrical equipment, raceway systems, and the neutral of all wiring systems in strict accordance with the state, and other applicable laws and regulations.

Use the following three paragraphs wherever it is decided to run individual equipment grounding wires, rather than rely on raceways as return paths for fault current. Such a grounding wire should be included on all medium voltage circuits.

- B. Where grounding conductors are shown, bond the wires to metallic enclosures at each end and to all intermediate metallic enclosures. Connect grounding conductors to all grounding bushings on raceways. Where any equipment contains a ground bus, extend and connect grounding conductors to that bus. Connect the enclosure of the equipment containing the ground bus to that bus. Run ground conductors inside conduits enclosing the power conductors.
- C. Ground connection to equipment and ground buses shall be by copper ground lugs or clamps. Connections to enclosures not provided with ground buses or ground terminals shall be by clamp type lugs added under permanent assembly bolts or under new bolts drilled and added through enclosures other than explosion proof, or by grounding locknuts or bushings. Ground cable connections to anchor bolts, against gaskets, paint, or varnish, or on bolts holding removable access covers will not be permitted.
- C. Ground shields of any shielded power cable at each splice or termination in accordance with recommendations of the splice or termination manufacturer. Ground shields of any control cables in accordance with the details shown.
- D. Ground metal sheathing and any exposed metal vertical structural elements of buildings.

Ground metal fences enclosing electrical equipment. Bond any metal equipment platforms which support electrical equipment to that equipment. Provide good electrical contact between metal frames and railings supporting pushbutton stations, receptacles, instrument cabinets, etc., and raceways carrying circuits to these devices.

- E. Bond neutrals of transformers within buildings to the system ground network, or to any additional indicated grounding electrodes.
- F. Ground cable penetrations through building exterior walls shall enter within 3 feet below finish grade and shall be prepared with a water stop. Unless otherwise indicated, the water stop shall include filling the space between the strands with solder and soldering a 12-inch copper disc over the cable.
- G. Ground cable near the base of a structure shall be in earth and as far from the structure as the excavation permits but not closer than 6 inches.
- H. The main grounding conductor when exposed within a building shall be copper bar supported with suitable spacers at $\frac{1}{2}$ to one inch from the structure. Unless otherwise indicated on the drawings, the ground bus shall not be smaller than $\frac{1}{4}$ by one inch rectangular.
- I. The grounding system shall be bonded to station piping by connection to the first flange inside the building on either a suction or discharge pipe which will form a good ground connection. The connection shall be made with a copper bar or strap by drilling and tapping the flange and providing a bolted connection.
- J. Ground conductors on equipment shall be formed to the contour of the equipment and firmly supported.
- K. All ground connection hardware, bolts, and nuts shall be high strength, high conductivity copper alloy.
- L. Ground cables with encased underground conduit banks shall be as indicated on the drawings.
- M. Ground cables in underground circuits shall be bonded with main ground cables in each maintenance hole and handhold. Maintenance hole hardware and cover shall be effectively grounded.
- N. Liquid tight flexible conduits shall be provided with separate equipment grounding conductors sized in accordance with the NEC. The equipment grounding conductor shall be bonded to an approved grounding bushing and terminal lug. The grounding conductor can be installed outside the conduit if the required size is greater than No. 10.
- O. Exposed splices and connections for bare copper conductors and buses shall be protected by wrapping with heat shrink tape or covering.

3.2 GROUNDING CONNECTIONS

- A. Unless shown otherwise, make connections of grounding conductors to ground rods at the upper end of the rod with the end of the rod and the connection point below finished grade.
- B. Make connections of sections of outdoor or other equipment underground. Make connections of other grounding conductors generally accessible.
- C. When making exothermic welds, wire brush or file the point of contact to a bare metal surface. Use exothermic welding cartridges and molds in accordance with the manufacturer's recommendations. After welds have been made and cooled, brush slag from the weld area and thoroughly clean the joint.
- D. Use connectors of proper size for conductors and ground rods specified. Use connector manufacturer's compression tool. Notify the ENGINEER and the INSPECTOR prior to backfilling any ground connections.

3.3 FIELD TESTS

- A. Perform all field tests in accordance with Section 16030 Electrical tests.

-- END OF SECTION --

SECTION 16480 LOW VOLTAGE MOTOR CONTROL CENTER

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall furnish and install all group-mounted and unit motor control as required for the motor furnished for installation all in accordance with the requirements of the Contract Documents.
- B. When motor furnished differ from the indicated, the CONTRACTOR shall, at no additional cost to CVWD, make the necessary adjustments to wiring, conduit, disconnect devices, motor starters, branch circuit protection, and other affected material or equipment to accommodate the motors actually installed.
- C. Make like items of equipment provided hereunder the end products of one manufacturer in order to achieve standardization for appearance, operation, maintenance, spare parts, and manufacturer's service.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. The work of the following Divisions or Sections applies to the work of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this work.
 - 1. Section 16010 Electrical General Provisions.
 - 2. Section 16030 Electrical Test.
 - 3. Section 16050 Basic Materials and Methods.
 - 4. Section 16310 Variable Frequency Drive
 - 5. Section 16400 Electrical Service and Distribution.

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. All work specified herein shall conform to or exceed the applicable requirements of the referenced portions of the following publications to the extent that the provisions thereof are not in conflict with other provisions of these specifications.

- 1. Codes and Standards:

NEC	National	Electrical
	Code, latest adopted edition.	
CEC	California	Electrical
	Code, latest adopted edition.	

California Code of Regulations Title 8, Industrial Relations, Subchapter 5, Electrical Safety Orders.

2. Commercial Standards:

UL 845 Standard for Safety Electric Motor Control Centers.

NEMA ICS-1 General Standard for Industrial Control and Systems

NEMS ICS-2 Industrial Control Devices, Controllers and Assemblies

1.4 CONTRACTOR SUBMITTALS

- A. Shop drawing submittals shall comply with the "Contractor Submittals" paragraph of Section 16010, "Electrical General Provisions".
- B. Final submittal shall include spare parts lists, catalog data for various motor control elements in addition to the submittals required by Section 16010 "Electrical General Provisions".
- C. The following submittals and specific information shall be provided.
 - 1. Elementary diagrams,
 - 2. Interconnection diagrams,
 - 3. Protective device time-current characteristics on conventional-sized transparencies,
 - 4. Operational description,
 - 5. Installation instructions,
 - 6. Maintenance instructions,
 - 7. Spare parts list,
 - 8. Test reports, including procedures, test conditions, results and graphs.

1.5 QUALITY ASSURANCE

- A. Quality assurance shall be in accordance with Section 16010 Electrical General Provisions.
- B. Electrical and Mechanical Testing: All components shall be factory tested in accordance

with the applicable NEMA ICS requirements.

- C. Field Testing: Field tests shall be performed in accordance with Section 16030 Electrical Tests.

PART 2 -- PRODUCTS

2.01 MOTOR CONTROL, GENERAL

- A. Provide each motor with a suitable controller and devices that will function as specified for the respective motors and meeting NEMA ICS 2, the NEC, and UL.
- B. Provide each motor controller with thermal overload protection in all ungrounded phases. Use protection consisting of thermal overload relays meeting NEMA ICS 2 which are sensitive to motor current and mounted within the motor controller, or a combination of thermal protectors embedded within the motor windings and controller-mounted overload relays, as indicated. Use overload protection devices of the inverse-time current characteristic type.
- C. Provide controller-mounted overload relays of the manual-reset type with externally operated reset button when used without motor thermal protectors; when used in conjunction with thermal protectors, provide the automatic reset type. Select and install overload relay heaters after the actual nameplate full-load current rating of the motor has been determined.
- D. Install and connect any required thermal protector monitoring relay provided by motor manufacturer in motor-control circuit and provide manual reset function.
- E. Motor Control Center shall be Allen-Bradley Centerline 2100, no equal.

2.02 MANUALLY OPERATED STARTERS, FRACTIONAL HORSEPOWER

- A. Provide starters meeting NEMA ICS 2 with the enclosures shown, rated 1 hp at single-phase, ac voltages of 115 and 230 volts, and with thermal overload protection, and toggle or pushbutton operation. Provide for locking in the OFF position.

2.03 FULL VOLTAGE MAGNETIC STARTERS

- A. Provide starters meeting NEMA ICS 2, Class A, with the rating and enclosure shown. **IEC or IEC/NEMA rated starters are not acceptable.** Starters shall be full voltage, non-reversing horsepower rated, providing combined protection against running and stalled overloads. Thermal overload relays on all phases shall be temperature compensated bimetallic type with manual reset and inherent single phasing prevention.

2.2 CONTROL POWER TRANSFORMERS

- A. Supply individual control power transformers unless noted otherwise. The transformers shall have sufficient capacity to serve the connected load and limit voltage regulation to 10 percent during contact or pickup. Fuse one side of the secondary winding and ground the other side. Provide primary, current limiting fuses where fuses shown on Drawings, or where required by applicable codes and standards.

2.3 MOTOR CONTROL CENTER

- A. Provide motor control center components meeting the requirements of the latest revised NEMA and UL standards and the following requirements, unless otherwise indicated:

RATING

Voltage	As indicated on the Drawings
NEMA Class	Class 1, Type B with all remote control and signal circuits wired to a separate terminal board compartment. All additions and revisions shall be included in the final as-built record drawings.

ENCLOSURE

Compartment Doors	Separate hinged doors for each starter, feeder, or other unit
Door Interlocking	Individual Starter and feeder doors mechanically interlocked so doors cannot be opened with unit energized; defeater mechanism to allow intentional access at any time; provisions for padlocking external disconnect handles in the OFF position

MOTOR STARTER UNITS

General	Individual components and control devices including pushbuttons, selector switches, indicating lights, control relays, time delay relays, and elapsed time meters as specified in Section 16050, "Basic Materials and Methods".
Starters	NEMA standard rating, NEMA Size 1; minimum meeting requirements specified under article 2.1, MOTOR CONTROL, GENERAL.
Disconnecting Device	Disconnecting device lockable in OPEN position

Circuit Breakers	Molded case motor circuit protectors with manufacturer's recommended trip setting for maximum motor protection, tripping indicated by operating handle position; interrupting capacity required for connection to system with short circuit capacity indicated.
Fused Switches	Heavy-duty (HD), motor rated, load-break, quick-make, quick-break type meeting requirements of UL and NEMA KS 1; current-limiting fuses as specified with rejection clips
Motor Overload	Temperature compensated, three-pole, Protection bimetallic thermal overload relay manual-reset overload relays

CONTROL UNITS

Disconnecting Device	Disconnecting device capable of de-energizing all circuits in the unit. Provide a warning sign giving location of disconnecting device if not located in the unit.
Control Devices	As indicated on the Drawings and as specified in Section 16050, "Basic Materials and Methods".
Wire Markers Control Wiring	Permanent sleeve type markers to be applied to all wires. Minimum wire size 14 AWG copper

NAMEPLATES

Engraved with inscription as shown on the single-line diagram, laminated plastic nameplates for each motor control center and each unit.

Nameplates that are white and engraved to a black core; attach nameplates with stainless steel panhead screws

SPACE HEATERS

Thermostatically controlled space heater in the bottom of each vertical section for operation from an external 120V power source. Derive 120V power for heater circuit from the lighting panel.

DIAGRAMS

Schematic (elementary) and outline diagrams, equipment schedules, wireless unit connection diagrams

2.4 ACCEPTABLE MOTOR CONTROL CENTER FABRICATOR

- A. Brithinee Electric, 620 South Rancho Avenue, Colton, CA 92324 - (909) 825-6312
- B. Tesco Controls, Inc. 8440 Florin Road, Sacramento, CA 95828 - (916) 395-8800
- C. Allen-Bradley 2125 E Katella Ave # 250, Anaheim, CA 92806 - (714) 938-9000

PART 3 -- EXECUTION

3.1 GENERAL

- A. Perform work in a workmanlike manner with craftsmen skilled in the particular trade. Provide work presenting a neat and finished appearance.

3.2 INSTALLATION

- A. Install equipment in strict accordance with submittal drawings and manufacturer's recommendations. Install motor control centers in accordance with NEMA ICS 2.3 as a minimum. Secure motor control centers using approved means as per latest standards and regulations. Grout mounting channels provided with motor control into the floor or mounting pads.
- B. Provide a qualified, factory-trained representative to supervise installation, final adjustment, and initial energization of this equipment. Make this representative available for as long as his services are required, but in any case for a period of 1-day minimum. At the end of installation and adjustment, provide certification signed by this representative that the equipment has been properly installed and tested, and is ready for energization.
- C. Retighten to NEMA standards all current-carrying bolted connections and all support framing and panels.
- D. Field adjust the trip settings of all motor starter magnetic trip only circuit breakers. Adjust as per manufacturer's recommendations. Determine motor rated current from motor nameplate following installation. Prepare a typed tabulation of motor name, motor horsepower, nameplate full load current, measured load current, heater catalog number, protective device, trip setting, and include copy in the Technical Manual. Attach to the tabulation a copy of the starter manufacturer's overload heater selection tables, including only the tables for the particular starters provided.
- E. After the equipment is installed, touch up any scratches, marks, etc., incurred during shipment or installation of equipment. If required by the ENGINEER because of undue amount of scratches, repaint the entire assembly.

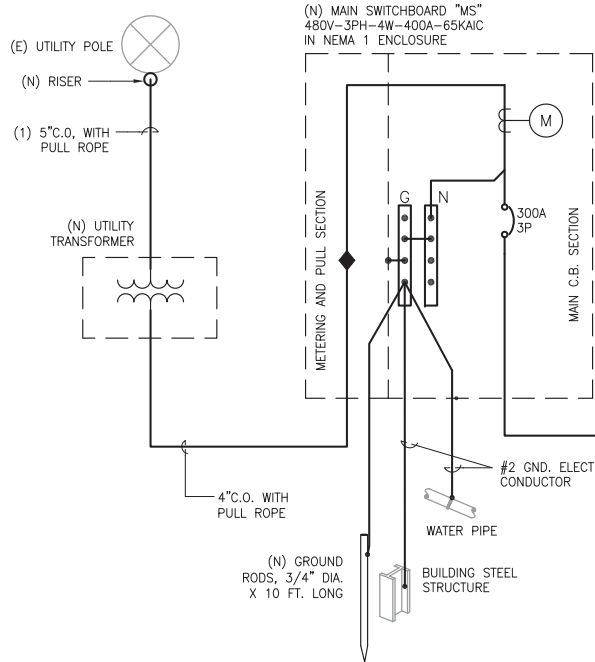
3.3 FIELD TESTS

- A. Field tests shall be in accordance with Section 16030 Electrical Tests.

-- END OF SECTION --

APPENDIX B

SINGLE LINE DIAGRAM, MCC & SWITCHBOARD



SINGLE LINE DIAGRAM

SCALE: NONE

1

E-2

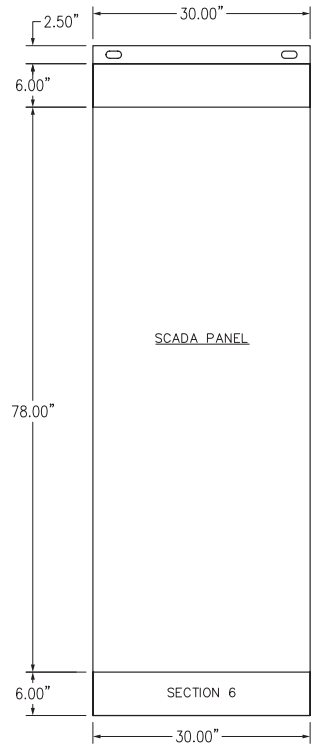
ELECTRICAL DESIGN LOAD SUMMARY	
SERVICE DESCRIPTION	LOAD (A)
WELL PUMP 2	21.00
BOOSTER PUMP A	7.60
BOOSTER PUMP B	7.60
AIR COMPRESSOR	11.00
APT CONTROL PANEL	51.15
MCC XFMR-A (75 KVA)	90.20
25% OF LML	5.25
TOTAL A	193.80

GENERAL NOTES:

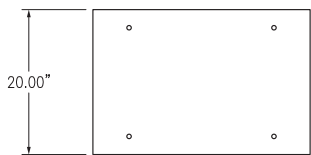
- ALL ELECTRICAL EQUIPMENT AND ALL CIRCUIT BREAKERS SHALL BE FULLY RATED FOR THE AVAILABLE FAULT CURRENT.
- CONDUCTOR LENGTH SHOWN HEREIN ARE FOR VOLTAGE DROP CALCULATIONS ONLY AND ARE NOT FOR MATERIAL TAKE-OFF.
- EQUIPMENT, DEVICE, AND WIRING SHOWN AS LIGHTWEIGHT LINES ARE EXISTING AND HEAVYWEIGHT LINES ARE NEW TO BE PROVIDED AND INSTALLED.

SPECIFIC NOTES:

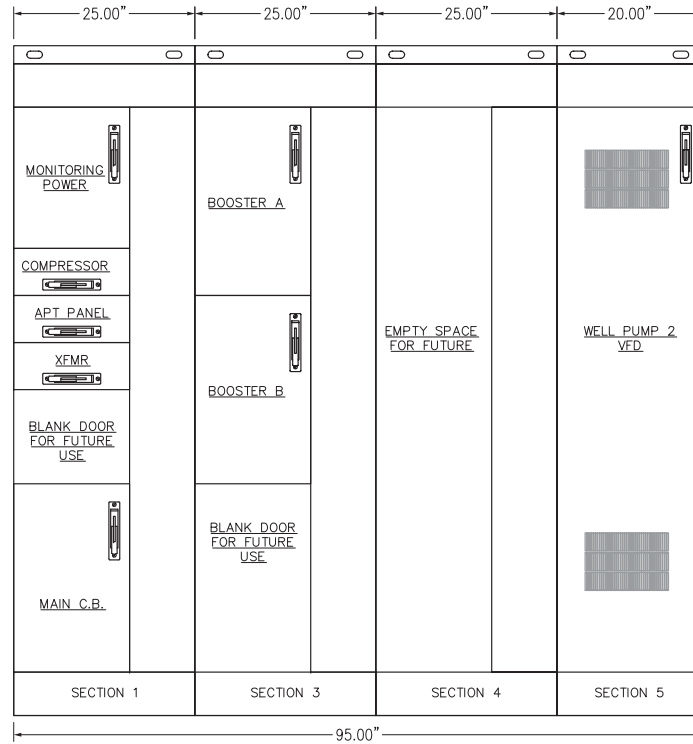
- WELL PUMP VFD SHALL BE ALLEN BRADLEY POWERFLEX 700, SIZE FOR MOTOR RATED HP-480V-3PH.
- BOOSTER PUMP ACCROSS THE LINE STARTER SHALL BE ALLEN BRADLEY SIIZE FOR MOTOR RATED HP-480V-3PH.
- MCC ENCLOSURE SHALL BE ALLEN BRADLEY CENTERLINE 2100.
- ALL MCC COMPONENTS (RELAYS, TIMERS, PHASE FAILURE RELAYS, ETC) SHALL BE ALLEN BRADLEY UNLESS OTHERWISE NOTED
- MAIN SWITCHBOARD SHALL BE EATON/CUTLER-HAMMER POW-R-LINE C., APPROVAL FROM UTILITY COMPANY PRIOR TO PURCHASE.



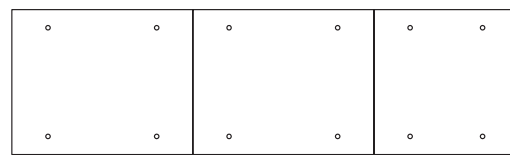
MCC-2ND CORNER ELEVATION



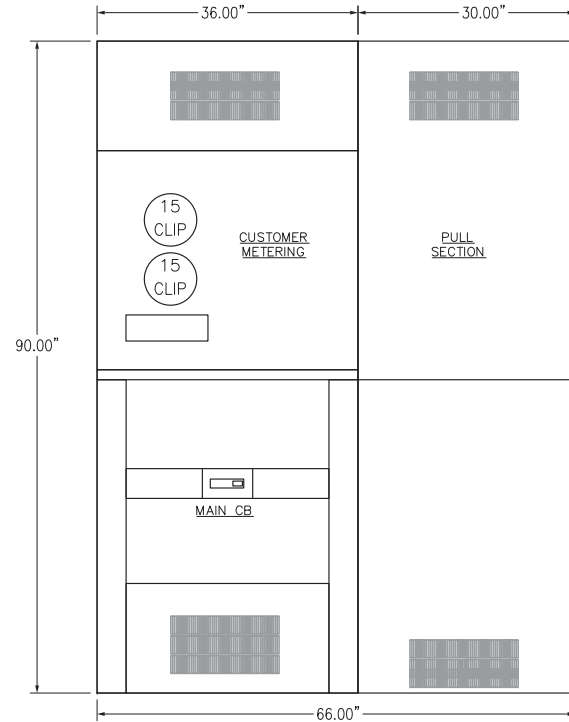
MCC-2ND CORNER PLAN



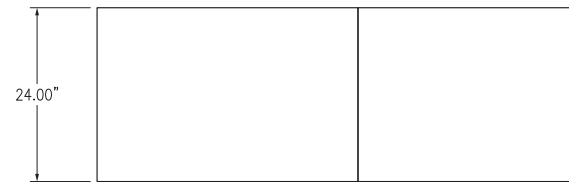
MCC-1ST CORNER ELEVATION



MCC-1ST CORNER PLAN



SWITCHBOARD ELEVATION



SWITCHBOARD FLOOR PLAN

MCC PLANS AND ELEVATIONS

SCALE: NONE

2

-

MAIN SWITCHBOARD PLAN AND ELEVATION

SCALE: NONE

3

-



REV.	DATE	REVISION	REV. BY	CKD. BY	APP'D

DISCLAIMER
Approval by C.V.W.D. does not constitute a representation as to the accuracy of design or the existence and location of underground utilities, structures, and conditions within the limits of this project.

SCALE: AS SHOWN	DATE
DRAWN BY: ER	-/-/-
CHECKED BY: OF	-/-/-
APPROVED: ----	-/-/-
AS BUILT:	

CRESCENTA VALLEY WATER DISTRICT CVWD	
WELL NO. 2	
SINGLE LINE DIAGRAM, MCC & SWITCHBOARD PLAN	

SHT. 22 OF 30 SHTS.	COMPLETION DATE:	LINEAR FT. ----
	JOB NO. E-956	FILE NO. ----

CRESCENTA VALLEY WATER DISTRICT

STAFF REPORT

Information Item No. 3
March 16, 2017

To: Engineering Committee
From: David S. Gould, P.E. – District Engineer
Subject: FY 17/18 - Draft Capital Improvement Project Program

INFORMATION ITEM:

FY 17/2018 Draft Capital Improvement Project Program – Discussion of the FY 17/18 Draft Capital Improvement Project (CIP) program budget

BACKGROUND:

Staff presented the draft Ten-Year CIP program at the last Engineering Committee meeting that outlines improvements needed to maintain or increase the reliability of CVWD's water system. The draft Ten-Year CIP was used as a baseline for discussions regarding the FY 17/18 CIP budget and beyond.

DISCUSSION:

Staff reviewed the FY 17/18 CIP budget and deferred a number of projects to future years with the goal of reducing the annual total CIP to best match the budget levels shown in the FY 16/17 budget. Staff has prepared three (3) scenarios of the CIP Budget, as shown on the attached, for review and discussion with the Engineering Committee.

Scenario 1: High priority CIP Projects shown highlighted in yellow that need to be completed. Also included are additional costs for projects that should be completed, but can be deferred another year. Scenario 1 also includes implementing the Automated Meter Information (AMI) project with completion within the next two (2) years. The CIP budget estimate for Scenario 1 is \$4.76M for FY 17/18.

Scenario 2: Limited to the high priority CIP Projects shown highlighted in yellow that need to be completed. The CIP budget estimate for Scenario 2 is \$3.41M for FY 17/18.

Scenario 3: The maximum CIP budget based on an overall water rate increase between 5.9% and 7.2% and maintaining the District's target reserve level. The CIP budget estimate for Scenario 3 is between \$2.09M to \$2.20M.

From these scenarios, staff developed the following tables that include the proposed rate increases required to meet the CIP budget goals for FY 17/18:

Table 1

<u>Scenario 1</u>	Projected \$4.76M CIP		
	1) Rate Increase – 5.9% & <u>below</u> Target Reserve Level 2) Rate Increase - 7.2% & <u>below</u> Target Reserve Level 3) Rate Increase - 39.1% <u>at</u> Target Reserve Level		
	FY 17/18	FY 17/18	FY 17/18
CIP Budget	\$4.76M	\$4.76M	\$4.76M
Water Rate	5.9%	7.2%	39.1%
\$/Kgal	\$6.64	\$6.72	\$8.72
Above/Below Target Reserves	(\$2.66M)	(\$2.56M)	\$0

Table 2

<u>Scenario 2</u>	Projected \$3.41M CIP 1) Rate Increase – 5.9% & <u>below</u> Target Reserve Level 2) Rate Increase - 7.2% & <u>below</u> Target Reserve Level 3) Rate Increase – 22.3% <u>at</u> Target Reserve Level		
	FY 17/18	FY 17/18	FY 17/18
CIP Budget	\$3.41M	\$3.41M	\$3.41M
Water Rate	5.9%	7.2%	22.3%
\$/Kgal	\$6.64	\$6.72	\$7.67
Above/Below Target Reserves	(\$1.31M)	(\$1.21M)	\$0

Table 3

<u>Scenario 3</u>	Max. CIP at Various Rate Increases 1) Reserve level <u>at</u> Target Reserve level 2) Rate Increase range from <u>5.9% to 7.2%</u>	
	FY 17/18	FY 17/18
CIP Budget	\$2.09M	\$2.20M
Water Rate	5.9%	7.2%
\$/Kgal	\$6.64	\$6.72
Above/Below Target Reserves	\$0	\$0

RECOMMENDATION:

Staff recommends proceeding with the high priority CIP Projects for FY 17/18 (Scenario 2) and to re-evaluate the scope of work and cost estimates as FY 17/18 progress, to see if other projects could be completed in FY 17/18.

In addition, staff recommends investigating further grant funding opportunities and possible financing of large CIP projects in coming years.

Prepared & Submitted by:



David S. Gould, P.E.
District Engineer

Attachments:

1. FY 17/18 CIP Budget Detail - Scenario 1
2. FY 17/18 CIP Budget Detail – Scenario 2
3. FY 17/18 CIP Budget Detail – Scenario 3

Capital Improvement Project Program FY 17-18 Budget - Scenario 1	Budget FY 16/17	Projected FY 16/17	Budget FY 17/18	Comments
1. Water Supply				
A. Groundwater				
i. Well Rehabilitation				
Well 7 Rehabilitation	\$ 60,000	\$ -		
Well 8 Rehabilitation		\$ 80,000		
Well 7 Rehabilitation			\$ 72,000	Add Well 8 to FY 16/17; Reduce Well Rehab from 3 Wells to 1 Well
ii. New Wells				
Re-Activate Well 2 - Design	\$ 70,895	\$ 71,000	\$ 125,000	Complete Design & Construction Admin
Re-Activate Well 2 - Construction	\$ 720,000	\$ 209,200	\$ 1,300,000	Complete Construction of Well 2 - Cost offset by \$750,000 Grant
iii. Studies				
Groundwater Source Water Protection Study		\$ 45,000		
B. Imported Water				
Ocean View Chlorination St (Grant - Matching Funds)	\$ 50,000	\$ 33,600		
Ocean View - Equip. (Grant - Matching Funds)	\$ 40,000	\$ 27,900		
Ocean View - Elect (Grant - Matching Funds)	\$ 35,000	\$ 32,000		
Ocean View - Final		\$ 26,000		
C. Groundwater Basin Recharge				
Storm Water Recharge Study (Grant - Matching Funds)	\$ 28,270	\$ 80,700		
Stormwater Recharge Project - Design	\$ 60,000	\$ 30,000	\$ 50,000	Design for Grant Application due in Nov. 2017
D. Recycled Water System				
i. Recycled Water				
Recycled Water System Study		\$ 15,600		
ii. Membrane Bioreactor Technology				
WS Total	\$ 1,064,165	\$ 651,000	\$ 1,547,000	
2. Water Storage				
A. Reservoir Rehabilitation				
i. Steel Reservoir Re-Coating/Roof/Vents Rehabilitation				
Oak Creek #1 & #2 - Roof/Air Vents/Recoat	\$ 320,000	\$ -	\$ 900,000	Design & Construction - Cost Estimate adjusted per HAEI comments
ii. Concrete Reservoir Rehabilitation				
iii. Corrosion Protection				
iv. Overflow & Drain System Upgrade				
B. Reservoir Water Quality				
i. Water Mixing System				
iv. Replace common inlet and outlet piping				
C. New Reservoir Water Storage				
WS Total	\$ 320,000	\$ -	\$ 900,000	

Capital Improvement Project Program FY 17-18 Budget - Scenario 1	Budget FY 16/17	Projected FY 16/17	Budget FY 17/18	Comments
3. Water Distribution				
A. Pipeline Replacement				
2600 Block - Harmony Place - 450 LF	\$ 151,800	\$ 52,300		
3900 Block - Park Place - 450 LF	\$ 151,800	\$ 52,300		
3900 Block - Glenwood - 650 LF	\$ 151,800	\$ 52,300		
2800 Block - Prospect & 4400 Block - Glenwood - 800 LF	\$ 76,435	\$ 110,700		
Lower Pickens Canyon Crossing & Slope - 600 LF	\$ 500,000	\$ 575,000		
4200 - 4400 Block - Penn - 1,450 LF	\$ 600,000	\$ 400,000		
Annual Pipeline Replacement - 3,000 LF			\$ 800,000	Pipeline Replacement Cost reduced from \$1.5M to \$800,000
B. New Pipelines				
Ramsdell - Bridge between Mayfield & Encinal				
C. Booster Pump System				
i. Annual Pump /Motor Replacement				
Booster 12 at Markridge	\$ 50,000	\$ 30,300		
Boosters - Encinal B & C			\$ 40,000	Reduce No. of Booster from 3 Booster to 2 Boosters
ii. Pump Station Upgrade				
Upgrade Paschall Booster Station	\$ 75,000	\$ -	\$ 75,000	Moved Design from FY 16/17 to FY 17/18 & Const. in FY 18/19
iii. VFD Pump Upgrade				
iv. MCC Replacement				
MCC upgrade at Paschall	\$ 75,000	\$ -	\$ 75,000	Moved Design from FY 16/17 to FY 17/18 & Const. in FY 18/19
D. Pressure Reducing Stations				
E. Miscellaneous Projects				
i. Water Surge Control				
Rehabilitation Surge Tank at Glenwood	\$ 65,000	\$ 50,000		
Rehabilitation Surge Tank at Mills Plant			\$ 75,000	Add Project per Recommendations; Cost includes Design & Constr.
ii. Street/Utility/ Meter Adjustment & Upgrade				
iii. Misc.				
Repairs to Ramsdell Mixing Station		\$ 75,000		
Mills Plant - Aeration Tower Rehabilitation			\$ 30,000	Project deferred for 2-years,
WD Total	\$ 1,896,835	\$ 1,397,900	\$ 1,095,000	
4. Water Treatment				
A. Nitrate Removal				
i. Glenwood				
ii. Mills				
iii. Ordunio				
B. Chlorine Disinfection				
New Chlorination Station at Pickens Canyon Reservoir			\$ 45,000	Added Project to Replace Chlorine System at Pickens Tunnel

Capital Improvement Project Program FY 17-18 Budget - Scenario 1	Budget FY 16/17	Projected FY 16/17	Budget FY 17/18	Comments
C. Convert to Chloramines				
D. New Federal and State Regulations				
E. Water Quality Studies				
F. MTBE Removal				
WT Total	\$ -	\$ -	\$ 45,000	
5. Technology				
A. Automated Meter Information (AMI) System				
Conversion of 3/4" & 1" meter		\$ -	\$ 325,000	Cost Estimate to Accelerate Project Completion by July 2019
Conversion of Large Meters & Fire Services		\$ -	\$ 220,000	Cost Estimate to Accelerate Project Completion by July 2019
Install & Integration of AMR & Fix Area Network		\$ -	\$ 495,000	Cost Estimate to Accelerate Project Completion by July 2019
B. Supervisory Control and Data Acquisition (SCADA) System				
SCADA RTU Replace - Equipment & Integration	\$ 200,000	\$ 200,000		
C. Graphical Information System (GIS)				
TECH Total	\$ 200,000	\$ 200,000	\$ 1,040,000	
6. Public Safety/Emergency Response				
A. Emergency Electrical Generators				
B. Water Storage				
Dunsmore/Pickens - Seismic Sensors & Valve Actuators	\$ 75,000	\$ 79,300		
Ordunio - Seismic Sensors & Valve Actuators			\$ 45,000	Continue with Installation of Seismic Sensors & Valve Actuators
C. Security				
D. Miscellaneous				
SF/ER Total	\$ 75,000	\$ 79,300	\$ 45,000	
7. Facilities & Planning				
A. Main Office				
B. Glenwood Plant				
C. Mills Plant				
D. Reservoir Site Improvements				
Ocean View - Site Improvements			\$ 85,000	Added Project to Regrade Site due to Drainage Issues
Ordunio Reservoir - North Wall		\$ 65,000		
5. Misc. Properties				
6. District Planning				
F & P Total	\$ -	\$ 65,000	\$ 85,000	
Capital Improvement Projects - Total	\$ 3,556,000	\$ 2,393,200	\$ 4,757,000	

Capital Improvement Project Program FY 17-18 Budget - Scenario 1	Budget FY 16/17	Projected FY 16/17	Budget FY 17/18	Comments
Capital Improvement Program 10-year CIP Planning	Budget FY 16/17	Projected FY 16/17	Budget FY 17/18	
1. Water Supply	\$ 1,064,165	\$ 651,000	\$ 1,547,000	
2. Water Storage	\$ 320,000	\$ -	\$ 900,000	
3. Water Distribution	\$ 1,896,835	\$ 1,397,900	\$ 1,095,000	
4. Water Treatment	\$ -	\$ -	\$ 45,000	
5. Technology	\$ 200,000	\$ 200,000	\$ 1,040,000	
6. Public Safety/Emergency Response	\$ 75,000	\$ 79,300	\$ 45,000	
7. Facilities & Planning	\$ -	\$ 65,000	\$ 85,000	
Capital Improvement Projects - Planning Total	\$ 3,556,000	\$ 2,393,200	\$ 4,757,000	
Capital Improvement Projects - Budget Forecast	\$ 3,556,000	\$ 3,556,000	\$ 3,335,000	

\$ (1,162,800) \$ 1,422,000

Capital Improvement Project Program FY 17-18 Budget - Scenario 2	Budget FY 16/17	Projected FY 16/17	Budget FY 17/18	Comments
1. Water Supply				
A. Groundwater				
i. Well Rehabilitation				
Well 7 Rehabilitation	\$ 60,000	\$ -		
Well 8 Rehabilitation		\$ 80,000		
Well 7 Rehabilitation			\$ 72,000	Add Well 8 to FY 16/17; Reduce Well Rehab from 3 Wells to 1 Well
ii. New Wells				
Re-Activate Well 2 - Design	\$ 70,895	\$ 71,000	\$ 125,000	Complete Design & Construction Admin
Re-Activate Well 2 - Construction	\$ 720,000	\$ 209,200	\$ 1,300,000	Complete Construction of Well 2 - Cost offset by \$750,000 Grant
iii. Studies				
Groundwater Source Water Protection Study		\$ 45,000		
B. Imported Water				
Ocean View Chlorination St (Grant - Matching Funds)	\$ 50,000	\$ 33,600		
Ocean View - Equip. (Grant - Matching Funds)	\$ 40,000	\$ 27,900		
Ocean View - Elect (Grant - Matching Funds)	\$ 35,000	\$ 32,000		
Ocean View - Final		\$ 26,000		
C. Groundwater Basin Recharge				
Storm Water Recharge Study (Grant - Matching Funds)	\$ 28,270	\$ 80,700		
Stormwater Recharge Project - Design	\$ 60,000	\$ 30,000	\$ 50,000	Design for Grant Application due in Nov. 2017
D. Recycled Water System				
i. Recycled Water				
Recycled Water System Study		\$ 15,600		
ii. Membrane Bioreactor Technology				
WS Total	\$ 1,064,165	\$ 651,000	\$ 1,547,000	
2. Water Storage				
A. Reservoir Rehabilitation				
i. Steel Reservoir Re-Coating/Roof/Vents Rehabilitation				
Oak Creek #1 & #2 - Roof/Air Vents/Recoat	\$ 320,000	\$ -	\$ 900,000	Design & Construction - Cost Estimate adjusted per HAEI comments
ii. Concrete Reservoir Rehabilitation				
iii. Corrosion Protection				
iv. Overflow & Drain System Upgrade				
B. Reservoir Water Quality				
i. Water Mixing System				
iv. Replace common inlet and outlet piping				
C. New Reservoir Water Storage				
WS Total	\$ 320,000	\$ -	\$ 900,000	

Capital Improvement Project Program FY 17-18 Budget - Scenario 2	Budget FY 16/17	Projected FY 16/17	Budget FY 17/18	Comments
3. Water Distribution				
A. Pipeline Replacement				
2600 Block - Harmony Place - 450 LF	\$ 151,800	\$ 52,300		
3900 Block - Park Place - 450 LF	\$ 151,800	\$ 52,300		
3900 Block - Glenwood - 650 LF	\$ 151,800	\$ 52,300		
2800 Block - Prospect & 4400 Block - Glenwood - 800 LF	\$ 76,435	\$ 110,700		
Lower Pickens Canyon Crossing & Slope - 600 LF	\$ 500,000	\$ 575,000		
4200 - 4400 Block - Penn - 1,450 LF	\$ 600,000	\$ 400,000		
Annual Pipeline Replacement - 3,000 LF			\$ 800,000	Pipeline Replacement Cost reduced from \$1.5M to \$800,000
B. New Pipelines				
Ramsdell - Bridge between Mayfield & Encinal				
C. Booster Pump System				
i. Annual Pump /Motor Replacement				
Booster 12 at Markridge	\$ 50,000	\$ 30,300		
Boosters - Encinal B & C			\$ 40,000	Reduce No. of Booster from 3 Booster to 2 Boosters
ii. Pump Station Upgrade				
Upgrade Paschall Booster Station	\$ 75,000	\$ -	\$ -	
iii. VFD Pump Upgrade				
iv. MCC Replacement				
MCC upgrade at Paschall	\$ 75,000	\$ -	\$ -	
D. Pressure Reducing Stations				
E. Miscellaneous Projects				
i. Water Surge Control				
Rehabilitation Surge Tank at Glenwood	\$ 65,000	\$ 50,000		
Rehabilitation Surge Tank at Mills Plant			\$ -	
ii. Street/Utility/ Meter Adjustment & Upgrade				
iii. Misc.				
Repairs to Ramsdell Mixing Station		\$ 75,000		
Mills Plant - Aeration Tower Rehabilitation			\$ 30,000	Project deferred for 2-years,
WD Total	\$ 1,896,835	\$ 1,397,900	\$ 870,000	
4. Water Treatment				
A. Nitrate Removal				
i. Glenwood				
ii. Mills				
iii. Ordunio				
B. Chlorine Disinfection				
New Chlorination Station at Pickens Canyon Reservoir			\$ 45,000	Added Project to Replace Chlorine System at Pickens Tunnel

Capital Improvement Project Program FY 17-18 Budget - Scenario 2	Budget FY 16/17	Projected FY 16/17	Budget FY 17/18	Comments
C. Convert to Chloramines				
D. New Federal and State Regulations				
E. Water Quality Studies				
F. MTBE Removal				
WT Total	\$ -	\$ -	\$ 45,000	
5. Technology				
A. Automated Meter Information (AMI) System				
Conversion of 3/4" & 1" meter		\$ -	\$ -	
Conversion of Large Meters & Fire Services		\$ -	\$ -	
Install & Integration of AMR & Fix Area Network		\$ -	\$ -	
B. Supervisory Control and Data Acquisition (SCADA) System				
SCADA RTU Replace - Equipment & Integration	\$ 200,000	\$ 200,000		
C. Graphical Information System (GIS)				
TECH Total	\$ 200,000	\$ 200,000	\$ -	
6. Public Safety/Emergency Response				
A. Emergency Electrical Generators				
B. Water Storage				
Dunsmore/Pickens - Seismic Sensors & Valve Actuators	\$ 75,000	\$ 79,300		
Ordunio - Seismic Sensors & Valve Actuators			\$ 45,000	Continue with Installation of Seismic Sensors & Valve Actuators
C. Security				
D. Miscellaneous				
SF/ER Total	\$ 75,000	\$ 79,300	\$ 45,000	
7. Facilities & Planning				
A. Main Office				
B. Glenwood Plant				
C. Mills Plant				
D. Reservoir Site Improvements				
Ocean View - Site Improvements			\$ -	
Ordunio Reservoir - North Wall		\$ 65,000		
5. Misc. Properties				
6. District Planning				
F & P Total	\$ -	\$ 65,000	\$ -	
Capital Improvement Projects - Total	\$ 3,556,000	\$ 2,393,200	\$ 3,407,000	

Capital Improvement Project Program FY 17-18 Budget - Scenario 2	Budget FY 16/17	Projected FY 16/17	Budget FY 17/18	Comments
Capital Improvement Program 10-year CIP Planning	Budget FY 16/17	Projected FY 16/17	Budget FY 17/18	
1. Water Supply	\$ 1,064,165	\$ 651,000	\$ 1,547,000	
2. Water Storage	\$ 320,000	\$ -	\$ 900,000	
3. Water Distribution	\$ 1,896,835	\$ 1,397,900	\$ 870,000	
4. Water Treatment	\$ -	\$ -	\$ 45,000	
5. Technology	\$ 200,000	\$ 200,000	\$ -	
6. Public Safety/Emergency Response	\$ 75,000	\$ 79,300	\$ 45,000	
7. Facilities & Planning	\$ -	\$ 65,000	\$ -	
Capital Improvement Projects - Planning Total	\$ 3,556,000	\$ 2,393,200	\$ 3,407,000	
Capital Improvement Projects - Budget Forecast	\$ 3,556,000	\$ 3,556,000	\$ 3,335,000	
\$ (1,162,800) \$ 72,000				

Capital Improvement Project Program FY 17-18 Budget - Scenario 3	Budget FY 16/17	Projected FY 16/17	Budget FY 17/18	Comments
1. Water Supply				
A. Groundwater				
i. Well Rehabilitation				
Well 7 Rehabilitation	\$ 60,000	\$ -		
Well 8 Rehabilitation		\$ 80,000		
Well 7 Rehabilitation			\$ -	
ii. New Wells				
Re-Activate Well 2 - Design	\$ 70,895	\$ 71,000	\$ 125,000	Complete Design & Construction Admin
Re-Activate Well 2 - Construction	\$ 720,000	\$ 209,200	\$ 1,300,000	Complete Construction of Well 2 - Cost offset by \$750,000 Grant
iii. Studies				
Groundwater Source Water Protection Study		\$ 45,000		
B. Imported Water				
Ocean View Chlorination St (Grant - Matching Funds)	\$ 50,000	\$ 33,600		
Ocean View - Equip. (Grant - Matching Funds)	\$ 40,000	\$ 27,900		
Ocean View - Elect (Grant - Matching Funds)	\$ 35,000	\$ 32,000		
Ocean View - Final		\$ 26,000		
C. Groundwater Basin Recharge				
Storm Water Recharge Study (Grant - Matching Funds)	\$ 28,270	\$ 80,700		
Stormwater Recharge Project - Design	\$ 60,000	\$ 30,000	\$ -	
D. Recycled Water System				
i. Recycled Water				
Recycled Water System Study		\$ 15,600		
ii. Membrane Bioreactor Technology				
WS Total	\$ 1,064,165	\$ 651,000	\$ 1,425,000	
2. Water Storage				
A. Reservoir Rehabilitation				
i. Steel Reservoir Re-Coating/Roof/Vents Rehabilitation				
Oak Creek #1 & #2 - Roof/Air Vents/Recoat	\$ 320,000	\$ -	\$ 900,000	Design & Construction - Cost Estimate adjusted per HAEI comments
ii. Concrete Reservoir Rehabilitation				
iii. Corrosion Protection				
iv. Overflow & Drain System Upgrade				
B. Reservoir Water Quality				
i. Water Mixing System				
iv. Replace common inlet and outlet piping				
C. New Reservoir Water Storage				
WS Total	\$ 320,000	\$ -	\$ 900,000	

Capital Improvement Project Program FY 17-18 Budget - Scenario 3	Budget FY 16/17	Projected FY 16/17	Budget FY 17/18	Comments
3. Water Distribution				
A. Pipeline Replacement				
2600 Block - Harmony Place - 450 LF	\$ 151,800	\$ 52,300		
3900 Block - Park Place - 450 LF	\$ 151,800	\$ 52,300		
3900 Block - Glenwood - 650 LF	\$ 151,800	\$ 52,300		
2800 Block - Prospect & 4400 Block - Glenwood - 800 LF	\$ 76,435	\$ 110,700		
Lower Pickens Canyon Crossing & Slope - 600 LF	\$ 500,000	\$ 575,000		
4200 - 4400 Block - Penn - 1,450 LF	\$ 600,000	\$ 400,000		
Annual Pipeline Replacement - 3,000 LF			\$ -	
B. New Pipelines				
Ramsdell - Bridge between Mayfield & Encinal				
C. Booster Pump System				
i. Annual Pump /Motor Replacement				
Booster 12 at Markridge	\$ 50,000	\$ 30,300		
Boosters - Encinal B & C			\$ -	
ii. Pump Station Upgrade				
Upgrade Paschall Booster Station	\$ 75,000	\$ -	\$ -	
iii. VFD Pump Upgrade				
iv. MCC Replacement				
MCC upgrade at Paschall	\$ 75,000	\$ -	\$ -	
D. Pressure Reducing Stations				
E. Miscellaneous Projects				
i. Water Surge Control				
Rehabilitation Surge Tank at Glenwood	\$ 65,000	\$ 50,000		
Rehabilitation Surge Tank at Mills Plant			\$ -	
ii. Street/Utility/ Meter Adjustment & Upgrade				
iii. Misc.				
Repairs to Ramsdell Mixing Station		\$ 75,000		
Mills Plant - Aeration Tower Rehabilitation			\$ -	
WD Total	\$ 1,896,835	\$ 1,397,900	\$ -	
4. Water Treatment				
A. Nitrate Removal				
i. Glenwood				
ii. Mills				
iii. Ordunio				
B. Chlorine Disinfection				
New Chlorination Station at Pickens Canyon Reservoir			\$ -	

Capital Improvement Project Program FY 17-18 Budget - Scenario 3	Budget FY 16/17	Projected FY 16/17	Budget FY 17/18	Comments
C. Convert to Chloramines				
D. New Federal and State Regulations				
E. Water Quality Studies				
F. MTBE Removal				
WT Total	\$ -	\$ -	\$ -	
5. Technology				
A. Automated Meter Information (AMI) System				
Conversion of 3/4" & 1" meter		\$ -	\$ -	
Conversion of Large Meters & Fire Services		\$ -	\$ -	
Install & Integration of AMR & Fix Area Network		\$ -	\$ -	
B. Supervisory Control and Data Acquisition (SCADA) System				
SCADA RTU Replace - Equipment & Integration	\$ 200,000	\$ 200,000		
C. Graphical Information System (GIS)				
TECH Total	\$ 200,000	\$ 200,000	\$ -	
6. Public Safety/Emergency Response				
A. Emergency Electrical Generators				
B. Water Storage				
Dunsmore/Pickens - Seismic Sensors & Valve Actuators	\$ 75,000	\$ 79,300		
Ordunio - Seismic Sensors & Valve Actuators			\$ -	
C. Security				
D. Miscellaneous				
SF/ER Total	\$ 75,000	\$ 79,300	\$ -	
7. Facilities & Planning				
A. Main Office				
B. Glenwood Plant				
C. Mills Plant				
D. Reservoir Site Improvements				
Ocean View - Site Improvements			\$ -	
Ordunio Reservoir - North Wall		\$ 65,000		
5. Misc. Properties				
6. District Planning				
F & P Total	\$ -	\$ 65,000	\$ -	
Capital Improvement Projects - Total	\$ 3,556,000	\$ 2,393,200	\$ 2,325,000	

Capital Improvement Project Program FY 17-18 Budget - Scenario 3	Budget FY 16/17	Projected FY 16/17	Budget FY 17/18	Comments
Capital Improvement Program 10-year CIP Planning	Budget FY 16/17	Projected FY 16/17	Budget FY 17/18	
1. Water Supply	\$ 1,064,165	\$ 651,000	\$ 1,425,000	
2. Water Storage	\$ 320,000	\$ -	\$ 900,000	
3. Water Distribution	\$ 1,896,835	\$ 1,397,900	\$ -	
4. Water Treatment	\$ -	\$ -	\$ -	
5. Technology	\$ 200,000	\$ 200,000	\$ -	
6. Public Safety/Emergency Response	\$ 75,000	\$ 79,300	\$ -	
7. Facilities & Planning	\$ -	\$ 65,000	\$ -	
Capital Improvement Projects - Planning Total	\$ 3,556,000	\$ 2,393,200	\$ 2,325,000	
Capital Improvement Projects - Budget Forecast	\$ 3,556,000	\$ 3,556,000	\$ 3,335,000	

\$ (1,162,800) \$ (1,010,000)