APPENDICES

TO THE

DESIGN-BUILD AGREEMENT
FOR THE
MONTEREY PENINSULA WATER SUPPLY PROJECT
DESALINATION INFRASTRUCTURE

between

CALIFORNIA-AMERICAN WATER COMPANY

and

CDM CONSTRUCTORS, INC.

Dated as of

[December 20, 2013]

APPENDICES

1. Description of the Project Site
2. Design and Construction Requirements
3. Governmental Approvals
4. General Design-Build Work Requirements
5. Design-Build Quality Management Plan and Quality Control Requirements
6. Design-Build Work Review Procedures
7. Acceptance Test Procedures and Requirements
8. Design-Build Alternatives
9. Operation and Maintenance-Related Deliverables
10. Key Personnel and Approved Subcontractors
11. Insurance Requirements
12. Allowances
13. Payment Procedures and Drawdown Schedule
14. Cost Substantiation
15. Restricted Persons
16. WMDVBE Utilization Plan
17. Local Resources Utilization Plan
18. Construction Component Price Escalator

Appendix 1

Description of the Project Site

Appendix 1

Description of the Project Site

1.1 Purpose

The purpose of this Appendix is to identify the Project Site.

1.2 Project Site

California American Water purchased an approximate 46-acre property in Marina, California for the purpose of locating a desalination facility. Figure 1-1 shows the location of the property in relation to surrounding cities. The Project Site is generally located to the north of Charles Benson Road, south of the Salinas River, east of State Route 1 and Del Monte Boulevard and west of Nashau Road, near the City of Marina, unincorporated County of Monterey, California. The Project Site consists of a portion of Assessor's Parcel Number (APN) 229-011-021. The property contains an approximate 40-foot wide easement that runs east-west and bisects the site. **Attachment 1** to this Appendix 1 contains the Grant Deed and Record of Survey for the Project Site.

Figure 1-1: Regional Location Map

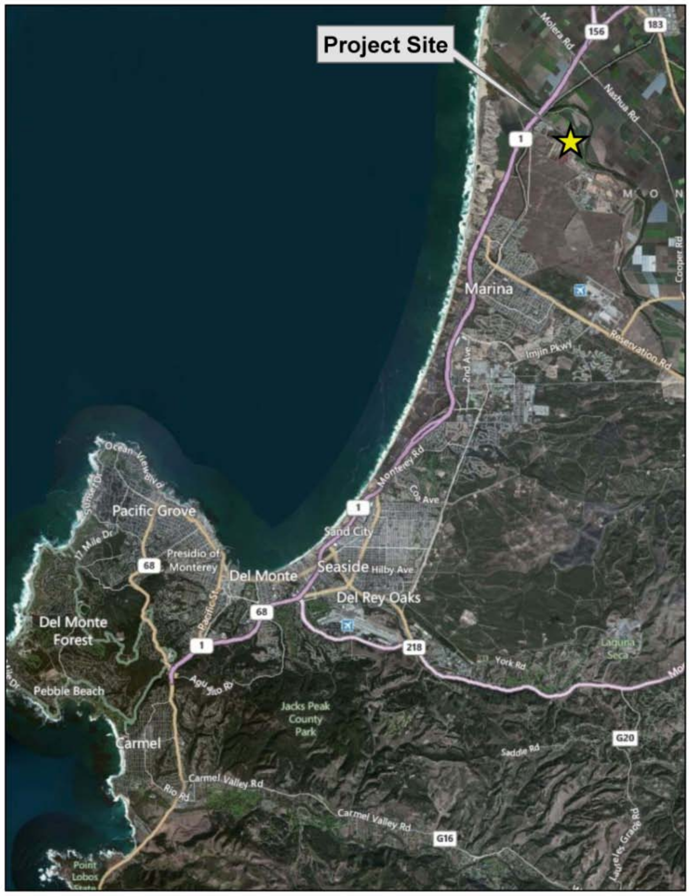


Figure 1-2 depicts the Project Site.

Figure 1-2: Project Site

Appendix 1 - Attachment 1

Grant Deed and Record of Survey

REEL 1389 PAGE 168

C 05085

RECORDING REQUESTED BY
Western Title Insurance Company

AND WHEN RECORDED MAIL TO

NAME BUD ANTLE INC.
ADDRESS P.O. Box 1759
CITY & STATE Salinas, Calif, 93902
Attn: Mitch Secundo

Title Order No. 118728/23 Escrow No.

RECORDED AT REQUEST OF
WESTERN TITLE INSURANCE COMPANY
Feb 8 9 35 AM '80
OFFICE OF RECORDER
COUNTY OF MONTEREY
SALINAS, CALIFORNIA

5

SPACE ABOVE THIS LINE FOR RECORDER'S USE

MAIL TAX STATEMENTS TO

NAME SAME AS ABOVE
ADDRESS
CITY & STATE

Documentary transfer tax $ 213.40
☒ Computed on full value of property conveyed, or
☐ Computed on full value less liens and encumbrances remaining thereon at time of sale.

Diane L. Ferris, WTIC
Signature of declarant or agent determining tax — firm name

Individual Grant Deed

WESTERN TITLE FORM NO. 104

FOR VALUE RECEIVED, RICHARD NIELSEN and JANET NIELSEN SMITH, each dealing with their separate property,

GRANT to BUD ANTLE INC.,

all that real property situate in the County of Monterey State of California, described as follows:

$213.40
TRANSFER TAX PAID
MONTEREY COUNTY

SEE EXHIBIT "A" ATTACHED HERETO AND MADE A PART HEREOF.

A.P. No: 229-011-10

Dated November 12 1979

Janet Nielsen Smith
Janet Nielsen Smith

Richard Nielsen
Richard Nielsen

STATE OF ~~CALIFORNIA~~ WASHINGTON
County of ~~Monterey~~ YAKIMA } ss.

On Nov 19, 1979, before me, the undersigned, a Notary Public, in and for said State, personally appeared Richard Nielsen ~~and Janet Nielsen Smith~~ known to me to be the persons whose name ~~s~~ are subscribed to the within instrument, and acknowledged to me that they executed the same.

Arthur E. Kaiser
Notary Public

FOR NOTARY SEAL OR STAMP

MAIL TAX STATEMENTS AS DIRECTED ABOVE

REEL 1389 PAGE 169

Oregon

STATE OF ~~CALIFORNIA~~ } ss.

County of Multnomah

On January 7, 198[illegible] before me, the undersigned a Notary Public, in and for said State, personally appeared Janet Nielsen Smith

known to me to be the person whose name is subscribed to the within instrument, and acknowledged to me that she executed the same.

My commission expires My Commission Expires July 17, 198[illegible]

Notary Public

OREGON

REEL 1389 PAGE 170

EXHIBIT "A"

Situate in the County of Monterey, State of California, described as follows:

Certain real property situate in the Rancho Rincon de las Salinas Monterey County, California, being a part of that certain 133.225 acre tract of land designated "PARCEL I" in the Decree in Action No. 15746 in the Superior Court of the State of California in and for the County of Monterey, a copy of which dated December 30, 1959 is recorded in Volume 2019 of Official Records, at page 20, records of said county, said part being particularly described as follows:

BEGINNING in the southeasterly boundary of said 133.225 acre tract of land at the easterly corner of that certain 4.671 acre strip of land (100 feet wide) described in deed from Opal Nielsen to Monterey Peninsula Garbage and Refuse Disposal District dated August 14, 1964 and recorded in Reel 370 of Official Records, at Page 136, records of said county and running thence along the northeasterly boundary of said strip of land

(1) N. 61° 50' W., 2069.55 feet to the northerly corner thereof in the northwesterly boundary of said 133.225 acre tract of land; thence along last mentioned boundary

(2) N. 14° 42' 30" E., 1594.69 feet to angle point in said boundary at the locus of post marked "125" at angle point in the southwesterly boundary of Zone 2 of Monterey County Flood Control and Water Conservation District; thence along said Southwesterly boundary

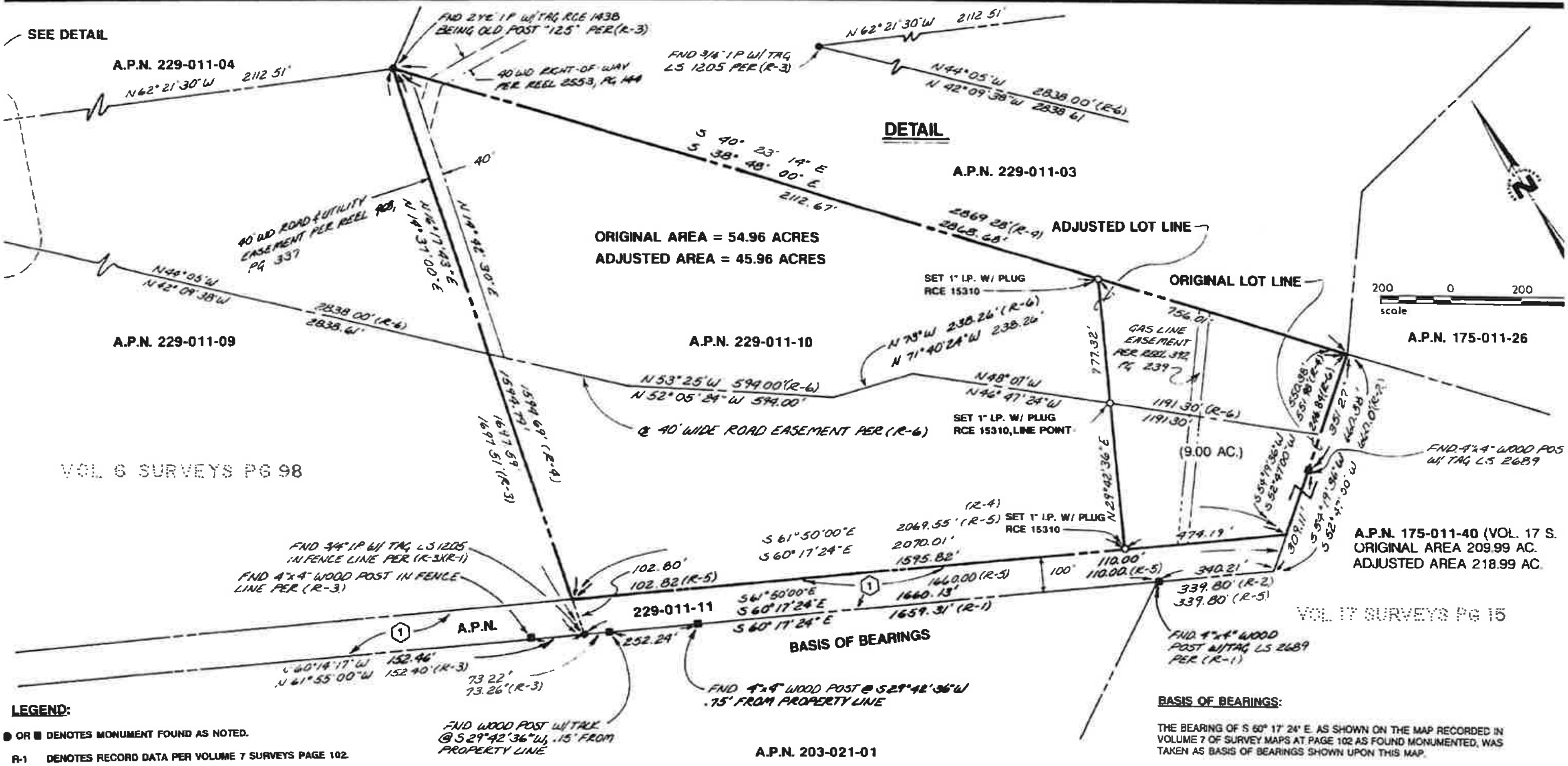
(3) S. 40° 23' 14" E., 2869.28 feet (course numbered "717" and designated "N. 40° 29' W., 2873.0 feet" in the description of said boundary) to an angle point in the southeasterly boundary of said 133.225 acre tract of land; thence along last mentioned boundary

(4) S. 52° 47' W., 551.98 feet to the place of beginning.

COURSES ALL TRUE.

END OF DOCUMENT

VOL. 18 SURV. PG. 10



LEGEND:

● OR ■ DENOTES MONUMENT FOUND AS NOTED.

R-1 DENOTES RECORD DATA PER VOLUME 7 SURVEYS PAGE 102.

R-2 DENOTES RECORD DATA PER VOLUME 17 SURVEYS PAGE 15.

R-3 DENOTES RECORD DATA PER VOLUME 6 SURVEYS PAGE 98.

R-4 DENOTES RECORD DATA PER DEED RECORDED AT REEL 1389 O.R. 168.

R-5 DENOTES RECORD DATA PER DEED RECORDED AT REEL 370, O.R. PAGE 136.

R-6 DENOTES RECORD DATA PER DEED RECORDED AT VOLUME 39 OF DEEDS AT PAGE 58.

(1) DENOTES 100' ACCESS STRIP TO STATE HIGHWAY NO. 1 ACQUISITION DEEDS 370-ROR-136, 371-ROR-849, AND 370-ROR-133.

COUNTY SURVEYOR'S STATEMENT

THIS MAP HAS BEEN EXAMINED IN ACCORDANCE WITH SECTION 8766 OF THE LAND SURVEYOR'S ACT THIS 4 DAY MARCH 1993.

[signature] - DEPUTY
MONTEREY COUNTY SURVEYOR

COUNTY RECORDER'S STATEMENT

FILED THIS DAY OF 10th DAY OF MARCH, 1993 AT 10:01 A.M. IN VOLUME 18 OF SURVEY MAPS, AT PAGE 10, AT THE REQUEST OF BESTOR ENGINEERS, INC.

ERNEST A. MAGGINI
COUNTY RECORDER

[signature]
DEPUTY

SERIAL NO. 16551 FEE: $ 6.00

ENGINEER'S STATEMENT

THIS MAP REPRESENTS A SURVEY MADE BY ME OR UNDER MY DIRECTION IN CONFORMANCE WITH THE REQUIREMENTS OF THE LAND SURVEYOR'S ACT AT THE REQUEST OF BUD ANTLE, INC.

[signature]
JOHN M. VAN ZANDER
REGISTERED CIVIL ENGINEER #15310
STATE OF CALIFORNIA
EXPIRES: 31 MARCH 1993

BASIS OF BEARINGS:

THE BEARING OF S 60° 17' 24" E. AS SHOWN ON THE MAP RECORDED IN VOLUME 7 OF SURVEY MAPS AT PAGE 102 AS FOUND MONUMENTED, WAS TAKEN AS BASIS OF BEARINGS SHOWN UPON THIS MAP.

NOTES:

1. DIMENSIONS SHOWN ARE IN FEET AND DECIMALS THEREOF.
2. FOUND OR SET POINTS ARE SO NOTED. ALL OTHER POINTS FOR REFERENCE ONLY.

RESOLUTION NO. 92-33 (LL 92-03)

RECORD OF SURVEY

SHOWING A LOT LINE ADJUSTMENT

BETWEEN A.P.N. 229-011-10 AND A.P.N. 175-011-40 IN AND ADJOINI

RANCHO RINCON DE LAS SALINAS, MONTEREY COUNTY, CALIFORNI

FOR

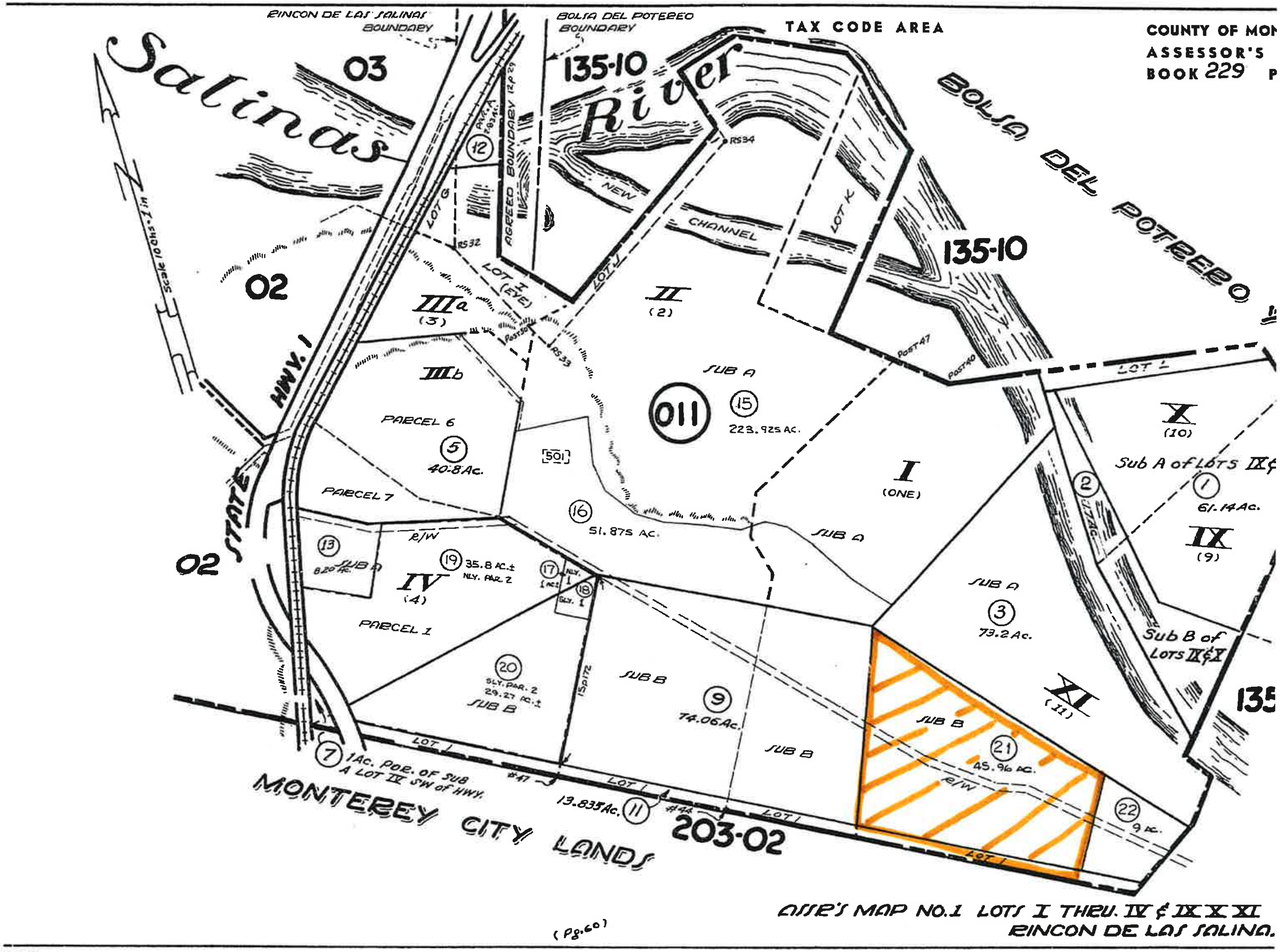
BUD OF CALIFORNIA

BY

BESTOR ENGINEERS, INC.
CIVIL ENGINEERING - SURVEYING - LAND PLANNING
3701 BLUE LARKSPUR LANE, MONTEREY, CALIFORNIA 93940
1"=200' 5219.00 FEB. 1993

229-011-010 175-011-042

DG 5648



COUNTY OF MON
ASSESSOR'S
BOOK 229 P
TAX CODE AREA
RINCON DE LAS SALINAS BOUNDARY
BOLSA DEL POTRERO BOUNDARY
Salinas River
BOLSA DEL POTRERO
135-10
03
02
HWY. 1
STATE
AGREED BOUNDARY
NEW CHANNEL
LOT G
LOT I (EYE)
LOT J
LOT K
LOT L
011
II (2)
IIIa (3)
IIIb
I (ONE)
IV (4)
X (10)
IX (9)
XI (11)
SUB A
SUB B
15 223.925 AC.
16 51.875 AC.
5 40.8 Ac.
PARCEL 6
PARCEL 7
PARCEL 1
501
12
13 8.20 AC.
19 35.8 AC.± NLY. PAR. 2
20 SLY. PAR. 2 29.27 AC.±
17
18
9 74.06 Ac.
3 73.2 Ac.
21 45.96 AC.
22 9 AC.
2
1 61.14 Ac.
Sub A of LOTS IX &
Sub B of LOTS IX & X
R/W
7 1 Ac. POR. OF SUB A LOT IV SW of HWY.
11 13.835 Ac.
LOT 1
203-02
MONTEREY CITY LANDS
Scale 10 chs = 1 in
ASSE'S MAP NO.1 LOTS I THRU. IV & IX X XI
RINCON DE LAS SALINA.
(Pg. 60)

Appendix 2

Design and Construction Requirements

[NOTE: Appendix under review.]

Appendix 2

Design and Construction Requirements

TABLE OF CONTENTS

ATTACHMENTS TO APPENDIX 2

ATTACHMENT	TITLE
1	AMERICAN WATER ENGINEERING STANDARD T2: LIQUID CHEMICAL STORAGE, FEED, AND CONTAINMENT
2	RAW WATER QUALITY CONDITIONS FOR BASIS OF DESIGN
3	FINISHED WATER QUALITY BASIS OF DESIGN STANDARDS AND WATER QUALITY ACCEPTANCE STANDARDS AND REQUIREMENTS
4	TYPICAL EQUIPMENT MANUFACTURERS (EXCEPT ELECTRICAL)
5	RESERVED
6	TYPICAL ELECTRICAL EQUIPMENT MANUFACTURERS
7	GENERAL ELECTRICAL DESIGN CRITERIA
8	POWER SYSTEM STUDY REQUIREMENTS
9	RESERVED
10	CHEMICAL STORAGE ANALYSIS
11	CAD STANDARDS
12	DRAWINGS
13	VALVE SCHEDULE
14	WIRING SPECIFICATION

EXHIBITS TO APPENDIX 2

EXHIBIT	TITLE
1	PRELIMINARY PROCESS FLOW DIAGRAM
2	CONCEPTUAL DESIGN OF POWER SYSTEM RISER DIAGRAM

The purpose of this Appendix is to describe the Design and Construction Requirements that the Design-Builder must meet for the Design-Build Improvements. This Appendix also includes the means and methods that the Design-Builder will use in performing the Design-Build Work to meet the Design and Construction Requirements. If the means and methods (including the drawings in Attachment 12) utilized by the Design-Builder fail to meet the Design and Construction Requirements or the Contract Standards, the Design-Builder must modify its means and methods to comply with the Design and Construction Requirements, subject to review and approval by the Owner.

Nothing in this Appendix shall be construed to allow design of facilities to a level less than the applicable building codes or absolve the Design-Builder of its responsibility as Engineer of Record.

This document contains a number of Attachments that are an integral part of this document.

1. INTRODUCTION

The Design-Build Improvements include:

- Raw water piping (from the property line)
- Granular media filtration system (filters, backwashing supply, spent backwash water clarification and recycle facilities)
- Filtered water storage and pumping system
- Reverse osmosis system
- Handling of treatment residuals resulting from the filtration of seawater from beach wells
- Product water stabilization system
- UV disinfection system
- Finished Water storage and disinfection
- Finished Water pumping system and piping (piping to the property line)
- Salinas Valley desalinated water return pumping system and piping (piping to the property line)
- Concentrate equalization, aeration and disposal system (piping to the property line)
- Chemical storage and feed facilities
- Electrical facilities including power supply
- Standby power facilities

- Process control and instrumentation system
- Buildings, inclusive of all mechanical, electrical, and special systems:
- Administration facilities
- Reverse osmosis (RO) building
- Chemical storage incorporated into the RO building
- UV equipment space incorporated into the RO building
- Granular media filtration building
- Electrical room incorporated into the RO building and a remote electrical building for MCC 2A and 2B .
- Project Site improvements for access, concentrate equalization storage, drainage, backwash reclamation, security, landscaping and public tours.
- All other improvements necessary for a fully functional facility.

The facility to be constructed shall be designed to reliably deliver either 7,168 acre-feet per year with a design capacity of 6.4 MGD, or 10,752 acre-feet per year with a design capacity of 9.6 MGD, of desalinated water for potable use. The selected final design capacity depends on the future decision of implementation of the groundwater replenishment ("GWR") project.

Water from the Pacific Ocean will be delivered to the Project Site by pipeline from slant beach wells on the coast nearby. The beach wells are to be provided by others on behalf of the Owner. Treatment shall consist of oxidation with sodium hypochlorite, granular media filtration, dechlorination, pH adjustment with sulfuric acid, cartridge filtration, a first pass of seawater reverse osmosis ("SWRO"), a partial second pass of brackish water reverse osmosis ("BWRO"), disinfection with ultraviolet light, post-stabilization treatment with carbon dioxide and hydrated lime, pH adjustment with sodium hydroxide, addition of an orthophosphate corrosion inhibitor and post-chlorination with sodium hypochlorite.

The UV disinfection system shall be capable of delivering a UV dose sufficient to meet CDPH requirements for LT2 Bin 4 (with a minimum of 4-log inactivation of *Cryptosporidium).* The facility shall meet all CDPH requirements for the removal and/or inactivation of *Cryptosporidium, Giardia* and virus.

The post-stabilization system shall be capable of producing a calcium hardness and alkalinity, which ranges from as low as 40 to as high as 100 mg/L as calcium carbonate at pHs, which correspond to slight saturation of calcium carbonate (Langelier Saturation Index of 0 to +0.2). The system shall also have the capability of operating over the same range of hardness and alkalinity while bringing the pH as low as 7.7 to facilitate the effective use of phosphoric acid as a corrosion inhibitor.

The post-stabilization system must be able to consistently hold the target levels of calcium hardness/alkalinity ± 5 percent based on the weekly average of daily measurements and the target pH ± 0.1 pH units based on the daily average of hourly measurements.

Post-stabilization to adjust the calcium hardness, alkalinity and pH may be accomplished with a combination of hydrated lime and carbon dioxide.

Downstream of the post-stabilization, orthophosphate may be added as a corrosion inhibitor and sodium hypochlorite will be added for post-disinfection prior to finished water storage and deliver to the distribution system.

The spent filter washwater will be equalized and treated to allow for recycle of the decant in compliance with CDPH's *Cryptosporidium Rule* stream to the head of the plant. The concentrate flows from the 1° pass SWRO will be conveyed to the MRWPCA site via a concentrate pipeline and disposed of via the existing MRWPCA outfall. The plant shall have the ability to convey the 2° pass BWRO concentrate to MRWPCA via the concentrate pipeline, as well as recycle the 2° pass BWRO concentrate to the 1° pass SWRO feed. An on-site 3.0 MG equalization basin will allow for temporary off-stream storage of concentrate.

2. GENERAL PROJECT DESIGN CRITERIA

a. Rated Capacity

i. Rated capacity, also termed "reliable capacity," is a design criterion defined as the capacity that can be treated and delivered with the single largest redundant process unit, for example pump or RO train, out of service.

ii. The rated capacity shall be 9.6 mgd or 6.4 mgd. The decision on rated capacity depends on whether the 3,500 afy GWR project is implemented by MRWPCA.

iii. Maximum Capacity: The maximum capacity is the capacity that can be treated and delivered with the spare RO train in operation. Pretreatment systems, chemical feeders and disinfection systems shall be designed to allow maximum capacity to be achieved with no allowance for redundancy. The purpose of defining a maximum capacity is to allow the spare RO rack to be used to "catch up" to annual production, but not exceed annual allowed production.

iv. Both rated capacity and maximum capacity shall be permitted capacities recognized by CDPH, including the *Cryptosporidium* action plan.

v. The first pass RO system shall be designed to produce the rated capacity with one train off-line.

vi. Table 2-1 identifies the effect of rated capacity on various facility components. Some facility components are modular, such as RO trains, and are identified as "variable capacity". Other components are not modular, for example the administration facilities, and are required regardless of capacity, and are noted as "fixed capacity". Components that are costly, and can't be readily duplicated, are identified as "fixed capacity". An ultimate capacity of 12.8 mgd is shown in Table 2-1 to provide a basis for design of fixed capacity components, and to identify space planning requirements for variable capacity components. The ultimate capacity is based on adding two RO trains (1.6 mgd each) to the 9.6 mgd rated capacity design, or adding four RO trains (1.6 mgd each) to the 6.4 mgd rated capacity design to provide 12.8 mgd capacity but without the redundant train in operation. Chemical storage volumes are identified as fixed because storage tanks are sized to safely receive bulk deliveries.

Table 2-1 Component Capacity

Item	Component	Variable or Fixed Capacity	Capacity to be Provided	Design Criteria for Ultimate Capacity
1	Administration Facilities/Building	Fixed	As identified in Appendix 2	N/A
2	Arterial Piping (such as Raw Water supply piping, piping to finished water tanks)	Fixed	12.8 mgd	Ultimate hydraulic capacity of 12.8 mgd
3	Chemical Storage Volumes	Fixed	As identified in Appendix 2	As identified in Appendix 2
4	Chemical Feeders	Variable	9.6 mgd	12.8 mgd
5	Electrical Service and Service Transformers	Variable	See electrical criteria in Appendix 2	12.8 mgd
6	Electrical Bus Capacity (4160 volt)	Fixed	12.8 mgd	12.8 mgd
7	Standby Electrical Generator	Fixed	As identified in Appendix 2	12.8 mgd
8	Granular Media Filtration Capacity	Variable	Selected rated capacity	12.8 mgd
9	Granular Media Filtration Wastewater Clarification	Fixed	9.6 MGD	12.8 mgd
10	Post Stabilization Chemical Storage	Fixed	9.6 MGD	12.8 mgd
11	Post Stabilization Lime System	Fixed	Selected rated capacity	12.8 mgd
12	UV Disinfection	Variable	Selected rated capacity	12.8 mgd
13	Clearwell Size	Fixed	As identified in Appendix 2	1.5 MG

Item	Component	Variable or Fixed Capacity	Capacity to be Provided	Design Criteria for Ultimate Capacity
14	Hypochlorite Generation Capacity	Variable	As identified in Appendix 2	12.8 mgd
15	Hypochlorite Storage Capacity	Fixed	As identified in Appendix 2	As defined in Appendix 2
16	Reverse Osmosis Capacity	Variable	Selected rated capacity	12.8 mgd
17	Reverse Osmosis Building	Variable	Selected rated capacity	12.8 mgd
18	Concentrate Equalization Pond Volume	Fixed	As identified in Appendix 2	3 MG
19	Finished Water Pumping Capacity	Variable	Selected rated capacity	12.8 mgd

b. Life Expectancy

i. Table 2-2 identifies the expected life of selected assets for the Design and Construction Requirements and the Design-Builder's means and methodology for meeting the requirement. The design and drawings submitted by the Design-Builder shall take precedence over the life expectancies in this section upon acceptance by the Owner of such designs and drawings.

Table 2-2 Life Expectancy

Equipment Type	Design and Construction Requirements: Life Expectancy (Years)	Design-Builder Comments
Process Equipment		
RO Equipment	25	Excludes membranes and pumps
Pressure Filters	15	Replace rubber lining
Electrical Power Equipment	30	
Instrumentation and control equipment	20	Software and processor may be obsolete in 5-10 years
Tankage		
Chemical Bulk Storage Tanks	25	Hypochlorite and sulfuric tanks require more frequent replacement
Chemical Day Tanks	15	Not applicable
Finished Water Storage Tanks	50	Requires periodic coating replacement

Equipment Type	Design and Construction Requirements: Life Expectancy (Years)	Design-Builder Comments
Earthen reservoirs	25 (life of liner)	20 year extended warranty provided
Buildings/Structures		
Reinforced Concrete Structures	75	
Administration Facilities	50	
Stand Alone Electrical Buildings	30	
Piping and Valves		
Finished Water Piping	50	
Finished Water Valves	25	
Saline Water Piping	25	
Saline Water Valves	15	
Chemical Piping	15	
Chemical Valves	15	

c. Staffing for Operation

i. It is expected that the Design-Build Improvements will be staffed 24 hours per day, seven days per week. However, it is a goal that operation of the Design-Build Improvements would be sufficiently reliable to allow partially attended operation.

ii. The Design-Builder's proposed automated components are summarized in Table 2-3 below.

Table 2-3 Automated Components

Process	Automation	Operational Benefit
Backwash	Automated backwash sequence	Provides for the routine unmanned operation of backwash sequence based upon start-up sequence, pressure differential, and or time based upon operating conditions without operator intervention. Failure of backwash initiation is alarmed for operator attention.
RO Flushing System	Automated system including flush supply and waste valves	Required flushing of the system is initiated as part of the system shutdown sequence, readying system for subsequent restarts, parking the membranes in a permeate solution rather than salt or brackish water extending the life of the membranes.

Process	Automation	Operational Benefit
RO Concentrate	Automatic sampler at sampling station	Collects composited samples for ease of collection, for analysis, to comply with discharge permit requirements.
Lime Slurry System	Automated batching system	Provides a continuous supply of lime while limiting the exposure of operations and maintenance staff to lime.
UV System	Automated start-up and shutdown sequence	Conserves power and extends life of bulbs and ballasts.
Medium Voltage Switchgear	Automated transfer control of the main-tie-main arrangement with capability of being fully automated in the future	Allows for automatic start and switch over in the event of power failure, allowing O&M staff to concentrate on equipment and system issues resulting from a power failure and the temporary power loss during the switchover
Supply to Filtered Water Feedwater Pumps and Finished Water Pumps	Automatic transfer control associated with the 480 VAC standby power generator	Allows for automatic start and switch over in the event of power failure, allowing O&M staff to concentrate on equipment and system issues resulting from a power failure and the temporary power loss during the switchover
Standby Power	Genset shall start automatically upon loss of power	Allows for automatic start and switch over in the event of power failure, allowing O&M staff to concentrate on equipment and system issues resulting from a power failure and the temporary power loss during the switchover.
Alarms	Automatic dialing capabilities	Provides duty operator with means to monitor alarms, via a duty mobile phone, to receive alarms when not stationed at control panel while making rounds, adjusting equipment, and performing other operation and maintenance duties. Feature also provides for future alarm response in the event scheduling and permits allow for unmanned operation periods.

d. Allowance for future or potential facilities

i. Seawater Treatment

(1) The Design-Builder shall identify an area of the Project Site where pretreatment processes for treatment of surface water, for example, dissolved air flotation and gravity granular media filtration, and appropriate residual handling facilities could be constructed if an open seawater intake should be required. Detailed design of seawater pretreatment facilities is not necessary.

(2) Sheet C-6 in Attachment 12 to this Appendix (the drawing set) identifies the area of the Project Site west of the pressure filters where pretreatment processes for seawater from a surface water intake can be treated using dissolved air flotation and granular media filtration. This process generates up to 2 tons of dry solids per day and requires the construction of residuals holding tanks, thickeners and dewater equipment. The site plan shows a dewatering equipment building with an enclosed truck loading station and pull through.

ii. Planning for Plant Expansion

(1) The Design-Builder shall reserve space for future build-out of the building housing the RO racks and other structures to allow for expansion to ultimate capacity. These areas shall be maintained free of large piping, ductbanks, and similar obstructions that would be difficult or costly to move/relocate in the future.

(2) As shown on the base case site plan for a 9.6 mgd facility M-5 the design reserves space on the east side of the building for future expansion of the Building by 20 feet and installation of an eighth and ninth 1.6 mgd SWRO unit and one 1.3 mgd BWRO unit. These areas have been maintained free of large piping, duct banks, and similar obstructions that would be difficult or costly to move/relocate in the future.

e. Sustainable Design, Construction and Operation in Building Technology

i. The Owner desires to implement the following sustainable features into the Project:

- Use of recycled materials for in the backfill of structures, as well as the backfill of pipe.
- Use of recycled materials in concrete such as flyash and reinforcing bar using recycled materials
- Reduction of painted surfaces to reduce future maintenance of VOC materials
- Energy efficient equipment
- Energy reduction, including occupancy lighting, light level correction and energy efficient lighting
- Materials selection criteria based upon recycled, rapidly renewable and locally manufactured materials
- Indoor air quality principles

ii. The Design-Builder will consider implementing the following:

- Compliance with the requirements of the International Energy Conservation Code, which is an additional requirement of the GBA. Compliance will be demonstrated through the COMCHECK compliance program related to insulation, lighting and building HVAC and plumbing Systems.
- Use of selected LEED® criteria to inform design decisions on the project.

- Implement design/build decisions based upon the Institute for Sustainable Infrastructure (ISI) (www.sustainableinfrastructure.org) Envision™ infrastructure sustainability rating system. Envision has been developed for use on civil engineering infrastructure projects, assessing the sustainability of projects in five major categories: quality of life, leadership, resource allocation, natural world, and climate and risk. The system allows for rating and recognition of infrastructure projects much like LEED provides through certification of buildings.

iii. Although the Envision infrastructure rating system has only recently been available for use, increasing numbers of public sector project proponents are using the system to assess their projects. The Design-Builder will apply the Envision infrastructure sustainability rating system checklist to identify appropriate sustainability approaches that could be used to improve the sustainability performance of the project during design-build and operation. The Design-Builder will conduct a workshop with key team members to identify opportunities for sustainability improvement.

iv. Design Workshop – The Design-Builder will meet with Owner staff and the Design-Builder project team to discuss overall project objectives and define learning objectives for the workshop. In collaboration with the Design-Builder design engineers, a workshop will be developed defining learning objectives and delivery methods, and proposed workshop participants. The draft workshop plan will be submitted to the Owner for review and upon approval The Design-Builder will work with the Owner to schedule the workshop and distribute background information to participants including pre-reading and the Envision spreadsheet.

v. Conduct Workshop – The Design-Builder will conduct the workshop and gather feedback through the series of interactive workshop brainstorming, table-top and small group exercises. The results of the workshop will be compiled and summarized immediately following the workshop.

vi. Develop Recommendations – Based on the results of the workshop feedback and in consultation with the Owner and Design-Build team, recommendations regarding sustainability approaches that could be implemented will be identified. A roadmap that would define key milestones for embedding the sustainability design principles and practices into the project. The workshop summary report will also outline plans for Envision have application to the project Design-Build and operation.

f. Spill Protection/Secondary Containment for Liquids

i. The Owner requires that controls be implemented to protect against groundwater contamination from all process fluids, for example seawater, RO concentrate, RO chemical waste, and treatment chemicals. Secondary containment of seawater and RO concentrate below grade piping is not required by CAW. Saline fluid waste is to be kept separate from non-saline wastewater and disposed separately to minimize the salinity of sanitary waste. Tankage for saline fluids is to include leak prevention and detection features to prevent groundwater contamination from tank leaks. Tank overflows are to be directed to wastewater basins to the extent possible rather than direct discharge to the ground. High level switches and alarms, independent of continuous level monitors, are to be provided for tanks to prevent overflow caused by uncalibrated level monitors.

ii. Chemical storage tanks shall be located within concrete curbing/walls to provide secondary containment of chemical tanks. Buried chemical piping is to be provided with secondary containment, either double wall pipe or replaceable tubing within a carrier pipe. Additional detail on secondary containment is provided in the Chemical Facility section and in Attachment 1 (American Water Engineering Standard: T2 Liquid Chemical Storage, Feed, and Containment). Liquid chemical spill containment is to be provided for chemical delivery trucks as identified in the chemical storage section.

iii. Table 2-4 identifies the Design-Builder's means and methodology for meeting the Design and Construction Requirements identified in this section.

Table 2-4 Controls Implemented to Protect Against Groundwater Contamination

Item for Containment	Method of Prevention
Process Fluids	
Seawater	The area under the pressure filters, filtered water tanks and pumps and cartridge filters are paved with impervious concrete to prevent infiltration. Any leaks or discharges associated with maintenance will be directed to the area drains that are pumped to the Brine EQ Basin. The filtered seawater for the feed water to the seawater RO units is contained in trenches which drain to a saline wet well which is pumped to the Brine EQ Basin.
RO concentrate	Seawater RO Brine discharge pipe is contained in the SWRO Building pipe trench and any leaks drain to the saline wet well and pumped to the Brine EQ Basin.
RO chemical waste	Chemical spills in the individual rooms is removed by vacuum truck or the neutralized waste is pumped to a holding tank. The RO cleaning chemical waste is neutralized in the neutralization tanks and pumped directly to a haul truck for disposal at the MRWPF.
Treatment chemicals	Spills contained in the storage rooms or the double contained pipes and pull boxes from the storage and metering rooms to the application point.
Tankage	

Item for Containment	Method of Prevention
For saline fluids	The Filtered Water Tank overflow is piped directly to the Brine Equalization Basin to prevent the discharge of saline water to the site. In addition the tanks are surrounded by asphalt paving to capture incidental spills and leak, and convey them to the area sumps which are then pump to the Brine EQ Basin.
Overflow discharge	Filtered seawater tanks, pressure filter leaks on the slab and the cartridge filters drainage are directed to area sump and pumped to the Brine EQ Basin. The pressure filter and filtered water tank drains can be discharged to the Backwash Reclamation basin and returned to the inlet to the pretreatment granular media filters rather than direct discharge to the ground
Overflow caused by uncalibrated level monitors.	High level switches and alarms, independent of continuous level monitors, are provided
Chemical storage	Chemical storage tanks will be located within concrete curbing/walls to provide secondary containment of chemical tanks. Any leaks from the tank fill connection, tanks, tank to pump piping, and pump discharge piping will be contained in the secondary containment area. The secondary containment area will be sloped toward a 2 ft x 2 ft x 2 ft sump that is equipped with level sensor and sump pump. The level sensor inside of the sump will alarm when there is a spill.
Other	
Buried chemical piping	All chemical piping outside of secondary containment areas will be provided with secondary containment, either as double wall pipe or replaceable tubing within a carrier pipe. For most chemicals, as discussed in Section 21, the piping outside of secondary containment areas will be flexible PVC tubing double contained inside HDPE piping for support and secondary containment. The HDPE piping will be intentionally sloped to leak detection manholes, and leak detection sensors will be provided at the low points of each chemical line to alarm when there is a leak in the chemical piping.
Liquid chemical spill containment for delivery trucks	TO BE PROVIDED BY CDM

g. Site Arrangement – Integrated vs. Campus Layout

i. Table 2-5 identifies the Design-Builder’s proposed site arrangement regarding the administration facilities, RO housing, and (liquid) chemical facilities to facilitate rapid access by walking between each of the functions

Table 2-5 Site Arrangement Decisions

Function	Description of Location	Means and Methodology
Administration	Site Location – south central Distance from RO Equipment Building – 50 ft Distance from Chemicals –150 ft	• Noise control –50 ft separation from RO process room and two insulated walls • Corrosion control –galvanized and aluminum construction • Structural –structural steel braced frame • Building code compliance – yes including Title 24 energy code
RO Housing	Site Location –south central Distance from Administration –50 ft Distance from Chemicals –adjacent	• Noise control – insulated walls • Corrosion control –galvanized and aluminum construction • Safety –separation from chemical and electrical rooms • Structural –structural steel braced frame • Building code compliance –yes including Title 24 energy code
Liquid Chemical	Site Location –south central Distance from Administration –150 ft Distance from RO Equipment Building – adjacent	• Noise control – Full height CMU walls separate the chemical rooms from the RO process room to provide fire separation and noise isolation • Corrosion control –coated concrete , CMU and galvanized aluminum • Safety –Separation of chemicals, sprinkler system, separate high and low rate ventilation systems; low concentration sodium hypochlorite • Structural – structural steel braced frame • Building code compliance – yes

ii. Drawing C-1 in Attachment 12 to this Appendix illustrates the relative location of all the facilities referenced in the table above.

h. Safety

i. The Owner requires facilities that meet or surpass OSHA standards and requirements.

ii. Ladders are discouraged where stairs can be provided. Underground pits and vaults for water metering are discouraged because of the safety concerns with confined spaces

iii. Table 2-6 identifies the Design-Builder’s means and methodology for meeting the Design and Construction Requirements identified in this section.

Table 2-6 Facility Safety Measures

Facility	Means and Methodology: Safety Measure	Meets or Exceeds OSHA
Raw water hypochlorite chemical feed	Above grade access, double contained piping and safety showers	Yes
Pressure filter pipe gallery	TO BE PROVIDED BY CDM	Yes
Filtered water sodium bisulfite, antiscalant and acid addition	Above grade access, double contained piping and safety showers	Yes
RO Process Room	Pipe installed in trench to improve access around medium voltage motors and high pressure pump equipment	Yes
Chemical Storage Rooms	Walkways above the containment areas, high and low rate ventilation rate for every chemical room	Yes
Post Treatment Stabilization	Above grade access, double contained piping and safety showers	Yes
Electrical Room	Separation of medium voltage equipment	Yes

i. Redundancy

i. The Design-Builder shall provide redundancy for all major process mechanical equipment such that the plant is capable of operating at design capacity with any single process unit out of service. This does not apply to chemical storage tanks but does apply to chemical feeders and chemical feed piping.

ii. Table 2-7 identifies the Design-Builder's means and methodology for meeting the Design and Construction Requirements identified in this section.

Table 2-7 Redundancy Provisions

Process	Means and Methodology: Redundancy Provided
RO Process	Spare first pass and second pass trains
RO Concentrate Disposal	Reserve pump
UV System	Spare UV unit
Liquid Chemical Systems	
Sodium Hypochlorite	Spare pumping unit for Raw Water dosing Spare pumping unit for post-treatment dosing
Sodium Bisulfite	One reserve metering pump
Sulfuric Acid	One reserve metering pump
Threshold Inhibitor	One reserve metering pump

Process	Means and Methodology: Redundancy Provided
Sodium Hydroxide	One reserve metering pump
Zinc Orthophosphate/Phosphoric Acid Corrosion Inhibitor	One reserve metering pump

j. Process Overflows

i. All processes shall have overflows that will safely direct excess flow away to protect structures, personnel, and the environment. Continuous level monitors, and an independent high level switch, are to be provided on tanks (water, wastewater, and chemical) to alert operations staff of a high level event. Overflow piping is to be directed to secondary containment or waste handling to the extent possible. Direct discharge to the environment is the least desirable approach. Chemical overflows to the concentrate equalization basin are not acceptable.

ii. Table 2-8 identifies the Design-Builder's means and methodology for meeting the Design and Construction Requirements identified in this section.

Table 2-8 Process for Overflow

Process	Continuous Level Monitor	Independent High Level Switch	Over-flow	Overflow Piping Direction	Means and Methodology
Filtered Feedwater Receiving Tanks	Yes	Yes	Yes	Concentrate Equalization Basin	Over flow piped directly to the Brine EQ Basin. For minor tank and pipe leaks the area around the tanks is paved with impervious concrete so seawater drains to collection sump
Finished Water Storage	Yes	Yes	Yes		TO BE PROVIDED BY CDM
Sodium Bisulfite	Yes	Yes	Yes	To Containment Basin	
Sulfuric Acid	Yes	Yes	Yes	To Containment Basin	
Threshold Inhibitor	Yes	Yes	Yes	To Containment Basin	
Sodium Hydroxide	Yes	Yes	Yes	To Containment Basin	

Process	Continuous Level Monitor	Independent High Level Switch	Over-flow	Overflow Piping Direction	Means and Methodology
Zinc Orthophosphate/ Phosphoric Acid Corrosion Inhibitor	Yes	Yes	Yes	TO Containment Basin	

k. Coastal Marine Environment and Corrosion Control

i. The coastal marine environment is corrosive to many metals, and the Design-Builder is to carefully select materials of construction to provide long service life and aesthetic appearance.

ii. Table 2-9 identifies the Design-Builder's means and methodology for meeting the Design and Construction Requirements identified in this section.

Table 2-9 Coastal Marine Environment and Corrosion Control

Process/Facility	Equipment or Item	Means and Methodology
Filtered Water Receiving Tanks	Tank sidewall panels	Glass lining
Site	Fencing	PVC coated galvanized steel
Pre-treatment	Steel Pressure Vessels	Epoxy coated exterior Rubber lined interior
RO Feed	Cartridge Filters	AL6XN corrosion resistant alloy
Chemical Storage Area	Tanks	HDPE Tanks, FRP grating
Finished Water Storage Tanks	TO BE PROVIDED BY CDM	TO BE PROVIDED BY CDM
Site	Vents	Zincalume
Administration, RO/Chemical and Pressure Filter Building	Facade	Zincalume
Administration, RO/Chemical and Pressure Filter Building	Roof	Zincalume

Process/Facility	Equipment or Item	Means and Methodology
Above ground low pressure piping	Piping	FRP

l. Saline Water and Corrosion Control

i. Saline water can be highly corrosive to metals. All metallic components in contact with saline water are to be selected with materials of construction that are compatible with seawater. Pitting is a particular problem with chlorides and stainless steels. Design-Builder is to identify a minimum Pitting Resistance Equivalency Number ("PREN") for metals in contact with saline water.

ii. Table 2-10 identifies the Design-Builder's means and methodology for meeting the Design and Construction Requirements identified in this section.

Table 2-10 Saline Water and Corrosion Control

Metallic Component	Means and Methodology	PREN
RO System Trains – bolts, nuts, washers, anchors, and support systems	316 stainless steel	24.2
Seawater Pre-treatment pressure filters	¼ rubber lining as required by RFP	NA
Cartridge filters for filtered seawater	AL6XN	42
SWRO High pressure feed water piping and brine piping	Super duplex 2507	42
SWRO Permeate piping	FRP piping	NA
BWRO high pressure feed water pipe	316L	23
BWRO brine piping	Duplex stainless 2205	34

3. RAW WATER QUALITY

Raw Water quality ranges have been inferred from a variety of sources of information because slant beach wells are not in place and are not operating. The Design-Builder shall rely on the Raw Water quality conditions identified in Attachment 2 for design. The Raw Water quality data in Attachment 2 are a best estimate of the Raw Water conditions for the MPWSP. Facility design shall be based on the design maximum values in Table 1 of Attachment 2. Both the average and maximum values will be used during Acceptance Testing of the RO system, discussed in Appendix 7.

4. FINISHED WATER QUALITY

Finished Water quality performance standards have been established for this Project and are presented in Attachment 3. Treated water quality Acceptance Standards and Requirements that will be used as the basis of design and during Acceptance Testing are shown in Table 2C-1 of Attachment 3 for the pretreatment effluent (RO feed stream), the combined RO permeate, and the Finished Water after stabilization for corrosion control and disinfection with chlorine. Design finished water quality (maximum average water quality, Appendix 2, Attachment 3, 2C-1) shall be based on a feedwater temperature of 12C and 33.6 ppt.

5. RAW WATER PUMPING

i. Beach wells will be provided through a separate procurement process.

ii. The Owner has been in contact with the property owner and is working to secure permanent easements on an approximately 376-acre parcel of land located due west of its proposed Project Site.

iii. The final arrangement of well type, number, and location will be determined at a later date.

iv. Electric power for the beach wells will not be provided from the Project Site. A separate electric service for the beach wells shall be assumed.

v. Source water hydraulic grade line of 175 feet MSL shall be assumed available at the fence.

vi. Communication with the beach well pump station shall be via fiber optic cable or high speed Ethernet radio (spread spectrum). Fiber optic cable shall be buried adjacent to the feedwater pipeline. Off-site fiber optic cable, and piping, shall be provided by others. Antenna towers are unlikely to be acceptable at either the wells or the Project Site.

vii. PLCs for control of the well pumps will be part of the Raw Water pumping scope (by others). Control programming for the wells will reside in the well PLCs. However, control of the wells is an important facet of plant operation and the detailed control strategy for the wells is to be developed by the Design-Builder and coordinated with the designer and constructor(s) of the raw water pumping facilities, and the Owner. Communication with the wells is to include start/stop commands, pump status, motor starter status, pumping levels, flow rates, and energy consumption. Security/intrusion data is to also be communicated from the wells to the treatment plant.

viii. It is expected that the pumps delivering Raw Water to the Project Site will be variable speed.

6. PRE-TREATMENT SYSTEM WITH GRANULAR MEDIA FILTRATION

a. Table 2-11 identifies the Design and Construction Requirements for the pre-treatment system with granular media filtration and the Design-Builder's means and methodology for meeting the Design and Construction Requirements identified in this section.

Table 2-11 Pre-Treatment System

Description	Units	Design and Construction Requirement	Means and Methodology
Filter Media: Dual Media: Sand and Anthracite			
Type: Complies with AWWA B100	-	Yes	
Sand Depth	inches	12	12
Sand Effective Size	mm	0.45 – 0.55	0.5
Sand Uniformity Coefficient		1.4 or less	1.4
Anthracite Depth	inches	18	18
Anthracite Effective Size	mm	0.65 to 0.85	0.65-0.85
Anthracite Uniformity Coefficient		1.6 or less	1.4
Conditioned with permanganate prior to service	-	Yes	yes
Media Support	-	Graded gravel	Graded gravel
Underdrain	-	PVC header encased in concrete with replaceable non-metallic distribution nozzles	PVC header encased in concrete with replaceable non-metallic distribution nozzles
Pressure Filter Vessels			
Type: Single Cell; Constructed in accordance with ASME unfired pressure vessel and code stamped	-	Yes	
Orientation	-		Single cell, horizontal
Filter vessel type	-	Steel	
Lining type	-	¼ neoprene rubber lining	
Interior pressure vessel lining: Enduraflex black, soft neoprene	inches	¼	

Description	Units	Design and Construction Requirement	Means and Methodology
NSF Approved Internal Lining System		Rubber lined; Blair Rubber Enduraflex™ VE713BNE | black, soft neoprene lining for abrasion service. FDA compliant	The lining specified in the RFP, Enduraflex black, soft neoprene lining by Blair Rubber Company or equal specified in Appendix 2 is “FDA compliant” but not NSF certified. The lining recommend by pressure filter supplier is a minimum 60 mil flexible polyurethane coating, Unithane 1600 by Prime Coatings Inc., or equal
Personnel Access	-	Two (2) flanged hatches (24” diameter) with self-supporting davit	
Media Inspection Port	-	Two (2) six inch flanged nozzles located top dead center to allow media levels to be measured	
Drain	inches	3	
Number of Units: duty + standby (indicate values for normal and maximum capacity)	-	X+2 (normal), X+1 (maximum)	8+2 (normal), 9+1 (maximum)
Filtration rate with one unit offline for backwashing, including recycle flow	gpm/sf		3.5 (Based on 42% SWRO recovery)
Filtration rate with two units offline, including recycle flow	gpm/sf	< 4 gpm/sf	3.9
Area per filter	sf		540
Flow Control Method	-		Constant Rate
Air Wash or Surface Wash			
Nozzle size	inches	12	
Blind flange on each filter (1 per filter)	-	150	
Filter to Waste			
Flow	mgd	3	Adjustable up to design rating of the filter

Description	Units	Design and Construction Requirement	Means and Methodology
Effluent turbidity is to be monitored during filter to waste			Backwash reclamation sized to allow minimum of 15 minutes of filter to waste
Washwater Collector (influent distributor)			
Material: nonmetallic	-	PVC	
Location above surface of filter media	inches	18	
Underdrain Maldistribution			
Maldistribution of flow during backwash	percent	<10	
Air Release			
Air release valve for each filter		2	Minimum 3 inch air release valve
Wastewater			
Observation and sampling means during backwashing			Sample line on drain
Filter Instrumentation			
Flowmeter	no.	10	
Differential Pressure	no.	10	
Turbidimeter	no.	10	
Valves			
Type		Butterfly	
Open-close actuated valves type		Pneumatic	
Open-close actuated valves actuator type		quarter turn vane	
Rate of flow control modulating valves type		Butterfly	
Rate of flow control modulating valves actuator		electric (208 volt, 3 phase)	
Valve position indicators		clearly indicate valve position	
Local panel for each filter valve type		Pneumatic	
Housing			
Filter End/Head Housing Type		Enclosed	
Backwash and Backwash Supply			
Backwash supply		filtered water storage tanks	

Description	Units	Design and Construction Requirement	Means and Methodology
Backwash pumps		2 (one duty, one reserve)	
Capacity	mgd	15.6 mgd (each)	
Total Dynamic Head	ft		
Type		Horizontal End Suction	
Materials		Super duplex	
Backwash sequence		low, high, low rate	5 gpm/sq ft/ 18 gpm/sq ft/ 5 gpm/sq ft
Only one filter shall wash at a time.			
Maximum backwash rate bed expansion of sand and anthracite media at coldest water temperature	percent	30	
Means of backwash flow control		electrically actuated modulating butterfly valve;	
Backwash sequence automation as initiated by Operator		1) time, 2) loss of head, and 3) effluent turbidity	
Backwash sequence filter to waste cycle termination		1) time, 2) volume, and 3) filtered turbidity	
Filter Backwash Waste Settling and Recycle			
Minimum Number of Wastewater Basins		2	Backwash water waste is discharged by gravity flow to the wastewater reclamation basins
Minimum Wastewater Basin Volume		Two filter backwashes plus residuals storage (one year)	
Volume per Basin	gal		
Minimum Unit Filter Waste Volume (backwash and filter to waste)	gal/sf/wash	200	
Maximum Unit Filter Waste Volume (backwash and filter to waste)	gal/sf/wash		
Basin operation mode		Batch Fill – Settle – Draw/Recycle	
Construction Material		HDPE Lined Earthen Basin	
Top of embankment / service road size	feet	12	
Top of embankment / service road capacity		Supports the weight of service vehicles	
Minimum freeboard	feet	3	

Description	Units	Design and Construction Requirement	Means and Methodology
Protect lagoon from surface runoff			
Provide continuous level measurement with ultrasonic level monitor; provide high level switch to alarm			
Liner type		HDPE Double lined with leak collection material and textured on the exposed side, protected from wind uplift, oxidation and sharp objects	
Collection sump pump and flow metering		Level switch with sump connected to alarm in SCADA	
Sludge storage capacity	yr		1
Assumptions for sludge storage capacity basis			
Provide a means of emergency egress		Sloped ramps provided in the middle of the basin	
Provide seepage collars; provide erosion protection at inlet			
Security/Fencing		Lagoon will be fenced in with gates for vehicles and personnel	
Recycle Pumping			
Type		Central supernatant sump with submersible recycle pumps	
Material		Super duplex	
Duty pumps		2	
Reserve pumps		1	
Capacity, each pump	gpm		
TDH for each pump	ft		
Flow control		VFD	
Vacuum priming system provided			yes
Recycle flow metering			
Recycle quality monitoring		Continuous turbidimeter	

Description	Units	Design and Construction Requirement	Means and Methodology
Regulatory Requirements			Complies with CDPH Cryptosporidium Action Plan
Recycle flow vs. influent flow at all times	percent	<10	
Recycle flow turbidity	NTU	<2	
Minimum number of settling basins	-	2	
Ability to continuously dose polymer as settling aid			

b. The key reference drawings in Attachment 12 to this Appendix associated with this section are:

- M-1 - PLAN AND SECTION - SEA WATER PRESSURE FILTER
- M-2 - PLAN - FILTERED WATER, BACKWASH WATER, CARTIDGE FILTER AND FINISHED WATER PUMP PAD AND TREATED WATER PUMP – 9.6 MGD
- M-3 - SECTIONS - FILTERED WATER, BACKWASH WATER, CARTIDGE FILTER AND FINISHED WATER PUMP PAD AND TREATED WATER PUMP – 9.6 MGD
- I-5 - P&ID IRON & MANGANESE FILTERS 1, 3, 5, 7 & 9
- I-6 - P&ID IRON & MANGANESE FILTERS 2, 4, 6, 8 & 10
- I-40 - P&ID BACKWASH SUPPLY PUMPS

7. FILTERED FEEDWATER RECEIVING TANKS

a. The key reference drawings in Attachment 12 to this Appendix associated with this section are:

b. M-14 FILTERED WATER STORAGE TANKS PLAN

c. M-15 FILTERED WATER STORAGE TANKS SECTION

d. I-7 P&ID FILTERED WATER STORAGE TANKS

e. General

i. Filters shall discharge to filtered feedwater receiving tanks. Filtered feedwater receiving tanks shall feed the cartridge filters associated with the RO trains, and shall provide backwash water for granular media filters.

ii. Flow Split: Piping to each feedwater receiving tank shall be identical to obtain a reasonably equal flow to each tank.

iii. Number of Tanks: two (2)

iv. Capacity, each: 300,000 gallons

v. The plant shall be capable of operating at rated capacity with a single feedwater receiving tank.

vi. Covered: aluminum self supporting dome

vii. Internal Roof Supports: not allowed

viii. Piped Overflow: to allow full raw water flow from each tank. Provide internal weir box. Overflow to Concentrate Equalization Basin.

ix. Materials of Construction Standards:

(1) AWWA D103 Factory Coated Bolted Steel Tank
(2) AWWA D108 Aluminum Dome Roofs for Water Storage Facilities
(3) Tank sidewall panels shall be glass lined for maximum corrosion resistance.

x. Personnel Access: Sidewall (2) and Roof (2)

xi. Tank Outlet Anti-Vortex Baffle: Provide anti-vortex baffle at outlets to minimize air entrainment.

xii. Sanitary Lip: Provide a removable baffle at the tank outlet to minimize potential for accumulated solids at the bottom of the tank from washing into the tank outlet.

xiii. Tank Drain: Drain to Concentrate Equalization Basin.

xiv. Level Controls: Each tank shall have a continuous level monitor (pressure transmitter) and an independent high level switch.

xv. Security Details: Provide security devices to prevent climbing of the tank by unauthorized persons; provide anti-tamper vents; provide checkvalve on overflow.

8. FILTERED WATER PUMP STATION

a. The key reference drawings in Attachment 12 to this Appendix associated with this section are:

i. M-2 PLAN FILTERED WATER, BACKWASH WATER, CARTIDGE FILTER AND FINISHED WATER PUMP PAD 9.6 mgd

ii. M-3 SECTIONS FILTERED WATER, BACKWASH WATER, CARTIDGE FILTER AND FINISHED WATER PUMP PAD 9.6 mgd

iii. M-4 SECTIONS FILTERED WATER, BACKWASH WATER, CARTIDGE FILTER AND FINISHED WATER PUMP PAD 9.6 mgd

iv. I-8 P&ID FILTERED WATER PUMP STATION

b. General

i. A filtered water pumping stage will provide sufficient pressure to operate the cartridge filters and supply minimum pressure to the RO process.

ii. Type of pump: horizontal end suction.

iii. Number and Capacity: Two at 11.8 mgd (50% rated capacity - one duty, one reserve); two at 5.9 mgd (25% rated capacity- two duty); VFD for two smaller pumps

iv. Materials of Construction: Super duplex

v. Motor Size, Voltage, and Motor Enclosure Type:

vi. Pump Location: Pumps to be located outdoors

vii. Electrical Starter Location: Electrical starters are to be protected from the weather inside of a building.

viii. Flow Metering: not required (flow = Raw Water flow less GMF wastewater)

ix. Power Metering: Power monitoring using Schweitzer Engineering Laboratories ("SEL") unit shall be provided. Information shall be provided to SCADA via ethernet modbus TCP/IP network.

9. REVERSE OSMOSIS SYSTEM

a. The key reference drawings in Attachment 12 to this Appendix associated with this section are:

- M-2 PLAN FILTERED WATER, BACKWASH WATER, CARTIDGE FILTER AND FINISHED WATER PUMP PAD 9.6 MGD
- M-3 SECTIONS FILTERED WATER, BACKWASH WATER, CARTIDGE FILTER AND FINISHED WATER PUMP PAD 9.6 MGD
- M-4 SECTIONS FILTERED WATER, BACKWASH WATER, CARTIDGE FILTER AND FINISHED WATER PUMP PAD 9.6 MGD
- M-5 RO LAYOUT 9.6 MGD BASE CASE
- M-6 SWRO LAYOUT – SECTIONS 1 9.6 MGD BASE CASE
- M-7 SECOND PASS SWRO EQUIPMENT ELEVATION 9.6 MGD BASE CASE
- M-10 SATURATED LIME SYSTEM AND PERMEATE FLUSH TANK SYSTEM

- I-8 P&ID FILTERED WATER PUMP STATION
- I-9 P&ID CARTIDGE FILTERS
- I-10 P&ID RO FEED PUMPS
- I-11 THROUGH I-17 P&ID FIRST PASS SWRO TRAIN 1 THROUGH FIRST PASS SWRO TRAIN 7
- I-18 THROUGH I-21 P&ID SECOND PASS BWRO TRAIN 1 THROUGH SECOND PASS BWRO TRAIN 4
- I-22 P&ID RO PERMEATE FLUSH AND CIP

b. General

i. The reverse osmosis system (the "RO System") consists of:

(1) First pass SWRO
(2) Second pass BWRO
(3) Energy recovery device ("ERD") and associated booster pumps
(4) Cartridge filters
(5) High pressure RO feed pumps with variable frequency drives
(6) Second pass RO feed pumps with variable frequency drives
(7) Pressure vessels and RO train support structure
(8) Clean-In-Place ("CIP") system
(9) Flush system

ii. Description

(1) The purpose of the RO System is to remove dissolved solids from the seawater, and in particular, to meet boron, bromide, chloride, and sodium water quality goals, as set in Attachment 3 of this Appendix and Appendix 7.
(2) The RO System configuration shall consist of a first pass SWRO system followed by at least a 40% partial or complete second pass BWRO system.
(3) The RO System design shall integrate each component such that the RO System shall be able to operate across the range of specified operating parameters (e.g. range of TDS and temperature conditions, and the corresponding RO pressure requirements).
(4) Each RO train should have a dedicated variable speed high pressure pump, energy recovery device, and support and monitoring systems.
(5) The rated capacity of the RO System shall be such that the Design-Build Improvements produce the capacity defined in Section 2.
(6) The RO System minimum daily production rate shall be 3.2 mgd.

iii. Requirements

(1) The anticipated RO feedwater quality is provided in Attachment 2 of this Appendix and the RO system hydraulic design shall be based on the maximum Raw Water concentrations listed in Table 1 of Attachment 2.

(2) The RO System shall be capable of providing and demonstrating, on a continuous basis, the necessary TDS reduction (as measured by continuous conductivity) for the purpose of achieving approval from CDPH for a minimum of 2-log virus, *Giardia*, and *Cryptosporidium* removal, each. In addition, the RO system shall be capable of meeting the Finished Water Maximum Average and Not to Exceed concentrations for the combined RO permeate, as defined in Attachment 3 and under normal design and operating conditions. The RO system shall meet all Acceptance Tests as defined in Appendix 7.

(3) Each RO train and the RO system in general shall meet all monitoring and permitting requirements as defined by CDPH and all applicable regulatory agencies.

(4) The RO system shall be capable of meeting the Finished Water Maximum Average and Not to Exceed Concentrations for the combined RO permeate water quality standards and requirements, as defined in Attachment 3 of this Appendix, while operating at the specified design requirements listed in this Appendix.

(5) The RO system shall meet all Acceptance Tests as defined in Appendix 7.

(6) All materials used in the RO System that are in contact with water shall be approved for contact with potable water in accordance with NSF Standard 61, as required by CDPH.

iv. RO Equipment Manufacturer Qualifications

(1) The Design-Builder's ROEM qualifications are listed in Table 2-12 below.

Table 2-12 ROEM Qualifications

Design and Construction Requirement	Means and Methodology
ROEM Firm Name	H2O Innovation USA, Inc.
Corporation, joint venture, or partnership	Corporation , a wholly owned subsidiary of H2O Innovation, Quebec, Canada
Experience in the design, construction, and startup of RO systems	13 years as H2O Innovation plus 10 years as Membrane Systems. Please see reference list of projects executed as an ROEM
Years in business (minimum three years)	Yes, Over 13 years as H2O Innovation
Service need notification response time	1 day
Designed, fabricated, and installed at least two seawater RO systems	Yes.
Designed, fabricated, and installed at least two RO systems that each have a permeate capacity of the same modular size or greater	Yes.

v. Space Requirements

(1) Approximately 20 feet shall be provided as a center aisle between groups of RO units, and 6 feet shall be provided between adjacent RO units to allow for routine maintenance and equipment replacement, including but not limited to the changing out of membrane elements, RO pressure vessels, and pumps.

c. Manufacturers

i. Refer to Attachment 4 (Acceptable Manufacturers)

d. Cartridge Filters

i. The purpose of the cartridge filters is to remove particulate matter and serve as a protective barrier for the RO membranes. The pressure filters should remove most particulates, but filter backwashing can cause particulate breakthrough that must be mitigated by the cartridge filters. The cartridge filter effluent silt density index ("SDI") must be less than 3 min^{-1} and must maintain the RO membrane warranty.

ii. Maximum effluent turbidity: 0.5 NTU

iii. Effluent SDI: $\leq$ 3 min^{-1} 95% of the time, < 4 min^{-1} at all times (see Attachment 3)

iv. The cartridge filters consist of removable filter cartridges inside a filter vessel. One filter vessel will be provided for each RO train. Each filter vessel holds multiple filter cartridges that can be manually removed when the pressure differential across the filters reaches the set maximum level. The filter pore size shall be a maximum of 5 microns (nominal) to adequately protect the RO membranes. Requirements listed below may be more stringent than the requirements of the RO membrane suppliers. In instances of conflict between the requirements of the RO membrane requirements and this RFP, the more stringent requirements shall apply.

- Pressure vessel reference standard: ASME Boiler and Pressure Vessel Code, Section VIII
- Type of filter vessel: Horizontal configuration
- Filter vessel material: AL-6XN stainless steel
- Filter vessel must meet or exceed ASME Section VIII Code for high pressure vessels
- Minimum vessel design pressure: 150 psi
- Vessel o-rings/gaskets: Buna-N
- Vessels must be designed so one person, at ground level, can easily open and close it to access the entire vessel interior for filter replacement or other maintenance activities.

- Sufficient clearance around each vessel must be provided for access to vent valves and drains, filter element replacement, and other routine maintenance activities.
- Pressure differential indicators and transmitters across the inlet and outlet of the vessels shall be provided and relayed to the RO system PLC.
- Filter pore size: 5 µm (nominal, minimum 90% efficiency)
- Filter type: string-wound depth cartridges
- Filter materials: polypropylene (FDA grade and ANSI/NSF 61 certified)
- Filter o-rings: Buna-N
- Filter outside diameter (OD): 2 3/8 inches or 2 1/2 inches
- Filter inside diameter (ID): 1 inch
- Filter flow configuration: outside-in
- Filter length: 40”
- Maximum design loading rate: 4 gpm per 10” length
- Maximum differential pressure of clean filter element at design loading rate: 4 psi
- Differential pressure to trigger replacement of filter element: 20 psi
- Filter element replacement interval: not less than 2 months
- The Design-Builder shall provide one set of replacement filter elements for all the vessels.
- The Design-Builder has proposed to use 6 filter vessels on duty and 1 on standby (for rated capacity) and 7 filter vessels on duty and 0 on standby (for maximum capacity) as the means and methodology for meeting the Design and Construction Requirements identified in this section.

e. RO System Trains

i. General

(1) All trains within each pass shall be identical. All equipment and the trains themselves shall be provided by the same manufacturer.
(2) Each train shall be capable of operating independently of the other trains.
(3) Each train shall be modular such that a total of either 6.4 or 9.6 mgd rated capacity can be achieved.
(4) All bolts, nuts, washers, anchors, and support systems used to install the train shall be corrosion resistant 316 stainless steel.
(5) All parts of the RO System, including the first pass SWRO, ERD, cartridge filters, and pumps, that are in contact with raw seawater, shall be designed to accommodate raw water chlorides of at least 24,000 mg/L. In addition, all parts of the RO System, including the first pass SWRO, ERD, and pumps, that are in contact with the RO concentrate, shall be designed to accommodate the resulting chloride concentrations in the RO concentrate.

(6) The frames of each train shall accommodate the number of pressure vessels required to achieve the design performance of the train. The frames of both first pass and second pass trains shall be able to accommodate an additional 10% of the pressure vessels and associated piping. Supports shall also be provided for train piping, valves, and appurtenances.
(7) Pressure vessels shall not be stacked higher than 6 vessels high for operator/maintenance safety.
(8) The frame and miscellaneous brackets shall be designed and constructed to meet structural and seismic code.
(9) The frame and miscellaneous brackets shall be epoxy coated carbon steel.
(10) Appropriate isolation of the RO system from the pretreatment shall be provided, such that chlorination of the pretreatment granular media filters may be performed without damage to the RO membranes.
(11) Appropriate provisions shall be provided to ensure that any sealed tanks within the RO system have ventilation systems that control microbiological activity (e.g. HEPA filters).

ii. First Pass SWRO

(1) Maximum train size shall be 2 mgd (as permeate water).
(2) First pass recovery shall be 42% minimum and 45% maximum.
(3) First pass maximum membrane flux rate shall be 8.75 gfd
(4) First pass maximum feed pressure shall be 1,000 psi, for membranes ages 0 to 5 years operating on the maximum feed water quality as defined in Attachment 2 (Table 1) and for temperatures as low as 8°C.
(5) RO design shall not exceed 7 elements per pressure vessel.
(6) The skid shall have the ability to receive the following chemicals for pretreatment prior to the first pass:
(7) Sulfuric acid to reduce the pH of the feedwater
(8) Scale inhibitor to prevent precipitation of sparingly soluble salts such as calcium carbonate, calcium sulfate, barium sulfate, and strontium sulfate.
(9) Table 2-13 identifies the Design-Builder's means and methodology for meeting the Design and Construction Requirements identified in this section.

Table 2-13 First Pass SWRO

Parameter	Units	Design and Construction Requirement	Means and Methodology
Maximum train size	mgd	2 (as permeate water)	1.6 mgd/train
Number of first pass trains (duty + standby)		X+1 (rated capacity), X+0 (maximum capacity)	6+1 (rated capacity), 7+0 (maximum capacity
First pass recovery	percent	42 (minimum) / 45 (maximum)	42% for lower power consumption

Parameter	Units	Design and Construction Requirement	Means and Methodology
First pass maximum membrane flux rate	gfd	8.75	Nominal 7.9 gfd for lower power consumption
First pass maximum feed pressure for membranes ages 0 to 5 years operating on the maximum feed water quality as defined in **Attachment 3** and for temperatures as low as 8°C	psi	1,000	1,000 guarantee 932 projected including safety factor
Number of Pressure Vessels provided per Train			76
Number of additional pressure vessels for which space is allocated on each train		Space allocated for additional 10% of required pressure vessels	8 pressure vessels
Elements per pressure vessel		7 (not to exceed)	7
Total number of elements per train			532
Total number of elements supplied to plant			3,724
Membrane surface area per element	ft2	400	400
Additional parameters			The skid shall have the ability to receive the following chemicals for pretreatment prior to the first pass: • Sulfuric acid to reduce the pH of the feed water • Scale inhibitor to prevent precipitation of sparingly soluble salts such as calcium carbonate, calcium sulfate, barium sulfate, and strontium sulfate

iii. Second Pass BWRO

(1) Second pass maximum recovery shall be 90%.
(2) Second pass maximum membrane flux rate shall be 18 gfd.
(3) RO design shall not exceed 7 elements per pressure vessel.
(4) The maximum pH of the second pass feed water shall be 10 or the maximum specified in the membrane warranty.

(5) The skid shall have the ability to receive the following chemicals for pretreatment prior to the first pass:

(6) Caustic soda to increase the pH of the feedwater and enhance boron removal, in order to meet the maximum average concentration for boron in Attachment 3 and Appendix 7.

(7) Scale inhibitor to prevent precipitation of sparingly soluble salts such as calcium carbonate, calcium sulfate, barium sulfate, and strontium sulfate.

(8) Provide a second pass concentrate recycle line to the RO first pass feed. The second pass concentrate recycle line will not be operated during Acceptance Testing.

(9) Table 2-14 identifies the Design-Builder's means and methodology for meeting the Design and Construction Requirements identified in this section.

Table 2-14 Second Pass BWRO

Parameter	Units	Design and Construction Requirement	Means and Methodology
Maximum Capacity/train	mgd		1.28
Minimum percent of total first pass permeate to second pass feed	%	40%	40% fixed rate
Number of second pass trains (duty + standby)		X+1 (rated capacity), X+0 (maximum capacity)	3+1 (rated capacity), 4+0 (maximum capacity)
Number of BWRO Stages per Train			2
Second pass maximum recovery	percent	90	90
Second pass maximum membrane flux rate	gfd	18	18
Stage 1 number of pressure vessels provided per train			18
Number of additional pressure vessels for which space is allocated per stage 1 per train			2
Stage 2 number of pressure vessels provided per train			8
Number of additional pressure vessels for which space is allocated per stage 2 per train			2

Parameter	Units	Design and Construction Requirement	Means and Methodology
Total number of elements per train			182
Total number of elements supplied to plant			546
Elements per pressure vessel		7 (not to exceed)	7
Maximum pH		10 or maximum specified in membrane warranty	10
Membrane surface area per element	ft2	up to 440 ft2 allowed	400 ft2
Influent Pressure	psi		
Second pass concentrate recycle to first pass flow rate	gpm		0

f. RO Membrane Elements

i. The type of first pass RO membrane elements shall be SWRO with minimum 99.6% salt rejection and minimum 90.0% boron rejection.

ii. The type of second pass RO membrane elements shall be BWRO with minimum 99.0% rejection.

iii. The size of all elements shall be standard 8-inch diameter, with a maximum of 400 square feet of surface area for first pass SWRO elements and a maximum of 440 square feet of surface area for second pass BWRO elements.

iv. Differential pressure across the membrane elements shall not exceed a five percent increase over the minimum membrane warranty period.

v. All membrane elements installed within a train shall be of a single manufacturer.

vi. The spiral wound membrane elements shall be manufactured with thin film composite polyamide membranes. The elements shall be suitable for high pressure seawater RO treatment in the first pass and brackish water RO in the second pass.

vii. The SWRO and BWRO membranes shall each be warranted in accordance with section 9(t) of this Appendix.

viii. The membrane models selected shall have a demonstrated track record of service with a minimum of two (2) years of operation at a full-scale seawater RO facility for drinking water application and of the comparable modular train size as this Project.

ix. Membrane Factory Testing

(1) Each membrane element shall be factory tested by the manufacturer and certified test data for each membrane element shall be supplied to the Owner prior to shipment. The test data shall be accepted by the Owner in writing prior to shipment.
(2) The elements shall be tested under the manufacturer's standard published test conditions.
(3) The elements shall meet the performance stated in the manufacturer's standards.
(4) Each membrane element must have a salt rejection greater than the minimum specified salt rejection defined in the membrane manufacturer's specification sheets for that membrane type.
(5) Certified test data shall be provided for each element and shall consist of the element serial number, the feed flow, recovery, productivity, and rejection. The Owner reserves the right to have a representative observe factory testing at any time during regular testing by the element manufacturer.

x. Table 2-15 identifies the Design-Builder's means and methodology for meeting the Design and Construction Requirements identified in this section.

Table 2-15 RO Membrane Elements

Parameter	Units	Design and Construction Requirement	Means and Methodology
Type of first pass RO membrane elements		SWRO	SWRO
SWRO Membrane Manufacturer			Hydranautics
SWRO Membrane Type/Model			3 x SWC5-LD and 4 x SWC6-LD per pressure vessel
SWRO salt rejection	percent	99.6	99.7 to 99.8
SWRO boron rejection	percent	90	91 to 92
Type of second pass RO membrane elements		BWRO	BWRO
BWRO Membrane Manufacturer			Hydranautics
BWRO Membrane Type/Model			ESPA2-LD
BWRO rejection	percent	99	99.5 to 99.6
RO membrane element diameter (SWRO and BWRO)	inches	8	8

Parameter	Units	Design and Construction Requirement	Means and Methodology
First pass SWRO membrane element surface area	square feet	400 (maximum)	400
Second pass BWRO membrane element surface area	square feet	440 (maximum)	400
Differential pressure across membrane elements over the minimum membrane warranty period	percent	5 (not to exceed)	This is not guaranteed. It is primarily a function of the actual raw water quality and pretreatment effectiveness. The Owner can clean the membranes if differential pressure increases by 5 percent. Membrane manufacturers typically recommend cleaning if differential pressure increases by 10%
Spiral wound membrane elements membrane type		thin film composite polyamide membranes	
Demonstrated track record of operation at a full-scale seawater RO facility for drinking water application and of the comparable modular train size	years	2	
Membrane Factory Testing			
Each membrane element will be factory tested by the manufacturer and certified test data for each membrane element will be supplied to California American Water prior to shipment. Shipment will not be processed until the manufacturer receives CAWs written acceptance of the test data.			
The elements shall be tested under the manufacturer's standard published test conditions.			
The elements shall meet the performance stated in the manufacturer's standards.			

Parameter	Units	Design and Construction Requirement	Means and Methodology
Each membrane element must have a salt rejection greater than the minimum specified salt rejection defined in the membrane manufacturer’s specification sheets for that membrane type.			
Certified test data will be provided for each element and will consist of the element serial number, the feed flow, recovery, productivity, and rejection.			
Other Parameters			
All membrane elements installed within a train are of a single manufacturer			Hydranautics
The elements shall be suitable for high pressure seawater RO treatment in the first pass and brackish water RO in the second pass.			

g. RO Pressure Vessels

i. The pressure vessels shall have a maximum working pressure of not less than 1200 psig and shall be code stamped for the rated pressure in accordance to the ASME Boiler and Pressure Vessel Code – Fiberglass-Reinforced Pressure Vessels.

ii. Pressure vessels shall be provided with ultraviolet light resistant coating.

iii. The feed and concentrate ports shall be located in the vessel sidewall.

iv. The pressure vessel ports shall be super duplex stainless steel for the first pass, and high grade (316L or better) stainless steel for the second pass.

v. Factory testing: Each vessel shall be tested at the manufacturer’s facility for compliance with requirements set forth herein. A certified copy of the production test data for each pressure vessel shall be submitted to the Owner prior to shipment.

h. RO First Pass High Pressure Pumps

i. The first pass RO feed pumps shall be horizontal, multistage, high-pressure, and centrifugal pumps.

ii. Minimum efficiency: 80%

iii. The high pressure pump maximum efficiency shall be designed for the maximum average water quality specified in Attachment 2.

iv. Acceptable materials of construction: super duplex stainless steel.

v. One high pressure feed pump, with variable frequency drive, shall be provided for each first pass membrane train.

vi. The high pressure pump shall be able to accommodate the entire range of operating water qualities, temperature (8ºC to 20ºC), RO fouling conditions, and ERD requirements.

vii. Design of the high pressure pump shall take into account the specific RO train configuration and energy recovery device to ensure proper operation and appropriate energy recovery and efficiency over the entire specified range of water quality parameters.

viii. Equipment Factory Testing

(1) Factory testing shall be performed for each high pressure RO feed pump. Testing shall comply with the latest version of the Hydraulic Institute/American National Standard for Rotodynamic Pumps for Hydraulic Performance Tests (14.6), referred to as HI Standard 14.6.
(2) Measurement accuracy shall be Grade 1 as defined by the HI Standard 14.6. Pump performance test acceptance grade shall be 1E.
(3) Pump tests shall be performed to verify the initial performance of new pumps. Performance testing shall include measurement of flow, head, and power input to the pump or test motor. NPSH testing shall be performed. Factory testing shall be performed at a dedicated test facility.
(4) Conduct tests on actual equipment to be furnished to the job site, including pump discharge heads and barrels, as applicable.
(5) Furnish certified test reports that include test data sheets, performance test logs, and equipment performance curves, as applicable. Indicate separately equipment guaranteed operating points identified in the specifications, including efficiency. Testing shall provide data for a minimum of five (5) flows.
(6) Factory testing of each high pressure pump motor shall be performed as listed below. Certified test results shall be submitted.
(7) Dielectric test on armature
(8) Insulation resistance
(9) No load current at rated voltage
(10) Efficiency and power factor calculated to 100 percent of full load at full load speed
(11) Locked rotor current
(12) Overspeed test
(13) Winding resistance
(14) Balance
(15) Bearing inspection

ix. Table 2-15A identifies the Design-Builder's means and methodology for meeting the Design and Construction Requirements identified in this section.

Table 2-15A RO First Pass High Pressure Pumps

Parameter	Units	Means and Methodology
Total number of pumps (duty + standby):		6+1 (rated capacity), 7+0 (maximum capacity)
Efficiency at Design Point	%	82

Parameter	Units	Means and Methodology
Capacity per pump:	gpm	1,153
Pump shut-off head:	psi	1,160
Maximum pressure rating of pump:	psi	1,200
Motor size, voltage, and motor enclosure type:	hp, V, -	800 hp, 4,160 V, WP2/TEFC

i. RO Second Pass Pumps

i. Minimum Efficiency: 70%

ii. Acceptable materials of construction: 316 SSL

iii. One second pass feed pump, with variable frequency drive, shall be provided for each second pass membrane train.

iv. The second pass pumps shall be able to accommodate the entire range of operating water qualities, temperature, and RO fouling conditions.

v. Pump and motor testing shall be performed as listed above for the high pressure pumps.

vi. Table 2-15B identifies the Design-Builder's means and methodology for meeting the Design and Construction Requirements identified in this section.

Table 2-15B RO Second Pass Pumps

Parameter	Units	Means and Methodology
Total number of pumps (duty + standby):		3+1 (rated capacity), 4+0 (maximum capacity)
Efficiency at Design Point	%	75
Pump type		multistage vertical turbine pumps, 316 S
Capacity per pump:	gpm	988
Pump head (TDH)	ft	538
Motor size, voltage, and motor enclosure type:	hp, V	250 hp, 480 V, WP2/TEFC

j. Energy Recovery Device

i. The purpose of the energy recovery device ("ERD") system is to reduce the RO system's power consumption by recapturing the energy present in the first pass concentrate stream.

ii. The type of ERD shall be positive displacement.

iii. Design of the ERD shall take into account the specific RO train configuration and high pressure pump and associated booster pumps to ensure proper operation and appropriate energy recovery.

iv. ERD booster pumps shall meet the following requirements:

(1) Acceptable materials of construction for wetted parts: non-corrosive, AL6XN, or Titanium.
(2) Pump type shall be horizontal multistage centrifugal design.
(3) Pump shall be equipped with a cartridge type mechanical seal.
(4) The pump shall be lubricated with the pumped fluid. Oil lubrication shall not be used.
(5) Pump capacity (gpm):
(6) Pump head: 30 – 35 psi

v. One ERD shall be provided per train (six ERI PX-Q300 Pressure Exchanger cylinders per SWRO unit).

vi. Total number of ERDs on duty and standby (indicate for normal and maximum capacity):

vii. Reference installations for the ERD shall be provided, and be independent plants with no affiliation to the ERD manufacturer.

viii. The expected lifetime of the ERD shall be at least twenty (20) years.

ix. The efficiency per ERD shall be a minimum of 95%.

x. The ERD maximum efficiency shall be designed for the maximum average water quality specified in Attachment 2.

xi. Mixing will be no more than three percent (3%) when the ERD low pressure flow rate equals the ERD high pressure flow rate and the membrane recovery rate is less than 50%.

xii. Conductivity of the flows into and out of the ERD shall be relayed to the main plant control system for continual calculation of ERD mixing percent. Sample ports shall also be provided at the same locations as the conductivity sensors.

xiii. The ERD must be able to operate within all the parameters of this Project (e.g., temperature, flow, pressure,).

k. RO System Piping and Valves

i. Interconnecting pipe manifolds for operation and sampling of the RO trains shall be provided that include but are not limited to connections for feed line, permeate line, brine line, CIP feed and return lines, and flush feed and waste lines. Pipe manifold materials shall be in accordance with materials listed in Appendix 2. CIP supply piping to second pass BWRO trains and CIP return piping shall be CPVC. Drawings shall be updated to show CPVC piping.

ii. Return lines off the permeate headers of each train shall be included. CIP return lines are provided on the permeate header from each train and shall be constructed of CPVC. Drawings shall be updated to show CPVC.

iii. Backflow prevention or air gap separation shall be provided on CIP waste, CIP recirculation and flush waste lines, as required by CDPH. Blocked and bleed valves will be used for isolation.

iv. The Design-Builder shall be responsible for providing sample ports and backflow prevention devices as required by CDPH.

v. Permeate sample points shall be provided on all vessels, and shall be such that a probe tube may be passed through for profiling and sampling within a vessel.

vi. A sample port panel shall be provided for each train, such that the operator can sample the permeate of each vessel, the feed and concentrate of each train, and any interstage header lines, in one convenient location. RO Trains shall use vertical feed/concentrate manifolds and vertical permeate manifolds.

vii. Side ported vessels shall be used for ease of maintenance.

viii. Piping shall be run at the ends or alongside the trains in easily accessible piping trenches. All horizontal runs shall be located beneath trench grating, as referenced on drawing M-5.

ix. The RO System shall be designed such that permeate backpressure cannot exceed the concentrate pressure by more than 5 psi to prevent damage to the RO membranes.

l. Flush System

i. The flush system shall be able to flush the entire RO system and each individual RO train including ERDs.

ii. The Design-Builder shall provide the ability to flush each train independently of the plant to allow for individual train shutdown and flushing. The first pass system shall be able to be flushed separately from the second pass.

iii. The flush water source shall be RO permeate from the flush tank.

iv. The first and second pass RO systems shall be designed and constructed with piping, valving, and instrumentation for an automated flushing even to occur. A flushing event shall occur if a train is taken offline. The Design-Builder shall provide the ability to manually initiate a flushing event.

v. Flush feed connections shall be provided to each train, along with automated flush supply and waste valves. The system shall be activated automatically through the RO system PLC on shutdown of the RO train to flush residual low pH feed and concentrate from the high pressure pump and pressure vessels. On initiation of a flush cycle, flush water shall be pumped to the flush feed valve on the suction side of the high pressure pump. A flush to waste valve shall be opened off the concentrate line ahead of the control valve, routing the flush water to waste.

vi. Flush feed connections shall be placed in close proximity to the train itself, without excess piping.

vii. The Design-Builder shall ensure that there is enough volume in the flush tank such that each train can be flushed in the event of a plant shut down.

viii. The Design-Builder shall provide the ability to add preservative solution to the flush system.

ix. A minimum of one standby pump shall be provided and at all times at least one flush pump shall be available to flush a first or second pass RO train.

x. Duty and standby pumps shall be connected to the standby power generator bus such that a single pump could operate during a power outage.

xi. The flush waste pumps shall be sized to flush an entire first or second pass RO train, including the ERD.

xii. The Design-Builder shall provide the flexibility to flush the first pass RO feed pumps.

xiii. Provisions shall be included to allow for proper sanitization of the flush tank to control microbiological activity.

xiv. Table 2-16 identifies the Design and Construction Requirements for the flush system and the Design-Builder's means and methodology for meeting the Design and Construction Requirements.

Table 2-16 Flush System

Parameter	Design and Construction Requirement	Means and Methodology
Flush water source	RO permeate from the flush tank	
Automated flushing event	First and second pass RO systems are designed and will be constructed with piping, valving, and instrumentation for an automated flushing event to occur if a train is taken offline.	
Manual flushing event	Ability to manually initiate a flushing event is provided in addition to automated flushing.	

Parameter	Design and Construction Requirement	Means and Methodology
Flush feed connections along with automated flush supply and waste valves for each train	- System shall be activated automatically through the RO system PLC on shutdown of the RO train to flush residual low pH feed and concentrate from the high pressure pump and pressure vessels. - On initiation of a flush cycle, flush water shall be pumped to the flush feed valve on the suction side of the high pressure pump. - A flush to waste valve shall be opened off the concentrate line ahead of the control valve, routing the flush water to waste.	Flush will go through the concentrate valve to brine outfall or brine equalization basin
Flush feed connections proximity	Placed in close to the train itself without excess piping.	
Number of Tanks		1
Flush tank volume	There is enough volume in the flush tank such that each train can be flushed in the event of a plant shut down.	43,000 gal
Preservative solution	Can be added to the flush system.	Connection to the sodium bisulfite feed system is provided
Flush pumps	One standby pump is available to flush the first or second pass RO train.	
Number of Pumps total		2
Duty and standby pumps	Are connected to the standby power generator bus such that a single pump could operate during a power outage.	
Flush waste pumps sizing	Sized to flush an entire first or second pass RO train, including the ERD.	780 gpm at 158 ft
Flush system flexibility	Can flush the first pass RO feed pumps	
Sanitization	Allow for proper sanitization of the flush tank to control microbiological activity.	Ability to feed sodium hypochlorite for sanitation and draining to waste is provided

m. Clean-In-Place System

i. A chemical cleaning system that includes CIP pumps, tanks, tank heater, and cartridge filter(s) shall be provided by the Design-Builder. This CIP system, including storage, make-up, piping, connections, and feed facilities, shall be permanently installed.

ii. Sufficient piping and valving shall be provided to clean each entire stage within each train individually.

iii. The Design-Builder shall provide a chemical storage area within the CIP area of the desalination building. Chemical containment and feed system design shall be consistent with Attachment 1.

iv. The Design-Builder may provide a dry or liquid CIP chemical system. If a dry system is selected, the CIP tanks shall be installed with a dry chemical feed system and submersible tank mixer. If a liquid chemical CIP system is selected, the Design-Builder shall provide a metering pump from the chemical storage to the CIP tank and a submersible mixer.

v. CIP tanks shall be suitable for storage of solutions between pH of 2 to 12. Tanks larger than 1000 gallons shall be FRP. The Design-Builder shall provide a 15,600-gallon tank.

vi. Each CIP tank shall have adequate volume to perform a CIP for either the first or second pass train, assuming heavily fouled conditions, and for chemical addition to neutralize the CIP solution and the minimum volume of one CIP tank shall be sufficient to allow filling of all pressure vessels in the first pass RO train or second pass RO train (which ever is larger) as well as the piping to and from the train.

vii. CIP tanks shall be installed with a drain at the tank bottom

viii. The CIP system shall be supplied with a heating system to raise the temperature of the CIP solution for a heavily fouled condition up to 45 °C in 8 hours or less.

ix. Design-Builder shall provide a minimum of one CIP pump to perform the cleaning of the entire first pass (3120 gpm at 161 feet).

x. Design-Builder shall provide a minimum of one CIP pump to perform the cleaning of the second pass and provisions shall allow each stage to be cleaned individually with the provided pumps(s). The pump(s) shall be 720 gpm at 161 feet.

xi. The CIP system shall be manually initiated.

xii. Permanent CIP piping shall be provided between the CIP system and each RO train. To provide separation for CDPH compliance, block and bleed valves shall be used at connections.

xiii. The CIP cartridge filter shall be a minimum of 5 micron pore size. The materials of construction for the cartridge filter shall be suitable for a cleaning solution with pH between 2 and 12.

xiv. A local control panel (LCP) is to be provided for the CIP system, the LCP shall be mounted at the CIP area at 4 ft above the building floor. The control system shall at a minimum display temperature, pH, pump status, flow and pressure during a CIP.

xv. Table 2-17 identifies the Design-Builder's means and methodology for meeting the Design and Construction Requirements identified in this section.

Table 2-17 Clean-In-Place System

Parameter	Units	Design and Construction Requirement	Means and Methodology
Piping and Valving		Sufficient to clean each entire stage within each train individually.	
Chemical storage area within CIP area		Chemical containment and feed system design is consistent with the American Water Engineering Standard T2: Liquid Chemical Storage, Feed, And Containment (Attachment 1 to the Design-Build Agreement Appendix 2)	
CIP Chemical System Type		Dry or Liquid	Liquid – an eductor has been included on the CIP recirculation line
Dry CIP chemical system		CIP tanks shall be installed with a dry chemical feed system and submersible tank mixer.	
Tank size	gallons	Adequate volume to perform a CIP for either the first or second pass train, assuming heavily fouled conditions, and for chemical addition to neutralize the CIP solution and the minimum volume of one CIP tank shall be sufficient to allow filling of all pressure vessels in the first pass RO train or second pass RO train (whichever is larger) as well as the piping to and from the train.	15,600 gal
Solution storage	pH	2 to 12	
Material for tanks larger than 1,000 gallons		FRP	
CIP pumps to perform the cleaning of the entire first pass		1 pump (minimum)	1 pump 3120 gpm at 161 ft
First Pass CIP Pump Motor Size (hp)			100

Parameter	Units	Design and Construction Requirement	Means and Methodology
First Pass CIP Pump Voltage			480
First Pass CIP Pump Motor Enclosure Type			TEFC
CIP pump to perform the cleaning of the second pass		1 pump (minimum)	1 pump 720 gpm at 161 ft
Piping type between CIP system and RO train		Permanent piping with block and bleed valves at connections.	
CIP cartridge filter pore size	µm	5	
Cartridge filter material		Suitable for a cleaning solution with pH between 2 and 12.	Polypropylene
Local control panel (LCP) height	feet	4 above the building floor	
Control system display		temperature, pH, pump status, and flow and pressure during a CIP (minimum)	
CIP Tank Heater		The CIP system shall be supplied with a heating system to raise the temperature of the CIP solution for a heavily fouled condition up to 45 °C in 8 hours or less.	Two immersion style heaters provided, 480v 100KW for the CIP system

n. Neutralization Tank

i. Table 2-18 identifies the Design and Construction Requirements for the neutralization tank and the Design-Builder's means and methodology for meeting the Design and Construction Requirements.

Table 2-18 Neutralization Tank

Parameter	Units	Design and Construction Requirement	Means and Methodology
Configuration		Neutralization tank, separate from the CIP tank, shall be provided	
Tank size	gallons	Large enough to receive 150% of the volume needed to clean one entire train.	15,600 gal

Parameter	Units	Design and Construction Requirement	Means and Methodology
Equipment		• mixer • neutralization chemical equipment • drain for disposal of the contents via trucking	Recirculation pump and eductor used for mixing
Level monitor and an independent high level switch		Provided for monitoring level and alarm on high level	

o. RO Membrane Storage and Preservation

i. The RO System shall be delivered to allow for proper storage and preservation of the RO elements.

p. RO System Control and Instrumentation

i. The RO system shall be controlled by a programmable logic controller ("PLC") based control system.

ii. Table 2-19 identifies the Design and Construction Requirements for the RO system control and instrumentation and the Design-Builder's means and methodology for meeting the Design and Construction Requirements.

Table 2-19 RO System Control and Instrumentation

Parameter	Design Criteria	Notes/Assumptions
PLC type	Allen Bradley	Control Logix with 1734 point I/O
Operator graphical interface	Provided to communicate with system	GE Intellution iFIX 5.5
Minimum RO system feed information (downstream of cartridge filter(s))	Temperature, conductivity, pH, turbidity, flowrate, pressure, and ORP.	PLC will calculate flows from SWRO high and low permeate and concentrate and present the sum of all SWRO trains feed flow and sum of Pass 2 BWRO concentrate streams
RO system operation	Constant permeate flow rate	
Minimum RO train information to be relayed to the main plant control system	1. Train Status	
	2. First Pass Feed: a. Pressure b. Flowrate	

Parameter	Design Criteria	Notes/Assumptions
	3. Second Pass First Stage Feed: pressures before and after feed pump a. Flowrate b. Temperature c. Conductivity d. pH	
	4. Second Pass Second Stage Feed: a. Pressure b. Flowrate c. Conductivity d. pH	
	5. First Pass Permeate: a. Pressure b. Flowrate c. Conductivity d. pH	
	6. Second Pass First and Second Stage Permeate: a. Pressure b. Flowrate c. Conductivity d. pH	
	7. Second Pass By-pass: a. Pressure b. Flowrate	
	8. Combined Permeate: a. Pressure b. Flowrate c. Conductivity d. pH	
	9. First pass concentrate: a. Pressure b. Flowrate c. Conductivity d. pH	
	10. Second pass second stage concentrate: a. Pressure b. Flowrate c. Conductivity d. pH	

Parameter	Design Criteria	Notes/Assumptions
	11. Combined concentrate: a. Flowrate b. Conductivity c. pH d. Turbidity e. Temperature	
	12. Differential Pressure (Train, Passes and Stage)	
	13. Valve Positions a. Feed b. Permeate c. Brine	
	14. RO Feed Rate and Calculated Recovery Rate	
	15. Alarm Condition for RO Feed Pumps and Energy Recovery Device	
	16. Energy Recovery Device for all streams a. Flowrate b. Pressure c. Conductivity	
Monitoring at common influent location	RO feed temperature, conductivity, and pH	
Real-time online normalization provided	Specific flux, differential pressure, and conductivity	
Sample points	Sufficient number to be provided on process system to allow the operator to determine the performance of the RO system.	
	Each stage of multistage trains shall be instrumented.	
Common monitoring location, rather than requiring the operator to visit each train	RO feed parameters	Each Permeate ports of each pressure vessel, Membrane Feed, Interstage, Each train combined permeate (1st stage, 2nd stage, combined), Each ERD stream, Final concentrate.
Meters and sampling points	Compliant with the provisions of Appendix 2 and Appendix 7.	

q. Spare Parts

i. The Design-Builder shall provide to the Owner the spare parts identified in Table 2-20 below. The cost to provide the spare parts is included as part of the Fixed Design-Build Price.

Table 2-20. RO System Spare Parts Recommended by the Manufacturer

Part Description
One mechanical seal of each type used for the RO systems
One set of pump bearings of each type used for the RO system
One set seals and gaskets for an ERD unit
10 RO pressure vessel seals for the end caps, permeate connectors, brine seals, couplings

r. Special Tools

i. The Design-Builder shall furnish any special tools that are necessary for maintenance of the system or for the removal and replacement of membrane elements. The Design-Builder does not anticipate that any special tools will be necessary.

ii. A single element test unit shall be provided at the plant for testing of individual membrane elements. The single element test unit shall meet the following requirements:

(1) The unit shall include a 5-micron cartridge filter, high pressure feed pump, and one 8-inch single element pressure vessel, and instrumentation.
(2) The unit shall be capable of operating up to 1200 psi.
(3) A concentrate recycle line shall be included.
(4) Instrumentation shall be panel mounted, and include instruments for monitoring raw feed pressure, post-cartridge filter pressure, permeate pressure, pressure differential across the single element pressure vessel, feed flow, permeate flow, recycle flow, and concentrate flow as well as feed, permeate and concentrate conductivities.
(5) Sample ports shall be provided for at least the RO feed water (before and after the concentrate recycle line), permeate, and concentrate flows.

s. Factory Testing

i. Factory tests shall be conducted on all actual equipment to be furnished to the job site.

ii. Test reports shall be provided to the Owner documenting the performance of each piece of equipment. Equipment guaranteed operating points shall be indicated.

t. RO System 14-day Run-In Test

i. The Design-Builder shall conduct a 14-day performance test on the complete RO system to demonstrate its competent operation.

ii. As applicable to the equipment furnished, state in writing that all necessary hydraulic structures, piping systems, and valves have been successfully tested; that all necessary equipment systems and subsystems have been checked for proper installation, started, and successfully tested to indicate that they are all operational; that the systems and subsystems are capable of performing their intended functions; and that the facilities are ready for startup and intended operation.

iii. After the Design-Build Improvements are operating, but prior to initiation of the 14-day run-in test, complete the testing of those items of equipment, systems, and subsystems which could not be or were not adequately or successfully tested prior to plant startup. This shall include verification of proper membrane element installation by conducting a conductivity profile on the pressure vessels of each RO train while the train is operating.

(1) The Design-Builder's personnel shall conduct the profiles by sampling permeate from the sample valves on each pressure vessel within a given train.
(2) Those vessels not meeting pre-established conductivity criteria shall be opened up by the Design-Builder and examined for proper installation of end connectors and element interconnectors, damaged o-rings, misaligned brine seals, and other like causes.
(3) Any observed deficiencies shall be corrected by the Design-Builder and the vessel retested.

iv. Successful checkout of the RO system and performance testing of related ancillary systems shall constitute grounds for substantial completion of the RO system and allow it to proceed to the Acceptance Test.

v. The test shall be considered complete when, in the opinion of the Owner, the complete treatment system has operated in the manner intended at plant design capacity for 14 continuous days without significant interruption. This period is in addition to any training, functional, or performance test periods specified elsewhere. A significant interruption will require the test then in progress to be stopped and restarted after corrections are made.

vi. Significant interruption may include any of the following events:

(1) Failure of Design-Builder to maintain qualified on-site startup personnel as scheduled.
(2) Failure of any equipment item or treatment subsystems furnished by the Design-Builder to meet specified performance requirements for more than 2 consecutive hours.
(3) Failure of any critical equipment unit, system, or subsystem that is not satisfactorily corrected within 5 hours after failure.
(4) Failure of noncritical unit, system, or subsystem that is not satisfactorily corrected within 8 hours after failure.
(5) As may be determined by the Owner.

vii. The following events will not be considered cause for significant interruption:

(1) Loss of feedwater delivered to the RO System for reasons beyond the control of the Design-Builder.
(2) Loss of power to the plant for reasons beyond the control of the Design-Builder.
(3) As may be determined by the Owner.

viii. Minimum prerequisites prior to initiation of the 14-Day Run-In Test include the following:

(1) Successful completion of the performance tests for the reverse osmosis trains.
(2) Completion of membrane element loading and checkout for the reverse osmosis trains.
(3) Completion of initial startup operations, including successful completion of performance testing on remaining equipment items as specified herein.

ix. Report: At the end of the 14-day run-in test, the Design-Builder's representative shall prepare a test report which shall include daily operating and normalized performance data for each day of the test, for each RO train and the system as a whole.

x. Acceptance Testing: Final Acceptance Testing is described in Appendix 7 and in Article 4 of the Design-Build Agreement.

u. RO system performance warranty

i. General: The Design-Builder shall warrant all components of each RO train supplied against defects in materials and workmanship in accordance with Article 6 of the Design-Build Agreement. This warranty shall state the following provisions with no additional conditions or exceptions:

(1) Each RO train shall produce the minimum permeate flow rate 1.67 mgd SWRO units and 1.2 mgd BWRO units at the overall recovery of 41.5 percent and design parameters while treating water at or below the maximum feed water quality parameters provided in Attachment 2 of Appendix 2, and meeting the product water quality parameters specified in Attachment 3 or Appendix 2.
(2) The maximum recovery per pass shall be 45 percent for the first pass, and 90 percent for the second pass.

ii. Membrane Elements: The Design-Builder shall furnish a separate warranty for the RO membrane elements. This warranty shall be a pass-through type, directly between Hydranautics and the Owner. This warranty must be signed by an individual authorized to execute contracts on behalf of the membrane manufacturer and shall state the following provisions with no additional conditions or exceptions:

(1) The membrane elements supplied under these specifications shall be warranted by the manufacturer to be free of liens and encumbrances, and against defects in materials and workmanship for a period of twelve (12) months in accordance with Article 6 of the Design-Build Agreement.
(2) The manufacturer shall warrant the performance of the membrane elements for a period of five (5) years from completion of the Acceptance Tests described in Appendix 7 (the "Extended Membrane Warranty Period"). The manufacturer

shall guarantee the membrane elements during the Extended Membrane Warranty Period in accordance with the performance requirements specified herein and the following prorated replacement conditions if the elements fail to meet the warranted performance:

(3) The elements shall at all times during the Extended Membrane Warranty Period have a minimum flow of 90 percent of the minimum product flow specified on the membrane manufacturer's specification sheet for the elements furnished when tested at standard conditions as defined herein.

(4) During the Extended Membrane Warranty Period, the element salt passage shall not exceed one hundred and fifty percent (150%) of the maximum salt passage specified on the membrane manufacturer's specification sheet for the elements furnished when tested at standard conditions as defined herein.

(5) At all times during the Extended Membrane Warranty Period, when the system is operated with feedwater consistent with the conditions applicable for the RO system in Table 1 in Attachment 2 of Appendix 2:

(6) Each RO train shall require no more than 1000 psi feed pressure to the first pass to produce design permeate capacity.

(7) The Combined RO permeate from each train shall meet both the maximum-average and not-to-exceed concentrations for boron, chloride bromide and sodium listed in Table 2C-1 in Attachment 3 of Appendix 2.

iii. The warranty conditions specified above shall be valid under the following conditions:

(1) Each RO train has been operated as designed in terms of product water recovery, flux, array configuration, and feedwater pH.

(2) The feedwater does not contain chemicals that chemically or physically destroy the elements.

(3) The membrane elements are periodically cleaned with an effective cleaning solution to remove colloidal matter inherent in ocean water.

(4) The membrane elements are cleaned using standard cleaning solutions prior to performance testing for warranty purposes.

(5) Biological matter or sparingly soluble substances in the feedwater have not irreversibly fouled the membrane elements.

iv. Should the RO train performance not meet the warranty requirements, the membrane element manufacturer shall provide sufficient replacement elements to achieve the specified train performance. The replacement elements will be provided at the current market price, less a credit of 1/60 of the purchase price for each unused month of the Extended Membrane Warranty Period. The manufacturer shall guarantee that future replacement elements will be sold to the Owner at a price not to exceed $ multiplied by the petrochemical and plastics escalation factor per 8-inch 40-inch element at any time within five years from Acceptance of each RO train.

10. HANDLING OF TREATMENT RESIDUALS

a. The key reference drawings in Attachment 12 to this Appendix associated with this section are:

   i. G-6 RESIDUAL PROCESS FLOW DIAGRAM

   ii. M-12 BRINE EQUALIZATION PUMP STATION

   iii. M-13 BACKWASH RECLAMATION BASIN PUMP STATION

   iv. I-41 P&ID BACKWASH RECLAMATION BASIN AND PUMP STATION

   v. I-42 P&ID BRINE CONVEYANCE SYSTEM

b. Types of Residuals: The Design-Build Improvements shall have different types of residual streams, as summarized in Table 2-21.

Table 2-21 Residuals Summary

Residual Stream	Disposal Method	Frequency of Disposal
CIP waste, neutralized	Neutralization holding tank, Trucking offsite (to MRWPCA)	Intermittent
Sanitary waste	Lift Station and forcemain to the Monterey Regional Water Pollution Control Authority treatment facility	Continuous, variable
Special laboratory waste	Discharge through neutralization pot to Holding tank, Trucking offsite	Intermittent (expect no more than twice per year)
Sample streams	Recycle to the extent possible; minimize discharge to sanitary	
Spent Granular Media Filter Wastewater	Settling followed by recycle, or discharge to concentrate/MRWPCA Concentration/treatment process then Trucking offsite	Periodic; no more than twice per year
Settled Solids from Granular Media Filtration	Concentration in settling basins; mechanical or non-mechanical dewatering ; landfill disposal	Not to exceed once per year
Lime Sludge Blowdown	Comingle with granular media filtration waste; manual removal then trucking offsite	Intermittent
First Pass RO Concentrate	Pipeline to MRWPCA	Continuous
Second Pass RO Concentrate	Pipeline to MRWPCA	Continuous

c. RO Concentrate Disposal

   i. Concentrate flows from both the first pass and the second pass of the RO system are to be conveyed to the MRWPCA site via a proposed concentrate pipeline and disposed of via the existing MRWPCA outfall.

(1) The concentrate disposal pipeline, beyond the Project Site, will be designed and constructed by others. The Design-Builder shall be responsible for the concentrate disposal piping within the Project Site boundary.

ii. RO concentrate, and related streams, shall be discharged to the MRWPCA ocean outfall. The discharge shall be piped to the effluent junction structure located at the MRWPCA facility. Piping from the Project Site property boundary to the MRWPCA tie-in is by others. The top elevation of the effluent junction structure is 101.0 feet MSL. The effluent junction structure is not pressurized.

(1) Digital communication with MRWPCA shall be established with a spread spectrum radio link to allow sharing of limited data. The communication link shall be protected by a firewall. The Design Builder shall provide and install all the necessary hardware and software required for the communication link on the Project Site.

iii. Discharge must be in compliance with MRWPCA concentrate discharge agreement.

iv. Previous analyses have indicated a need for on-site (Project Site) concentrate flow equalization. The capacity of the concentrate equalization lagoon shall be a minimum of 3,000,000 gallons.

v. Number of pumps, duty + standby

vi. Capacity per pump: 6MGD

vii. Flow control:

viii. TDH of each pump (ft):

ix. Type of pump:

x. A pumping facility shall be provided to drain the equalization lagoon over a 12 hour period. The pumping facility shall provide one or two duty pumps, and a reserve pump. Discharge flow shall be continuously measured.

xi. Flow metering of the discharge to MRWPCA shall be provided.

xii. A sampling station, with automatic sampler, shall be provided on the discharge to MRWPCA. The area in which the sampler and associated piping are located shall be protected with a roof. A suitable drain shall be provided. Continuous monitoring of pH, conductivity, turbidity, and dissolved oxygen shall be provided and input to SCADA.

xiii. An air break between the reverse osmosis brine pipeline and the wastewater outfall will be provided offsite by the Owner to eliminate backflow concerns.

xiv. A revised National Pollutant Discharge Elimination System (NPDES) permit will be required to allow discharge of desalination concentrate to the MRWPCA outfall. The conditions of the permit have not been identified to date. Discharge of objectionable wastes/contaminants to the concentrate stream for disposal to MRWPCA outfall is not allowed.

(1) Minimum dissolved oxygen is expected to be a permit condition of discharge.
(2) Beach well water is likely to have low levels of dissolved oxygen.
(3) Aeration of concentrate is proposed downstream of reverse osmosis. The California American Water Coastal Water Project Final EIR (2009) recommended aeration of the discharge to achieve a dissolved oxygen value of 5.0 mg/L to avoid a significant impact.
(4) The aeration system Design and Construction Requirement is based on injected air into the brine discharge pipeline and taking advantage of the transit time and elevation pressure to reach a dissolved oxygen content of 5 mg/L. This results in a required air flow of 150 cfm at 10 psig.

xv. Concentrate Equalization Lagoon Details

(1) Design and construction details shall comply with all regulatory requirements. Details presented below are not inclusive of all technical and regulatory requirements.
(2) Top of embankment shall be suitable for use as a service road, and shall be a minimum of 12 foot wide and designed to support the weight of service vehicles.
(3) Minimum freeboard of 3 feet is to be provided.
(4) Protect lagoon from surface runoff.
(5) Provide continuous level measurement with ultrasonic level monitor; provide high level switch to alarm.
(6) A double lined lagoon is required. Leak collection material between the two liners shall be designed to rapidly transmit liner leakage to a collection sump. Provide level switch on collection sump connected to alarm in SCADA. Provide sump pump and flow meter for measuring leakage.
(7) The primary liner shall be textured on the exposed side for personnel slip protection. Provide a means of emergency egress.
(8) Protect liner from wind uplift, oxidation and sharp objects.
(9) Liner penetrations are to be limited to the extent possible and reserved to areas above the lagoon freeboard to reduce the potential for leaks.
(10) Provide seepage collars; provide erosion protection at inlet
(11) Fence the lagoon from public access. Provide gates for Owner vehicles and personnel.

d. Dewatering of Settled Solids from Granular Media Filtration

i. Settled solids from granular media filtration are to accumulate in the wastewater basins identified under Granular Media Filtration. The solids are to be periodically removed and then mechanically or non-mechanically dewatered and disposed of at a landfill. Dewatering is expected to occur once per year. Plant operation will continue while dewatering process is performed.

ii. Power supply and water supply are to be provided to support contract dewatering.

iii. The Design-Builder has proposed to take one basin off-line for gravity thickening and solar drying as the means and methods to meet this section.

11. PRODUCT WATER STABILIZATION

a. The key reference drawings in Attachment 12 to this Appendix associated with this section are:

   i. M-8 CHEMCIAL SYSTEMS PLAN AND SECTIONS

   ii. M-10 SATURATED LIME SYSTEM AND PERMEATE FLUSH TANK SYSTEM

   iii. M-11 CO2 (CALCIUM DIOXIDE) – FOR 6.4 AND 9.6 MGD

   iv. I-27 P&ID CARBON DIOXIDE STORAGE AND FEED SYSTEM (CALCITE CONTACTOR)

   v. I-27A P&ID CARBON DIOXIDE STORAGE AND FEED SYSTEM (CALCIUM HYDROXIDE)

   vi. I-36 P&ID OPTION 2 - POST TREATMENT FOR CALCITE CONTACTOR STABILIZATION PROCESS

   vii. I-36A P&ID OPTION 1 AND ALTERNATIVE TO OPTION 1 - POST TREATMENT FOR CALCIUM HYDROXIDE STABILIZATION PROCESS

   viii. I-43 P&ID OPTION 1 POST TREATMENT - SATURATED LIME SYSTEM

   ix. I-44 P&ID ALTERNATIVE TO OPTION 1 POST TREATMENT – LIME SLURRY BATCHING SYSTEM – SHEET 1

   x. I-45 P&ID ALTERNATIVE TO OPTION 1 POST TREATMENT – LIME SLURRY BATCHING SYSTEM – SHEET

b. Purpose:

   i. The RO permeate will have different characteristics than water in the Owner's existing drinking water distribution system. RO feed water quality is very different than other sources used for drinking water, and the RO process rejects more than 99 percent of constituents such as calcium, magnesium, sulfate, sodium, and chloride. RO product water has low hardness, alkalinity, and pH, and sodium and chloride are the principal ions. Water with these characteristics is associated with corrosion, the release of corrosion byproducts that can cause "red water" (drinking water with elevated levels of iron causing a red or brown color and increased turbidity), and difficulty complying with the United States Environmental Protection Agency Lead and Copper Rule (LCR).

   ii. Minimizing the likelihood of these problems requires corrosivity to be reduced by adding calcium hardness and alkalinity to adjust the pH and stabilize the water and/or through the use of a corrosion inhibitor. The Owner's existing distribution uses orthophosphate for corrosion control, which is a capability that will be incorporated into the stabilization of the RO product water to conform to the Owner's current corrosion control practices. However, the RO product water stabilization system is also required to have sufficient corrosion control without orthophosphate to provide the Owner with the flexibility to modify its approach for corrosion control in its distribution system, using higher hardness and alkalinity and hardness and calcium carbonate saturation instead.

c. Water quality requirements for stabilized RO product water are shown in Attachment 3.

d. Acceptable Options for Post-Stabilization

i. The Design-Builder shall ultimately be responsible for designing and constructing a product water stabilization strategy that can meet the range of water quality objectives listed in Attachment 3, meeting the LCR requirements, and not resulting in red water events.

ii. Calcite contactors have reduced operation and maintenance requirements compared to continuous lime feed but it must be demonstrated that they can provide the flexibility required and that large-scale experience is available.

e. Hydrated Lime System

i. Hydrated lime dosing system:

ii. Maximum flow to be treated: Refer to Section 2.

iii. Range of hydrated lime dose: 30 to 74 mg/L as $Ca(OH)_2$

iv. Range of hydrated lime dose: 40 to 100 mg/L as $CaCO_3$

v. Range of hydrated lime consumption at flow of 9.6 MGD: 2,370 to 5,925 lb/d as $Ca(OH)_2$

vi. Range of hydrated lime consumption at flow of 6.4 MGD: 1,580 to 3,950 lb/d as $Ca(OH)_2$

vii. Hydrated lime slurry tank feed rate at 9.6 MGD flow: 99 to 247 lb/hr as $Ca(OH)_2$

viii. Hydrated lime slurry tank feed rate at 6.4 MGD flow: 66 to 165 lb/hr as $Ca(OH)_2$

ix. Target hydrated lime slurry tank feed concentration: 8.0%

x. Acceptable range for hydrated lime slurry tank feed concentration: ±5% of target concentration

xi. Hydrated lime slurry tank flow rate at 9.6 MGD: 3.1 to 7.7 gpm

xii. Hydrated lime slurry tank flow rate at 6.4 MGD: 2.1 to 5.2 gpm

xiii. Source of water for hydrated lime system and saturators shall be from second pass RO permeate to minimize calcium carbonate formation.

xiv. Minimum number of lime saturators: 2 duty

xv. Saturated limewater concentration: 1.8 g/L as $Ca(OH)_2$ at 12°C

xvi. Maximum turbidity of saturated limewater: 5 NTU

xvii. Range of limewater flow rate at 9.6 MGD: 114 to 286 gpm

xviii. Range of limewater flow rate at 6.4 MGD: 76 to 190 gpm

xix. Number of limewater flow equalization tanks: 2 duty

xx. Capacity of limewater flow equalization tanks for 9.6 MGD: 17,200 gallons, each

xxi. Capacity of limewater flow equalization tanks for 6.4 MGD: 11,500 gallons, each

xxii. The saturated lime dose will be controlled based on the flow rate (primary control variable) and trimmed on target alkalinity of the product water downstream (secondary control variable) using a PID feedback control loop.

xxiii. Cleanouts and flushing connections at all lime slurry and/or lime sludge pipeline transition points.

xxiv. Long radius elbows and fittings along the lime slurry and/or lime sludge pipelines.

xxv. Vertical piping runs shall not be used for lime slurry and/or lime sludge pipelines.

xxvi. When feasible, provide flexible hose and quick disconnect fittings on lime slurry and lime sludge pipelines to facilitate replacement/cleanout of pipelines.

xxvii. Minimize aeration of lime solutions to prevent uptake of carbon dioxide and formation of calcium carbonate.

xxviii. CO_2 dosing system:

xxix. The CO_2 dose will be controlled based on the flow rate (primary control variable) and trimmed on pH of the product water downstream (secondary control variable) using a PID feedback control loop.

xxx. CO_2 needs to be added so chemical reactions and blending of the main flow of water with the limewater are completed and pH has stabilized before the pH measurement location that provides process control

xxxi. Minimum number of CO_2 storage tanks: 1

xxxii. Minimum number of vaporizers: 2

xxxiii. Minimum number of vapor heaters: 2

xxxiv. Tables 2-22 through 2-24 identify the Design and Construction Requirements and the Design-Builder's means and methodology for meeting the Design and Construction Requirements for this section.

Table 2-22 Hydrated Lime System

Parameter	Units	Design and Construction Requirements	Means and Methodology
Basis of Flow			
Maximum flow	mgd	11.2	This capacity must be provided for post-stabilization treatment process to enable the Owner to produce a stable finished water product with all installed reverse osmosis units in operation. Providing a capacity of 9.6 mgd will limit the Owner's calcium hardness and total alkalinity operating range when "catching up" to annual production goals.
Average flow	mgd	9.6	Capacity which corresponds to desired annual average production rate of 10,671 afy.
Minimum flow	mgd	3.2	Capacity which corresponds to reverse osmosis system minimum production rate of 3.2 mgd.
Calcium Hydroxide Dose			
Application Point		Composite Reverse Osmosis Permeate Downstream of UV Disinfection and Carbon Dioxide Application Point	
Maximum hydrated lime dose	mg/L as $Ca(OH)_2$	74.0	
Average hydrated lime dose	mg/L as $Ca(OH)_2$	30	Based upon relevant CDM Smith experience (i.e. Santa Cruz finished water coupon testing) a minimum alkalinity of 30 mg/L as calcium carbonate was sufficient to prevent the occurrence of red water events. As such, the minimum water quality requirements identified in Table 11-1 were assumed to be appropriate for average operating conditions.

Parameter	Units	Design and Construction Requirements	Means and Methodology
Minimum hydrated lime dose	mg/L as $Ca(OH)_2$	28.7	A reduction of the minimum calcium hydroxide dosage indicated in the RFP [30 mg/L as $Ca(OH)_2$] was required to allow the Owner to produce finished water with a calcium hardness of 40 mg/L as calcium carbonate. This reduction was necessitated by the presence of calcium in the reverse osmosis permeate.
Calcium Hydroxide Consumption Rate			
Maximum flow-Maximum dose	lb/day as $Ca(OH)_2$	6,912	The calcium hydroxide consumption range indicated in the RFP [2,370 to 5,925 lb/day as Ca(OH)2] restricts the Owner from operating within the full range of production rates and calcium hardness/total alkalinity values required by the RFP. Appropriate range provided to allow the Owner to operate within the full range of production rates and calcium hardness/total alkalinity values required by the RFP.
Average flow-Average dose	lb/day as $Ca(OH)_2$	2,298	Same as above.
Minimum flow-Minimum dose	lb/day as $Ca(OH)_2$	766	Same as above.
Maximum flow-Average dose	lb/day as $Ca(OH)_2$	2,681	Same as above.
Average flow-Maximum dose	lb/day as $Ca(OH)_2$	5,925	Same as above.
Bulk Storage Silo			
Number of Silos	Number	1 (1 Active)	
Capacity of Silo	Tons [96.8% $Ca(OH)_2$]	47	Bulk storage silo sized to provide no less than 31 days of storage at maximum flow-average dose consumption rate
Storage Time at Maximum flow-Average dose Consumption Rate	Days	31	Same as above.
Storage Time at Average flow-Maximum dose Consumption Rate	Days	31	Same as above.

Parameter	Units	Design and Construction Requirements	Means and Methodology
Materials of Construction		Steel Construction; Ancillary Systems (Lime Feeder, Slurry Tank, Slurry Pumps, etc.)	
Lime Feeder			
Number of Feeders	Number	1 (1 Active)	
Maximum Feeder Capacity	lb/hr as $Ca(OH)_2$	317	The hydrated lime slurry tank feed rate range indicated in the RFP [99 to 247 lb/hr as Ca(OH)2] restricts the Owner from operating within the full range of production rates and calcium hardness/total alkalinity values required by the RFP. Appropriate range provided to allow the Owner to operate within the full range of production rates and calcium hardness/total alkalinity values required by the RFP. The lime feeder is sized to deliver 110% of the maximum usage rate.
Minimum Feeder Capacity	lb/hr as $Ca(OH)_2$	32	Same as above.
Materials of Construction		Steel Construction	
Hydrated Lime Slurry Feed Tank			
Number of Hydrated Lime Slurry Feed Tanks	Number	1 (1 Active)	
Source of water for hydrated lime slurry feed tank		Second Pass Reverse Osmosis Permeate	
Target Hydrated Lime Slurry Tank Feed Concentration	Percent	8.0	
Acceptable Range for Hydrated Lime Slurry Tank Feed Concentration	Percent	±5 of target concentration	
Materials of Construction		Steel Construction	
Hydrated Lime Slurry Feed Pumps			
Number of Hydrated Lime Slurry Feed Pumps	Number	2 (2 Active)	Hydrated Lime Slurry Feed Pumps are configured to match required Lime Saturator configuration (i.e. 2 Active)

Parameter	Units	Design and Construction Requirements	Means and Methodology
Type of Hydrated Lime Slurry Feed Pumps	Type	Tubular Diaphragm, Peristaltic, or Lined Centrifugal	To be determined during final design.
Maximum Hydrated Lime Slurry Feed Pump Capacity (Each)	Gpm of 8.0% $Ca(OH)_2$ Slurry	3.8	
Minimum Hydrated Lime Slurry Feed Pump Capacity (Each)	Gpm of 8.0% $Ca(OH)_2$ Slurry	0.4	
Total Installed Maximum Hydrated Lime Slurry Feed Pump Capacity	Gpm of 8.0% $Ca(OH)_2$ Slurry	7.6	The hydrated lime slurry tank flow rate range indicated in the RFP [3.1 to 7.7 gpm] restricts the Owner from operating within the full range of production rates and calcium hardness/total alkalinity values required by the RFP. Appropriate range provided to allow the Owner to operate within the full range of production rates and calcium hardness/total alkalinity values required by the RFP. The hydrated lime slurry feed pumps are sized to deliver 110% of the maximum usage rate.
Total Installed Minimum Hydrated Lime Slurry Feed Pump Capacity	Gpm of 8.0% $Ca(OH)_2$ Slurry	0.8	Same as above.
Motor Size (Each)	HP	Less than 1	To be determined during final design.
Drive Type (Each)	Type	Constant Speed	
Lime Saturators			
Number of Lime Saturators	Number	2 (2 Active)	
Type of Saturator	Type	Upflow Contactor	
Maximum Upflow Rate	Gpm/ft2	1.0	Maximum upflow rate selected to comply with saturated lime water turbidity requirement.
Source of water for lime saturators		Second Pass Reverse Osmosis Permeate	
Saturated limewater concentration	g/L as $Ca(OH)_2$	1.8 at 12°C	

Parameter	Units	Design and Construction Requirements	Means and Methodology
Maximum turbidity of saturated limewater	NTU	5	
Maximum Saturated Lime Water Flow Rate (Each)	Gpm	176	
Minimum Saturated Lime Water Flow Rate (Each)	Gpm	17.5	
Total Installed Maximum Saturated Lime Water Flow Rate	Gpm	352	The saturated lime water flow rate range indicated in the RFP [114 to 286 gpm] restricts the Owner from operating within the full range of production rates and calcium hardness/total alkalinity values required by the RFP. Appropriate range provided to allow the Owner to operate within the full range of production rates and calcium hardness/total alkalinity values required by the RFP. The lime saturators are sized to deliver 110% of the maximum usage rate.
Total Installed Minimum Saturated Lime Water Flow Rate	Gpm	35	Same as above.
Materials of Construction		Steel Construction	
Lime Water Equalization Tanks			
Number of Lime Water Equalization Tanks	Number	2 (2 Active)	
Capacity of Lime Water Equalization Tank (Each)	Gal	17,200	
Total Installed Lime Water Equalization Tank Capacity	Gal	34,400	
Materials of Construction		Steel, HDXLPE, or FRP	To be determined during final design.

Parameter	Units	Design and Construction Requirements	Means and Methodology
Lime Water Feed Pumps			
Number of Lime Water Feed Pumps	Number	2 (2 Active)	Lime Water Slurry Feed Pumps are configured to match required Lime Saturator configuration (i.e. 2 Active)
Type of Lime Water Feed Pumps	Type	Centrifugal	
Maximum Lime Water Feed Pump Capacity (Each)	Gpm of Saturated Lime Water	176	
Minimum Lime Water Feed Pump Capacity (Each)	Gpm of Saturated Lime Water	17.5	
Total Installed Maximum Lime Water Feed Pump Capacity	Gpm of Saturated Lime Water	352	The saturated lime water flow rate range indicated in the RFP [114 to 286 gpm] restricts the Owner from operating within the full range of production rates and calcium hardness/total alkalinity values required by the RFP. Appropriate range provided to allow the Owner to operate within the full range of production rates and calcium hardness/total alkalinity values required by the RFP. The lime water feed pumps are sized to deliver 110% of the maximum usage rate.
Total Installed Minimum Lime Water Feed Pump Capacity	Gpm of Saturated Lime Water	35	Same as above.
Maximum Line Pressure Lime Water Feed Pumps must Pump Into	Psi	10	Pressure requirement based upon finished water storage tank dimensions and piping/equipment configuration.
Motor Size (Each)	HP	Less than 5	To be determined during final design.
Drive Type (Each)	Type	Variable Frequency Drive	

Parameter	Units	Design and Construction Requirements	Means and Methodology
Additional Means and Methodology			The hydrated lime system, specifically the lime water feed pumps, is designed to be controlled based on the flow rate (primary control variable) and trimmed on target alkalinity of the product water downstream (secondary control variable) using a PID feedback control loop.
			The hydrated lime system is designed to incorporate cleanouts and flushing connections at all lime slurry and/or lime sludge pipeline transition points.
			The hydrated lime system is designed to utilize long radius elbows and fittings along the lime slurry and/or lime sludge pipelines.
			The hydrated lime system is designed to specifically eliminate vertical piping runs on all lime slurry and/or lime sludge pipelines.
			The hydrated lime system is designed to incorporate flexible hose and quick disconnect fittings on lime slurry and lime sludge pipelines to facilitate replacement/cleanout of pipelines.
			The hydrated lime system is designed to minimize the aeration of lime solutions to prevent uptake of carbon dioxide and formation of calcium carbonate.

Table 2-23 Carbon Dioxide System

Parameter	Units	Design and Construction Requirements	Means and Methodology
Basis of Flow			
Maximum flow	mgd	11.2	This capacity must be provided for post-stabilization treatment process to enable the Owner to produce a stable finished water product with all installed reverse osmosis units in operation. Providing a capacity of 9.6 mgd will limit the Owner's calcium hardness and total alkalinity operating range when "catching up" to annual production goals.
Average flow	mgd	9.6	Capacity which corresponds to desired annual average production rate of 10,671 afy.
Minimum flow	mgd	3.2	Capacity which corresponds to reverse osmosis system minimum production rate of 3.2 mgd.
Carbon Dioxide Dose			
Application Point		Composite Reverse Osmosis Permeate Downstream of UV Disinfection and Upstream of Calcium Hydroxide Application Point	
Maximum carbon dioxide dose	mg/L as CO_2	91.3	Dosage determined by water quality modeling. Model designed to achieve calcium hardness and total alkalinity values of 100 mg/L as calcium carbonate while meeting other finished water quality requirements identified in Table 11-1.

Parameter	Units	Design and Construction Requirements	Means and Methodology
Average carbon dioxide dose	mg/L as CO_2	33.3	Based upon relevant CDM Smith experience (i.e. Santa Cruz finished water coupon testing) a minimum alkalinity of 30 mg/L as calcium carbonate was sufficient to prevent the occurrence of red water events. As such, the minimum water quality requirements identified in Table 11-1 were assumed to be appropriate for average operating conditions.
Minimum carbon dioxide dose	mg/L as CO_2	33.3	Dosage determined by water quality modeling. Model designed to achieve calcium hardness and total alkalinity values of 40 mg/L as calcium carbonate while meeting other finished water quality requirements identified in Table 11-1.
Carbon Dioxide Consumption Rate			
Maximum flow-Maximum dose	lb/day as CO_2	8,528	
Average flow-Average dose	lb/day as CO_2	2,666	
Minimum flow-Minimum dose	lb/day as CO_2	889	
Maximum flow-Average dose	lb/day as CO_2	3,110	
Average flow-Maximum dose	lb/day as CO_2	7,310	
Bulk Storage Tank			
Number of Tanks	Number	1 (1 Active)	
Capacity of Tank	Tons	120	Bulk storage tank sized to provide no less than 31 days of storage at maximum flow-average dose consumption rate or average flow-maximum dose consumption rate, whichever was larger.
Storage Time at Maximum flow-Average dose Consumption Rate	Days	77	Same as above.

Parameter	Units	Design and Construction Requirements	Means and Methodology
Storage Time at Average flow-Maximum dose Consumption Rate	Days	33	Same as above.
Materials of Construction		Steel Construction; Urethane Insulation; Aluminum Shell; Ancillary Systems (Refrigeration System, Vaporizer System, Vapor Heater System) located within Cabinet	
Refrigeration System			
Number of Refrigeration Units	Number	1 (1 Active)	
Vaporizer System			
Number of Vaporizer Units	Number	2 (1 Active and 1 Standby)	
Capacity of Vaporizer Unit (Each)	Lb/hr as CO_2	391	Sized to allow the Owner to operate within the full range of production rates and calcium hardness/total alkalinity values required by the RFP. Each vaporizer is sized to vaporize 110% of the maximum usage rate.
Vapor Heater System			
Number of Vapor Heater Units	Number	2 (1 Active and 1 Standby)	
Capacity of Vapor Heater Unit (Each)	Lb/hr as CO_2	391	Sized to allow the Owner to operate within the full range of production rates and calcium hardness/total alkalinity values required by the RFP. Each vapor heater is sized to heat 110% of the maximum usage rate.
Pressure Solution Feed Panel			
Number of Pressure Solution Feed Panels	Number	1 (1 Active)	Single panel will include redundant control valves (one automatic and one manual)

Parameter	Units	Design and Construction Requirements	Means and Methodology
Maximum Capacity	Lb/hr as CO_2	391	Sized to allow the Owner to operate within the full range of production rates and calcium hardness/total alkalinity values required by the RFP. The pressure solution feed panel is sized to deliver 110% of the maximum usage rate.
Minimum Capacity	Lb/hr as CO_2	37	Same as above.
Carrier Water Pumps			
Number of Carrier Water Pumps	Number	2 (1 Active and 1 Standby)	
Type of Carrier Water Pumps	Type	Centrifugal	
Maximum Carrier Water Pump Capacity (Each)	Gpm of Reverse Osmosis Permeate	391	Carrier water pump capacity dictated by maximum capacity of the pressure solution feed panel.
Minimum Discharge Pressure	Psi	65	Based on 55 psi for diffuser assembly and 10 psi for piping/system losses.
Materials of Construction		Stainless Steel	
Motor Size (Each)	HP	30	
Drive Type (Each)	Type	Constant Speed	
The carbon dioxide system, specifically the carbon dioxide control valve inside the pressure solution feed panel, is designed to be controlled based on the flow rate (primary control variable) and trimmed on pH of the product water downstream (secondary control variable) using a PID feedback control loop.			
The post-stabilization process, including the physical location of all chemical application points and all control devices (i.e. pH instruments, alkalinity instruments, etc.) is designed such that all chemical reactions will be complete prior to measurement to ensure consistent, accurate, and reliable process control.			

Table 2-24 Sodium Hydoxide System

Parameter	Units	Design and Construction Requirements	Means and Methodology
Basis of Flow			
Maximum flow	mgd	11.2	This capacity must be provided for post-stabilization treatment process to enable the Owner to produce a stable finished water product with all installed reverse osmosis units in operation. Providing a capacity of 9.6 mgd will limit the Owner’s calcium hardness and total alkalinity operating range when “catching up” to annual production goals.
Average flow	mgd	9.6	Capacity which corresponds to desired annual average production rate of 10,671 afy.
Minimum flow	mgd	3.2	Capacity which corresponds to reverse osmosis system minimum production rate of 3.2 mgd.
Sodium Hydroxide Dose			
Application Point		Composite Reverse Osmosis Permeate Downstream of Saturated Lime Water Application Point (If Required)	
Maximum Sodium Hydroxide Dose	mg/L as NaOH	5	
Average Sodium Hydroxide Dose	mg/L as NaOH	3	
Minimum Sodium Hydroxide Dose	mg/L as NaOH	2	
Sodium Hydroxide Consumption Rate			
Maximum flow-Maximum dose	gal/day as 50% NaOH	80	
Average flow-Average dose	gal/day as 50% NaOH	41	
Minimum flow-Minimum dose	gal/day as 50% NaOH	9	
Maximum flow-Average dose	gal/day as 50% NaOH	48	

Parameter	Units	Design and Construction Requirements	Means and Methodology
Average flow-Maximum dose	gal/day as 50% NaOH	69	
Bulk Storage Tanks			
Number of Tanks	Number	1 (1 Active)	
Capacity of Tank	Gallons	5,200	
Storage Time at Maximum flow-Average dose Consumption Rate	Days	108	Presented storage time accounts for all process demands.
Storage Time at Average flow-Maximum dose Consumption Rate	Days	75	Presented storage time accounts for all process demands.
Materials of Construction		Steel Construction	
Metering Pumps			
Number of Metering Pumps	Number	2 (1 Active and 1 Standby)	
Maximum Capacity	gal/hr as 50% NaOH	3.7	Sized to allow the Owner to operate within the full range of production rates and calcium hardness/total alkalinity values required by the RFP. Each metering pump is sized to deliver 110% of the maximum usage rate.
Minimum Capacity	gal/hr as 50% NaOH	0.4	Same as above.
Maximum Line Pressure Sodium Hydroxide Metering Pumps must Pump Into	Psi	10	Pressure requirement based upon finished water storage tank dimensions and piping/equipment configuration.
			The sodium hydroxide system, specifically the sodium hydroxide metering pumps, is designed to be controlled based on a PID feedback control loop using pH as the control variable.

Parameter	Units	Design and Construction Requirements	Means and Methodology
			The post-stabilization process, including the physical location of all chemical application points and all control devices (i.e. pH instruments, alkalinity instruments, etc.) is designed such that all chemical reactions will be complete prior to measurement to ensure consistent, accurate, and reliable process control.

12. DISINFECTION REQUIREMENTS

a. Source Water Characterization Information

i. Disinfection requirements must be set prior to construction and startup of the treatment facilities. The proposed test well will not be sufficient for definitive water quality characterization. The USEPA Long Term 2 Enhanced Surface Water Treatment Rule (LT2 Rule) identifies disinfection requirements for surface water and groundwater under the direct influence of surface water.

ii. The following CDPH disinfection requirements for seawater desalination are expected:

(1) LT2 Rule Bin Classification: 1
(2) Cryptosporidium Treatment, log: 2
(3) Giardia Treatment, log: 3
(4) Virus Treatment, log: 4

iii. The followings CDPH disinfection requirement through the RO membrane system is expected:

(1) Continuous demonstration of specific log reduction of conductivity
(2) 2 log Giardia removal
(3) 2 log Cryptosporidium removal
(4) 2 log Virus removal

iv. A watershed survey and 24 months of monitoring for *Cryptosporidium* per the requirements of the LT2 Rule have not been performed.

v. The Owner is presenting a source water characterization plan to CDPH in June 2013 with the goal of eliminating the need for UV disinfection.

b. Disinfection Design Standards and Requirements: UV disinfection is to be designed, as outlined below. Based on the outcome of discussions with CDPH and future testing results, it may be possible to avoid constructing the UV disinfection facilities.

   i. Disinfection Design Standard and Requirements –Case 1 (with UV disinfection) – Base project

   (1) Design-Builder shall use Case 1 as the basis of design.
   (2) Cryptosporidium Treatment Required: 6 log; meet with RO membranes (2 log) and UV disinfection (4 log)
   (3) Giardia Treatment Required: 7 log; meet with RO membranes (2 log), chlorine disinfection (1 log) and UV disinfection (4 log)
   (4) Virus Treatment Required: 6 log: meet with RO membranes (2 log) and chlorine disinfection (4 log)

   ii. Disinfection Design Standards and Requirements – Case 2 (without UV disinfection) – (i.e with UV system deducted from Base project)

   (1) Cryptosporidium Treatment Required: 2 log; meet with RO membranes (2 log)
   (2) Giardia Treatment Required: 3 log; meet with RO membranes (2 log), chlorine disinfection (1 log)
   (3) Virus Treatment Required: 6 log: meet with RO membranes (2 log) and chlorine disinfection (4 log)

13. UV DISINFECTION

a. The key reference drawings in Attachment 12 to this Appendix associated with this section are:

   i. M-9 UV SYSTEM PLAN AND SECTIONS

   ii. I-35 P&ID UV SYSTEM

b. General

   i. Design in accordance with the USEPA UV Design Guidance Manual (2006).

   ii. Provide minimum 4-log inactivation of Giardia and Cryptosporidium

   iii. Validation of UV reactor performance reactors must have been previously validated off-site in accordance with USEPA requirements identified in the UV Design Guidance Manual (2006). CFD analysis is not a substitute for validation.

   iv. Maximum Flow: at least 11.2 mgd for 9.6 mgd design capacity

   v. Process Location: Downstream of RO membranes; upstream of post-stabilization

   vi. Number of Reactors: N+1

   vii. UV Lamp Technology: medium pressure high output

viii. Special lamp requirements:

(1) Minimum UV dose: 22 mJ/cm^2
(2) Supplier: Trojan or Calgon
(3) Model: UV Swift 2L12 or Sentinel 12
(4) Diameter: 12 inches
(5) Number of units: 3
(6) Lamps per unit: 2
(7) Power supply: 480 VAC

ix. Cooling requirements (startup or shutdown): maximum water temperature of 30ºC; minimum flow of 18 gpm

x. Mass of mercury shall be 200 mg in one lamp, 400 mg in one reactor, and 1200 mg in all reactors.

xi. Startup and shutdown requirements and timing: 5 minute warm up, 2 minute cool down, maximum 600 on/off cycles in 5000 hour lifetime

xii. Intensity sensor verification and calibration methods: DVGW-certified UV Intensity sensor.

xiii. Minimum UVT: 95% transmittance

xiv. Submergence: UV lamps shall be inherently submerged at all times by the location within the hydraulic gradeline.

xv. Power Supply: The Design-Builder shall provide uninterrupted power supply ("UPS"); UPS to provide 10 minutes of ride through upon power failure for UV reactors, controls, and instrumentation. The UPS is to be provided with a remote maintenance by-pass switch to allow isolation of the unit for servicing and testing. UPS status is to be monitored through SCADA.

xvi. Flow Distribution and Measurement: Each UV reactor shall be paired with a magnetic flow meter to document flow through UV reactor.

xvii. UV Dose Control Strategy: Control strategy shall minimize power consumption through monitoring of UV transmittance and flow rate.

xviii. UV Transmittance Monitoring: Provide an on-line UV transmittance monitor with appropriate sample delivery/conditioning system

xix. Start-up and Shutdown Sequence: CDPH typically requires that flow cannot enter/leave a UV reactor until the minimum dose, intensity and UV treatment performance levels are reached on startup. Provide an automated startup shutdown sequence that is in accordance with CDPH requirements as well as UV supplier requirements. Provide a "bumpless" sequence that allows for the spare UV unit to be brought on-line and an on-line unit to be taken out of service. The 10% off-spec water allowance in the LT2SWTR for UV treatment is not allowed by CDPH. Automatic plant shutdown, in a controlled fashion, is required if the UV reactor(s) fails to achieve any UV performance standards for more than 15 (fifteen) consecutive minutes.

xx. Housing: UV reactors, associated electrical supply equipment, and instrumentation shall be protected from the weather inside a building.

xxi. Spare Parts: Provide two year's worth of spare parts. Spare parts shall include but not be limited to UV lamps, UV sensors, quartz sleeves, seals, ballasts, fuses.

xxii. Service Contract: The UV supplier shall provide a service contract for 24 months following Acceptance. Provide a minimum of eight (8) service visits over the 24 month period. A trip report identifying "as found" conditions, work performed, and "as left" conditions shall be prepared and delivered to the Owner for each visit. Each trip report shall also include recommendations for improved operation and maintenance. Service technician is to provide calibration, repair/replacement, and provide instruction to Owner staff.

c. Table 2-23A identifies the Design-Builder's means and methodology for meeting the Design and Construction Requirements for this section.

Table 2-23A UV Disinfection

Parameter	Units	Means and Methodology
Type of UV disinfection		Medium Pressure High Output
Number of reactors: duty+ Standby		2 duty +1 stand-by
Flow capacity per reactor	MGD	4.8
Minimum UV Dose	mJ/cm2	22
Inactivation Credit for Cryptosporidium/Giardia/Virus	log/log/log	4/4/0

14. FINISHED WATER STORAGE

a. The key reference drawings in Attachment 12 to this Appendix associated with this section are:

i. M-16 FINISHED WATER STORGE TANKS PLAN

ii. M-17 FINISHED WATER STORGE TANKS SECTIONS

iii. I-37 P&ID TREATED WATER

b. General

i. Disinfection: Size each tank to provide 1-log inactivation of *Giardia* using a free chlorine residual, the minimum volume is 615,000 gallons (assumes: 9.6 mgd rate of flow; 1.2 mg/L free chlorine residual, pH=8.0, baffling factor = 0.5; and temperature = 10 deg C).

ii. CT compliance is based on the highest flow, minimum clearwell/tank level, lowest chlorine residual, lowest temperature, and highest pH value recorded for each day.

iii. Tank Number, Volume, and Operation: Two (2) tanks, each sized at 750,000 gallons; tanks shall operate in series. Tanks are also able to operate alone.

iv. Baffling: two Hypalon™ baffles are included in each tank

v. Operation with One Tank Out of Service: Tanks must be taken out of service for inspection, cleaning, and maintenance. When operating with only one tank in service, operational adjustments may be required to provide reliable disinfection, including increasing chlorine residual, decreasing flow, and operating within a more narrow level band.

vi. Tank Type:

(1) Above Ground: Concrete (AWWA D110 Standard for Wire and Strand-Wound, Circular, Prestressed Concrete Water Tanks)

vii. Level Controls: Provide continuous level and independent high level switch for alarm in each tank

viii. Drain: Provide method to drain each tank without creating a cross-connection. Drain shall be located in the bottom of the tank to allow full drainage.

ix. Access: Provide at least two points of access to each tank. Access is to be secure.

x. Overflow: Provide overflow at maximum capacity. Provide overflow secure from tampering. Provide internal check valve to prevent tampering. Provide second external check valve to prevent entry of foreign materials. Route overflow to Concentrate LagoonVents: Provide vents appropriately sized for inlet/outlet flows. Vents are to be screened, highly corrosion resistant, and secure against tampering.

15. SALINAS VALLEY DESALINATED WATER RETURN PUMPING AND CONVEYANCE

a. The key reference drawings in Attachment 12 to this Appendix associated with this section are:

i. M-2 PLAN - FILTERED WATER, BACKWASH WATER, CARTIDGE FILTER AND FINISHED WATER PUMP PAD AND TREATED WATER PUMP – 9.6 mgd

ii. M-3 SECTIONS - FILTERED WATER, BACKWASH WATER, CARTIDGE FILTER AND FINISHED WATER PUMP PAD AND TREATED WATER PUMP – 9.6 mgd

iii. I-39 P&ID SALINAS VALLEY PUMP STATION

b. General Design Criteria:

    i. Convey a portion of the desalinated product water to the Salinas Valley groundwater basin via the Castroville Seawater Improvement Project (CSIP). The Finished Water is to be pumped from the Finished Water storage tanks through a proposed 1.2-mile-long, 12-inch-diameter Salinas Valley return pipeline to the existing CSIP pond at the southern end of the MRWPCA regional wastewater treatment plant. The CSIP pond has a storage capacity of 80 acre-feet. From the CSIP pond, water is to be delivered to agricultural users in the Salinas Valley through existing infrastructure. The Design-Builder is responsible for piping within the Project Site boundary.

c. Pumping Equipment:

    i. Provide two (2) pumps to deliver Finished Water.

d. Capacity:

    i. Capacity of each pump shall be 1.2 mgd; head conditions are expected to be 30 feet or less.

e. Type of Pump:

    i. End suction pumps

f. Capacity Control:

    i. Provide variable frequency drives for variable speed operation.

g. Housing:

    i. Pump may be located outdoors. Electrical equipment shall be located in secure building located near the pumps.

h. Flow Metering:

    i. Provide one (1) flow meter with input to SCADA.

i. Water Quality Monitoring:

    i. Provide analyzers for conductivity.

j. Appurtenances:

    i. Valves, checkvalves; provide electrically actuated shutoff butterfly valve to isolate pump from finished water storage upon pump shutdown. Provide air gap at discharge to eliminate backflow concerns.

16. FINISHED WATER PUMPING AND PRESSURE TRANSIENT CONTROL

a. The key reference drawings in Attachment 12 to this Appendix associated with this section are:

    i. M-2 PLAN - FILTERED WATER, BACKWASH WATER, CARTIDGE FILTER AND FINISHED WATER PUMP PAD AND TREATED WATER PUMP – 9.6 mgd

    ii. M-3 SECTIONS - FILTERED WATER, BACKWASH WATER, CARTIDGE FILTER AND FINISHED WATER PUMP PAD AND TREATED WATER PUMP – 9.6 mgd

    iii. I-38 P&ID TREATED WATER PUMP STATION

b. General Design Criteria:

    i. Four Finished Water pumps providing a minimum capacity of 9.6 mgd with the largest capacity unit out of service. The Design-Builder is responsible for Finished Water piping within the Project Site boundary.

    ii. Number of Pressure Gradients Served: 1

    iii. Gradient Served: Monterey

    iv. Distribution System Hydraulic Grade Line at Project Site: (all values preliminary)

    (1) Maximum: 425 feet
    (2) Pumping head assuming finished water storage elevation of 120 feet
    (3) 305 feet plus plant piping and valve losses

    i. Number of Pumps: Four (4); Two at 50% of rated capacity (4.8 mgd each) and two at 25% of rated capacity (2.4 mgd each)

    ii. Housing: Pumps may be located outdoors. Electrical gear is to be housed in a secure building located near the pumps.

    iii. Pump Capacity: Pumps shall be provided in two capacities. The highest capacity pumping units shall each be sized at 4.8 mgd (50% of plant rated capacity) while the two smaller units shall each be sized at 2.4 mgd (25% of plant rated capacity). Pump rating shall be at the maximum head anticipated.

    (1) Provide sufficient electrical capacity to allow any three pumps (including two largest pumps) to operate concurrently.
    (2) Efficiency at design point: 82% for the 4.8 mgd pumps, and 66.2% for the 2.4 mgd
    (3) Motor size (hp) and voltage (V): 400 hp, 480 V and 300 hp, 480 V
    (4) Total dynamic head: 337 ft.
    (5) Motor enclosure type: TEFC

    iv. Type of Pump:

(1) Horizontal split case centrifugal if finished water storage is above ground. Vertical orientation of split case pump is not allowed.
(2) Vertical turbine type pump if finished water storage is below ground.

v. Pump Starters and Controls:

(1) The two larger pumps shall be constant speed with soft-starters.
(2) The two smaller pumps shall be equipped with adjustable frequency drives.

vi. Finished Water Flow Meters:

(1) Provide flow meter on each of the two 2.4-mgd pumps.
(2) Provide one (1) common flow meter.

vii. Pump Control Valve:

(1) For each pump, provide AWWA swing check valve to prevent reverse flow.

c. Hydraulic Transient Control:

i. Perform evaluation of hydraulic transient conditions and identify recommended control devices at the treatment plant and along transmission pipeline. The Design-Builder shall provide one 25,000-gallon hydropneumatic tank with appurtenances on discharge of finished water pumping station.

d. Design for Maintenance:

i. Provide concrete slab and unobstructed access to pump and pump motor with mobile A-frame gantry. Provide one A-frame gantry and manual chain fall rated for largest pump and pump motor.

e. Appurtenances:

i. Design shall include all necessary appurtenances including but not limited to air release valves, pressure gages and motor controls and protection devices.

17. YARD PIPING AND VALVES

a. The key reference drawings in Attachment 12 to this Appendix associated with this section are:

i. C-4 YARD PIPING ULITMATE CONDITIONS 9.6 MGD BASE CASE

b. Yard piping and valves is defined as piping and valves outside of structures.

c. No yard piping is allowed within 25 feet of primary electrical service transformers or switchgear.

d. Finished Water

   i. Finished Water piping may be ductile iron pipe, steel, or HDPE. Ductile iron pipe is generally preferred on the treatment Project Site.

   ii. Ductile Iron Pipe shall be Class 52 on the Project Site.

   iii. Valves less than 12 inch pipe size shall be resilient seated gate valves; valves 12 inches and larger shall be butterfly type.

   iv. Valves shall open LEFT.

   v. Valves shall be provided with valve box and lid. A concrete collar shall be poured at the top of the valve box. A stainless steel valve identification tag shall be embedded in the concrete collar listing the Valve ID, type of valve, and number of turns.

e. Permeate (prior to stabilization)

   i. Permeate piping shall be HDPE pipe below grade and FRP above grade. Valves with pipe size less than 12 inches shall be resilient seated gate valves. Values with pipe size 12 inches or larger shall be butterfly type. The valve open direction shall be to the left.

f. Raw/Saline water – Below ground, less than 100 psi: HDPE

g. CIP waste – Double wall CPVC underground

h. Chemicals

   i. Liquid chemicals shall be run underground within flexible PVC tubing, or other type tubing or hose compatible with the specific chemical. The tubing or hose shall be run within a HDPE carrier pipe providing support and secondary containment. Each HDPE pipe shall have only one length of tubing to allow for ease of replacement. Chemical piping/tubing shall be run together, to the extent possible, and the HDPE carrier piping is to be encased in concrete. The HDPE carrier piping is to be intentionally sloped to pull boxes. Pull boxes, constructed of pre-cast concrete, shall be located no less than 100 ft intervals along the route of the piping. Each pull box shall be equipped with a level sensor to detect chemical leakage. Splices in tubing are to be minimized. Where splices are necessary, they shall be made within a pull box. The top of pull boxes shall be above ground to prevent surface water entry, and shall be equipped with lockable aluminum hinged access door. Door frame drain shall be piped to a dry well.

i. Water Supply to Landfill and WWTP

i. The Design-Builder shall provide a 8-inch ductile iron pipeline providing finished water for potable use and fire fighting to the landfill and WWTP. The pipeline will extend to the southern boundary of the property. A pressure reducing valve and vault will be provided. Water use is estimated at 50 ACFT/YR.

18. PROCESS PIPING AND VALVES

a. General

i. Process piping is generally defined as the piping within structures. Plastic, polyethylene and FRP piping and valves shall be NSF 61 listed.

ii. The Design-Builder's proposed preliminary pipe schedule is shown in Table 2-25 below.

Table 2-25 Preliminary Pipe Schedule

Duty	Example	Below Grade/ Buried	Joints	Pressure Rating	Above Grade	Joints	Min Pressure Rating
Saline Water (<100 psi)	Raw Water, Concentrate	HDPE	Heat fusion	100 psi	FRP	Flanged, glued	100 psi
Saline Water (>200 psi)	RO High Pressure Pump Discharge	n/a			Super duplex	Flanged, welded, grooved	1000 psi
Permeate	Permeate	HDPE	Heat fusion	100 psi	FRP	Welded Flanged Grooved	100 psi
RO Flush		HDPE	Heat fusion	100 psi	PVC	Welded Flanged Grooved	100 psi
Permeate Following Stabilization	Post treatment stabilization	DIP	Push-on joints and flanged	150 psi	DIP	Flanged (above ground)	150 psi
Finished Water	Filtered water tank	DIP	Flanged	150 psi	DIP	Flanged (above ground)	150 psi

iii. The Design-Builder's proposed piping material to be used for the Design-Build Improvements are shown in Table 2-25A below.

Table 2-25A Piping Material

Service	Reach	Above / Below Grade	Pipe Diameter (inches)	Pipe Material	Pressure Rating (psi)	Velocity at Plant Ultimate Capacity (ft/s)	Flow Rate MGD
Raw Sea Water	Upstream Pressure Filters	Below	36	HDPE (DR 26)	80	8.3	32
Raw Sea Water	Pressure Filter Pipe Gallery	Above	12	FRP (1)	100	7 .0	3.2
Filtered Water	Pressure Filter Pipe Gallery	Above	12	FRP (1)	100	7.0	3.2
Filtered Water	Downstream of Pressure Filters	Below	36	HDPE (DR 26)	80	8.6	33
Filtered Water	Downstream of Filtered Water Tanks	Below	42	HDPE (DR 26)	80	6.1	32
Filtered Water	Downstream of Filtered Water Pumps	Below	36	HDPE (DR 17)	125	9.1	32
Filtered Water	Downstream of Filtered Water Pumps	Above	12-30	FRP (1)	100	7.0	5.7 – 22.8.4
RO Feed	Flow Split Upstream of Cartridge Filters	Below	30	HDPE (DR 17)	125	7.5	5.7 – 22.8
RO Feed	Downstream of Cartridge Filters	Below	36	HDPE (DR 17)	125	9.1	31
RO Feed	Interior Pipe Trenches	Trench	10-36	FRP (1)	100	7.0	1.7 - 32
RO Permeate	Downstream of UV	Below	24	HDPE (DR 26)	80	7.5	12.8
Finished Water	Downstream of Post Treatment	Below	30	HDPE (DR 26)	80	4.8	12.8
Finished Water	Downstream of Post Treatment	Below	24	DI - CL52	250	5.9	12.8
Finished Water	Downstream of Treated Water Storage Tank	Below	30	HDPE (DR 26)	80	4.8	12.8
Finished Water	Downstream of Treated Water Storage Tank	Below	24	DI - CL52	250	5.9	12.8

Service	Reach	Above / Below Grade	Pipe Diamete r (inches)	Pipe Material	Pressure Rating (psi)	Velocity at Plant Ultimate Capacity (ft/s)	Flow Rate MGD
Finished Water	Downstream of Treated Water Pumps	Below	24	HDPE (DR 11)	200	9.7	12.8
Finished Water	Downstream of Treated Water Pumps	Below	20	DI - CL52	250	8.5	12.8
Finished Water	Upstream of Salinas Valley Pump Station	Below	10	HDPE (DR 26)	80	3.5	1.2
Finished Water	Downstream of Salinas Valley Pump Station	Below	12	HDPE (DR 26)	80	2.5	1.2
Finished Water	Downstream of Salinas Valley Pump Station	Below	12	DI - CL52	250	2.2	1.2
RO Brine	Downstream of RO	Below	30	HDPE (DR 26)	80	7.1	19
RO Brine	Downstream of Brine EQ Pumps	Below	18	HDPE (DR 26)	80	6.2	6
RO Brine	To MRWPCA Outfall	Below	36	HDPE (DR 26)	80	6.5	25
Back Wash Supply	Upstream of Backwash Supply Pumps	Below	30	HDPE (DR 26)	80	5.8	15.5
Back Wash Supply	Downstream of Backwash Supply Pumps	Below	30	HDPE (DR 17)	125	6.4	15.5
Back Wash Waste	Downstream of Pressure Filters	Below	30	HDPE (DR 26) or Spirolite (TM)	80	5.8	15.5
Back Wash Reclamat ion	Downstream of Backwash Reclamation Pumps	Below	10	HDPE (DR 17)	125	6.4	2
First Pass SWRO							
High	Feed Sea	above	8	FRP	100	8.2	1.7

Service	Reach	Above / Below Grade	Pipe Diameter (inches)	Pipe Material	Pressure Rating (psi)	Velocity at Plant Ultimate Capacity (ft/s)	Flow Rate MGD
Pressure Pump Suction	Water Inlet		10			5.2	1.7
High Pressure Pump Discharge	RO Skid Feed Inlet	above	8	Super Duplex Sch 40	1000	7.4	1.7
			6			12.9	
Pressure Vessel Inlet Manifold	RO Array Distribution Manifold	Located in Trench	12	Super Duplex Sch 40	1000	7.8	4.0
ERD Low Pressure Inlet	Feed Sea Water Inlet	above	10	FRP	100	6.3	2.4
ERD Low Pressure Outlet	RO Skid Concentrate	above	10	Super Duplex Sch 40	1000	6.3	2.4
Permeate - Low TDS	Front end of RO Skid	above	6	316 Sch 10	100	8.2	1.0
			8			4.7	1.0
Permeate - High TDS	Feed to SPRO	above	6	316 Sch 10	100	6.1	0.7
CIP Supply /Return	-	above	12	PVC Sch 80	100	6.3	4.4
Flush Feed	-	above	6	PVC Sch 80	100	7.0	0.85
Second Pass BWRO							
High Pressure Pump Suction	SWRO Permeate - High TDS	above	8	FRP/316 L	100	5.9	1.3
High Pressure Pump Discharge	BWRO Skid Feed Inlet	above	6 pump	316L Stainless Steel Sch 10	250	10.0	1.3
			8			5.9	1.3

Service	Reach	Above / Below Grade	Pipe Diameter (inches)	Pipe Material	Pressure Rating (psi)	Velocity at Plant Ultimate Capacity (ft/s)	Flow Rate MGD
High Pressure Distribution Manifold	RO Array Distribution Header	Located in Trench	8	316L Stainless Steel Sch 10	250	5.9	1.33
Permeate	BWRO	above	6	316 SS Sche 10	100	9.4	1.2
Concentrate	BWRO	above	2.5	high pressure 2205 SS/ low pressure FRP	100	5.8	0.1
CIP Supply & Return	-	above	6	PVC Sch 80	100	8.1	1.0

b. Preliminary Valve Schedule

i. Attachment 13 to this Appendix includes the Design-Builder's preliminary valve schedule.

ii. Saline Water (< 100 psi): Butterfly; Nylon coated steel butterfly

iii. Saline Water (> 100 psi): Plug; Superduplex

iv. Permeate: Butterfly; Nylon coated steel butterfly

v. Permeate Following Stabilization:

(1) Isolation: Resilient Seated Gate Valve < 12 inch
(2) Isolation: Butterfly Valve ≥12 inch

vi. Finished Water (same as permeate following stabilization)

c. Chemical Piping

i. Above-ground pipe type: CPVC (generally); PVC for parts of SHC generator system piping

ii. Buried pipe type: PVC tubing inside HDPE containment pipe

iii. Valve type: Tru-union type ball valves

iv. Ball valves for sodium hypochlorite system will be vented type.

v. Butterfly valves close coupled to bulk storage tanks for isolation

19. GENERAL PUMPING EQUIPMENT REQUIREMENTS

a. Introduction

i. This section provides general guidance on desired pump station design, construction, and operation features. Specific information on each pumping stage is presented elsewhere. This section does not address chemical pumping.

ii. Pumping information described below is to be included in the BODR as the design progresses.

iii. Pumping design is to follow Hydraulic Institute standards.

iv. A system head curve is to be prepared for each pumping stage. The proposed pump performance shall be shown against the system head curve.

v. Pumping with a suction lift is undesirable.

vi. Pump design and selection, including valve design and selection, is to consider life-cycle costs.

vii. Pump layout must consider space for maintenance and removal of pump, motor, valves and instrumentation.

viii. Emergency stop pushbuttons are to be provided (locally) at each pump.

ix. Materials of selection are to be suitable for production of potable water. Materials of construction are to prevent dezincification.

x. Rated capacity shall be achievable with the largest unit out of service.

xi. Variable speed drives are to be used/applied judiciously where energy savings are real, or process conditions require variable capacity.

xii. Mechanical seals are preferred

b. Pump Station Design

i. Hydraulic design information such as system head curves, pump operating curves, net positive suction head ("NPSH"), hydraulic calculations, transient analysis and surge control, and other pertinent information is to be presented in the BODR as the design progresses.

ii. Flow Velocities

(1) Maximum allowable suction velocity shall be 5 fps

(2) Maximum allowable discharge velocity shall be 14 fps at pump discharge nozzle. Typical piping velocities are expected to be no more than 9 fps at ultimate plant capacity.

c. Piping and Pipe Joints

i. Pipe materials shall be suitable for the fluid and pressure conditions. Pipe materials are specified elsewhere. Pipe joints shall allow disassembly for pump repair and replacement, and future piping modifications.

ii. Piping and valves are to be supported independently of the pump.

iii. Fittings for differential settlement shall be provided where differential settlement is a concern.

d. Vibration Control

i. To minimize vibration and resonance, the Design-Builder shall:

(1) Properly design suction and discharge piping
(2) Select a pump that operates within a stable range to prevent cavitation
(3) Select a mounting pedestal, floor or inertial block, of sufficient mass, typically five times greater than the mass of the pump
(4) Require, and provide, level installation of the pump base and anchor bolts, and dynamically balanced pump
(5) Specify vibration amplitude that is no more than 75% of the limits set by Hydraulic Institute standards.
(6) Specify unit responsibility and a single manufacturer for all pump components

ii. Pump Characteristic and System Head Curves

(1) The Design-Builder shall identify and present system head curves and pump performance curves for minimum flow, maximum flow, and expected average flow conditions. Assumptions for pipe roughness shall be stated. Curves for efficiency, NPSH and BHP shall be presented.
(2) The Design-Builder shall carefully review and confirm that:
(3) The pump characteristic curve is not "flat" where a small change in total dynamic head results in a large change in pump flow.
(4) The operating point on the system curve, for prevailing operating conditions is near the maximum efficiency point (optimally just to the right of this point) of the pump characteristic curve. The maximum efficiency point is also known as the best efficiency point.
(5) The pumps can operate, even with compromised efficiency, for both minimum and maximum operating conditions.
(6) The pump/impeller combination is located near the center of the pump operating curve to allow modifying the pump with a different impeller to change pump performance. The maximum diameter impeller shall not be selected for a pump housing unless no other alternative is possible.
(7) The NPSH available shall be calculated and presented for maximum flow and maximum temperature operating conditions (pumps operating alone, and together). The NPSHA shall be compared to the NPSHR of the selected pumps at maximum flow conditions. The NPSHR shall be less than the NPSHA under all conditions with a reasonable margin of safety, not less than 6 feet. Streams with high entrained air/gas require special attention.

(8) Table 2-26 shows the calculation of the NPSH available (NPSHA) for maximum flow and maximum temperature operating conditions (pumps operating alone, and together). The NPSHA is compared to the NPSHR of the selected pumps at maximum flow conditions. As shown, the NPSHR is less than the NPSHA under all conditions with a reasonable margin of safety, not less than 6 feet. There are no process flows with significant entrained air that impact the NPSHR.

Table 2-26 NPSH Calculations

Structure/Pump	Maximum Flow	Maximum Temperature	NPSHA	NPSHR
Filtered Water Pumps	15 mgd	20C	30 ft	10
First Pass Seawater RO Feed pumps	2 mgd	20C	82	50
ERD Booster Pump	2 mgd	20C	500 psi	20
Second Pass Brackish Water RO feed water pump	1.5 mgd	20C	30 ft	20
Finished Water Pumps	6 mgd	20C	40 ft	20
Pressure Filter Backwash Pumps	14 mgd	20C	30	20

20. ROTATING EQUIPMENT MONITORING

a. Pumps and motors that are 200 hp or above are to be equipped with temperature and vibration data collection systems as described below.

b. Temperature:

i. Motor windings, motor bearings, and pump bearing temperatures are to be continuously monitored through 100 ohm platinum RTD's and input to Schweitzer Engineering Laboratories ("SEL") devices provided for power monitoring and motor protection. Values are to be available for trending and monitoring through the California American Water Business Network.

c. Vibration:

i. Vibration data is to be gathered and made available for off-site analysis through the internet.

ii. Online vibration data collection system is to be provided based on multichannel continuous processor. Locate processors in a suitably protected area. Provide enclosures suitably rated for the environment in which they are installed.

(1) Manufacturer: Ludeca
(2) Model: Vibnode
(3) Dynamic Range: 96dB 16 bit A/D converter
(4) Frequency Range: 2-1000 Hz
(5) Frequency Resolution 3200 lines
(6) RPM Tracking

(7) Measurement Functions: Fast Fourier Transform (FFT), Time signal, High frequency envelope FFT, overall values, narrow and broadband alarms, process parameters
(8) Band Analysis: 12 bands per spectrum
(9) High Frequency Enveloping: Band pass filters for low, medium and high speed machines
(10) Digital Output: for external trigger
(11) Analog Output: 4-20 ma
(12) Digital Input: 5-30 volt
(13) Ethernet Capable
(14) License: Provide licenses for each processor as needed

iii. Power supply: provide 15 minute UPS on power supply to multichannel processor and monitoring devices.

iv. Protect multichannel processors and monitoring devices from electric transients including lightning

v. Analysis Software

(1) Provide OMNITREND software by Ludeca
(2) Band Analysis capable
(3) Narrowband and broadband alarm capable
(4) Real time overall values
(5) Email alarm capable
(6) Built in reporting features
(7) Web based for remote access
(8) Built in Fault Frequency Markers

vi. Local Personal Computer for display of overall vibration levels and alarm notifications

(1) Processor: 4G RAM; 2.5 GHz
(2) USB and Ethernet ports
(3) 24 inch monitor

vii. Tachometer – Inductive type; vendor to be Ludeca. Device shall be suitable for outdoor installation.

viii. Accelerometers- provide the number and type needed for the specific application. Vendor to be CTC. Coordinate accelerometer installation with pump vendor. Install accelerometers per California American Water's recommendations. Device shall be suitable for outdoor installation.

(1) Vertical pumping systems require a minimum of five (5) measured points each.
(2) Single stage horizontal split case pumps require ten (10) measured points each.
(3) Accelerometer Mounting:
(4) Remove paint and mount transducer on flat metal surface. Stud mount preferred. Epoxy mounted pads to be used where stud mounting is not possible.
(5) Mount on bearing housing in location with best available direct path to bearing and shaft vibration.

(6) Two accelerometers shall be mounted at two perpendicular planes on each bearing housing. One accelerometer per machine shaft mounted parallel to the axis of rotation.

ix. Cabling: Cables from sensors to multi-channel monitor shall be of the type and length with connectors needed for each application. Cables shall be provided by CTC. Cables shall be installed in conduit where physical protection is needed.

x. Device Driver : Provide the device driver for the Project Site.

xi. On-site Commissioning: Provide a minimum of 2 days of on-site startup service with Ludeca application engineer.

21. CHEMICAL SYSTEMS

a. The key reference drawings in Attachment 12 to this Appendix associated with this section are:

i. M-8 CHEMCIAL SYSTEMS PALN AND SECTIONS 9.6 MGD BASE CASE

ii. I-23 P&ID SODIUM BISULFITE FEED SYSTEM

iii. I-24 P&ID ANTISCALANT FEED SYSTEM

iv. I-25 P&ID ORTHOPHOSPHATE FEED SYSTEM

v. I-26 P&ID SODIUM HYDROXIDE FEED SYSTEM

vi. I-28 P&ID NON-IONIC POLYMER FEED SYSTEM

vii. I-29 P&ID SULFURIC ACID FEED SYSTEM

viii. I-30 P&ID SODIUM HYPOCHLORITE BRINE TANKS

ix. I-31 P&ID SODIUM HYPOCHLORITE GENERATOR 1

x. I-32 P&ID SODIUM HYPOCHLORITE GENERATOR 2

xi. I-33 P&ID SODIUM HYPOCHLORITE GENERATOR 3

xii. I-34 P&ID SODIUM HYPOCHLORITE METERING PUMPS FEED SYSTEM

b. Overview of Chemical Systems

i. Lime and carbon dioxide requirements are addressed in Section 11 Post-Stabilization.

ii. CIP chemicals are to be addressed by the Design-Builder. Secondary containment and other safeguards are to be provided in accordance with the design features for other chemicals on this project.

iii. Chemicals addressed in this section are listed below. Estimated chemical dosages and storage volumes are included in Attachment 10. Attachment 10 is provided to demonstrate the logic used in sizing bulk storage tanks. The

Design-Builder is responsible for selecting appropriate chemical dosages and for all chemical storage and feed calculations.

(1) Sodium Hypochlorite (liquid) for chlorination
(2) Sodium Bisulfite (liquid) for quenching chlorine residual
(3) Sulfuric Acid (liquid) for pH adjustment prior to cartridge filters
(4) Threshold Inhibitor (liquid) to inhibit scale formation in RO membranes
(5) Non-Ionic Polymer (dry or emulsion) for settling of granular media wastewater
(6) Sodium Hydroxide (liquid) for pH adjustment
(7) Phosphoric Acid (liquid) for corrosion control

iv. Design of liquid chemical systems shall comply with the intent of American Water Engineering Standard T2 (see Attachment 1) to contain leaks and spills, prevent unintentional overfeed, and provide prudent process control.

(1) Secondary containment of the liquid chemical delivery area is to be provided to capture leakage from delivery trucks. Containment volume shall be 125% of a full bulk delivery.
(2) The Design-Builder shall add flow meters to each chemical feed line to prevent overfeeding of chemicals.

v. HDXLPE chemical tanks shall be supplied by Poly Processing. Tanks shall be NSF 61 listed. Provide 5 year warranty on sodium hypochlorite tanks.

vi. Diaphragm metering pumps shall be accurate, reliable, heavy duty, and motor driven. Solenoid type metering pumps will not be used. For critical applications, non-lost motion type pumps are to be provided to minimize pulsing and provide continuous feed.

vii. Provide insulation and heat tracing for chemical feed piping where freezing is possible. The Design-Builder shall provide insulation and heat tracing for the sodium bisulfite system and the sodium hydroxide system.

viii. The Design-Builder has proposed spare chemical feed lines to all the application points, and the Owner will show the spare chemical feed lines on the P&IDs and yard piping plans as well as the detailed chemical system schematics provided as part of the final design documents.

c. Sodium Hypochlorite

i. Chlorine equivalent dose

(1) Raw Water, mg/L: min, avg, max: 0.5, 2, 3
(2) Spent Filter Backwash Storage, mg/L: min, avg, max: 0.5, 1, 1.5
(3) Post Treatment, mg/L; min, avg, max: 1, 1.5, 2

ii. Sodium hypochlorite shall be generated onsite using electrolytic equipment. Equipment sizing shall be based to provide sufficient capacity 3 ppm dose to Raw Water and 2 ppm dose to Finished Water.

iii. Number of Units: Provide three 500 ppd units. Provide sufficient power supply to allow operation of three (3) units concurrently.

iv. High quality salt shall be delivered in bulk, transferred pneumatically, and stored in dissolvers to create a brine supply to the generation equipment.

v. Provide two (2) salt dissolvers with usable capacity of 23 tons each.

vi. Salt dissolvers may be located outdoors; provide secondary containment curbing to capture leaks.

vii. Provide low hardness reverse osmosis permeate as supply water to brinemakers and to generators.

viii. Provide online conductivity meter, reading in percent NaCl, to monitor the brine concentration in the feed to the generators.

ix. Locate generators in a room separate from hypochlorite storage and feeders.

x. Provide redundant hydrogen in air monitors in generation and hypochlorite storage rooms.

xi. Provide two (2) dilute sodium hypochlorite storage tanks. Each tank shall be sized at approximately 6500 gallons.

xii. Hypochlorite storage tanks shall be installed within a concrete secondary containment, located within a secure building. A means must be provided to readily replace storage tanks with either a roof hatch or removable wall section.

xiii. Sodium hypochlorite storage tanks shall be high density cross linked polyethylene HDXLPE type with a fixed medium density linear polyethylene lining, or FRP.

(1) For HDXLPE Tanks, tank outlet shall be IMFO type for complete drainage. Tanks shall be supplied by Poly Processing.

(2) FRP tanks shall be designed specifically with sodium hypochlorite corrosion resistance. Vinyl ester resin is to be used for both the structural and the corrosion barriers. The corrosion barrier is to include two nexus veils. The corrosion barrier is not to be part of the structural design of the tank. The corrosion barrier is to be catalyzed with a BPO/DMA cure system. A post-cure heat treatment of at least four hours is to be provided.

xiv. Provide capability to receive bulk sodium hypochlorite (12.5%) in both tanks should the generators not be operating. Provide a manual adjustable dilution panel to continuously dilute bulk hypochlorite to 0.8 percent for storage in the second storage tank.

xv. Feed of the dilute hypochlorite solution to the application point shall be by use of sealless magnetic drive gear pumps with variable speed capacity control.

xvi. Provide two units for Raw Water dosing (one duty, one spare), and two units for post-treatment dosing (one duty, one spare).

xvii. Feed Control: Control modes shall be local manual, remote manual, remote flow pace, and remote compound loop with chlorine residual.

xviii. The onsite sodium hypochlorite vendor shall provide a service contract covering one year after Acceptance plus one additional year of operation. A total of six (6) service visits by qualified technicians shall be provided to perform preventive maintenance, testing, cleaning, repairs, and instruction to staff. The technician shall be on-site for at least 6 hours each visit. The visits shall be scheduled upon request of the Owner. Following each visit, a service report shall be sent to the Owner within seven days, describing the work performed and the "as-left" condition as well as the "as-found" condition.

d. Sodium Bisulfite

i. Product: Liquid form; 38% concentration

(1) Specific Gravity: 1.33

ii. Application Points

(1) GMF discharge
(2) Concentration Discharge

iii. Dose GMF discharge (min, avg, max): 1.5, 3, 6 mg/L

iv. Dose Concentration discharge: TBD

v. Bulk Storage

(1) Bulk Storage Tanks, Number Required: One (1)
(2) Bulk delivery Volume: 4,000 gallons
(3) Bulk Storage Volume Criteria (minimum): 1.5 x bulk delivery volume
(4) Bulk Storage Tank Volume : 6,000 gallons
(5) Bulk Tank Material: HDXLPE or FRP
(6) Bulk Tank Nozzles: Fill, outlet, vent, overflow, level sensor (ultrasonic), high level switch
(7) Bulk Tank Outlet Valves: Butterfly with lever actuator; electric actuator on ball valve; See detail

vi. Metering Pumps

(1) Number of pumps required per application point: Two (2)
(2) Type of Pump: Diaphragm metering pumps
(3) Anticipated Discharge Pressure: < 30 psi

vii. Piping

(1) Bulk Tank to Day Tank to Metering Pump: CPVC
(2) Discharge of Metering Pump: CPVC above ground;
(3) Below Ground Piping: Reinforced flexible PVC tubing inside secondary HDPE containment pipe.

viii. Continuous Dilution Water (post metering pump): Provide dilution water to improve dispersion at point of application; provide 0.5-2.0 gpm from UV disinfected permeate water supply. The Design-Builder has proposed to meet this requirement by pumping UV product water from the RO permeate flush tank.

ix. Other: Provide ORP sensor following bisulfite feed to provide feedback that dechlorination has occurred to prevent membrane oxidation.

e. Sulfuric Acid (50%)

i. Product: Liquid form; 50% concentration

(1) Specific Gravity: 1.4

ii. Application Points

(1) GMF Filtered Water

iii. Dose (min, avg, max) mg/L: 5, 10, 30

iv. Bulk Storage

(1) Bulk Storage Tanks, Number Required: One (1)
(2) Bulk delivery Volume: 3,800 gallons
(3) Bulk Storage Volume Criteria (minimum): 1.5 x bulk delivery volume
(4) Bulk Tank Recommended Volume : 10,000 gallons
(5) Bulk Tank Material: XLHDPE or FRP
(6) Bulk Tank Nozzles: Fill, outlet, vent, overflow, level sensor (ultrasonic), high level switch
(7) Bulk Tank Outlet Valves: Butterfly with lever actuator; Electric actuator on ball valve; See detail

v. Metering Pumps

(1) Number of pumps required per application point: Two (2)
(2) Type of Pump: Diaphragm metering pumps
(3) Anticipated Discharge Pressure: < 30 psi

vi. Piping

(1) Bulk Tank to Day Tank to Metering Pump: CPVC
(2) Discharge of Metering Pump: CPVC above ground;
(3) Below Ground Piping: Reinforced flexible PVC tubing inside secondary HDPE containment pipe.

vii. Continuous Dilution Water (post metering pump): Provide dilution water to improve dispersion at point of application;

f. Threshold Inhibitor

i. Product: Liquid form; 100% concentration

(1) Specific Gravity: 1.25

ii. Application Points

(1) Inlet to First Pass RO
(2) Inlet to Second Pass RO

iii. Dose (min, avg, max), mg/L: 2,3,6

iv. Bulk Storage

(1) Bulk Storage Tanks, Number Required: One (1)
(2) Bulk delivery Volume: 4200 gallons
(3) Bulk Storage Volume Criteria (minimum): 1.5 x bulk delivery volume
(4) Bulk Storage Tank Volume : 6,300 gallons
(5) Bulk Tank Material: HDXLPE or FRP
(6) Bulk Tank Nozzles: Fill, outlet, vent, overflow, level sensor (ultrasonic), high level switch
(7) Bulk Tank Outlet Valves: Butterfly with lever actuator; Electric actuator on ball valve.

v. Metering Pumps

(1) Number of pumps required per application point: Two (2)
(2) Type of Pump: Diaphragm metering pumps
(3) Anticipated Discharge Pressure: < 30 psi

vi. Piping

(1) Bulk Tank to Day Tank to Metering Pump: CPVC
(2) Discharge of Metering Pump: CPVC above ground;
(3) Below Ground Piping: Reinforced flexible PVC tubing inside secondary HDPE containment pipe.

vii. Continuous Dilution Water (post metering pump): Provide to improve dispersion at point of application; provide 0.5-2.0 gpm

g. Non-Ionic Polymer

i. Product: Liquid (emulsion) form; 35% concentration

(1) Specific gravity: 1.1

ii. Application Points

(1) GMF wastewater clarification

iii. Dose (TBD)

iv. Bulk storage – none; provide storage for 5 gallon pails (within secondary containment)

v. Batch tank and feed tank (over under configuration)

(1) Prepare batches manually
(2) Transfer (by gravity) to feed tank

vi. Metering Pumps

(1) Number of pumps required per application point: Two (2)
(2) Type of Pump: peristaltic tubing pump
(3) Anticipated Discharge Pressure: < 30 psi

vii. Piping

(1) Bulk tank to day tank to metering pump: CPVC
(2) Discharge of metering pump: CPVC above ground;
(3) Below ground piping: Reinforced flexible PVC tubing inside secondary HDPE containment pipe.

viii. Continuous Dilution Water (post metering pump): Provide dilution water to improve dispersion at point of application; provide 0.5-2.0 gpm

h. Sodium Hydroxide

i. Product: Liquid form; 50% concentration

(1) Specific gravity: 1.4

ii. Application Points

(1) RO second pass
(2) Finished Water for stabilization

iii. Dose

(1) RO Second Pass (min, avg, max) mg/L: 5, 10, 20
(2) Finished Water (min, avg, max) mg/L : 2,3,5

iv. Bulk Storage

(1) Bulk Storage Tanks, Number Required: one (1)
(2) Bulk Delivery Volume: 3500 gallons
(3) Bulk Storage Volume Criteria (minimum): 1.5 x bulk delivery volume
(4) Bulk Storage Tank Volume : 5,200 gallons
(5) Bulk Tank Material: Steel
(6) Bulk Tank Nozzles: Fill, outlet, vent, overflow, level sensor (ultrasonic), high level switch
(7) Bulk Tank Outlet Valves: Butterfly with lever actuator; electric actuator on ball valve;

v. Metering Pumps

(1) Number of pumps required per application point: Two (2)
(2) Type of Pump: Diaphragm metering pumps
(3) Anticipated Discharge Pressure: < 30 psi

vi. Piping

(1) Bulk Tank to Day Tank to Metering Pump: CPVC
(2) Discharge of Metering Pump: CPVC above ground;
(3) Below Ground Piping: Reinforced flexible PVC tubing inside secondary HDPE containment pipe.

vii. Continuous Dilution Water (post metering pump): Provide dilution to improve dispersion at point of application; provide 0.5-2.0 gpm from UV disinfected permeate (low hardness) water supply.

viii. Other: Provide low power density (external) heating of tanks; provide insulation jacket to maintain temperature of not less than 80 deg F in tanks. Pipe insulation is not required.

i. Zinc Orthophosphate/Phosphoric Acid Corrosion Inhibitor

i. Product: Liquid form; zinc orthophosphate (5:1 ratio of PO_4 to Zn); Future conversion to phosphoric acid

(1) Specific Gravity of Zinc Orthophosphate: 1.4
(2) Percent Phosphate: 32.5%
(3) Specific Gravity of Phosphoric Acid (75%): 1.57
(4) Percent Phosphate:

ii. Dose (as PO4) Min = 0.5 mg/L; Average = 1.0 mg/L; Maximum = 4.0 mg/L

iii. Bulk Storage

(1) Bulk Storage Tanks, Number Required: One (1)
(2) Bulk delivery Volume: 3700 gallons (zinc orthophosphate)
(3) Bulk Storage Volume Criteria (minimum): 1.5 x bulk delivery volume
(4) Bulk Tank Material: HDXLPE or FRP
(5) Bulk Tank Nozzles: Fill, outlet, vent, overflow, level sensor (ultrasonic), high level switch
(6) Bulk Tank Outlet Valves: Butterfly with lever actuator; electric actuator on ball valve; See detail

iv. Control: Local Panel for control; push to run pump; open/close bulk tank isolation valve; select transfer pump; bulk tank and day tank level display

v. Metering Pumps

(1) Number of pumps required: Two (2)
(2) Type of Pump: Solenoid driven diaphragm pumps
(3) Anticipated Discharge Pressure: < 30 psi

vi. Piping

(1) Bulk Tank to Day Tank to Metering Pump: CPVC
(2) Discharge of Metering Pump: CPVC above ground;
(3) Below Ground Piping: Reinforced flexible PVC tubing inside HDPE secondary containment pipe

vii. Continuous Dilution Water (post metering pump): provide dilution water flow of 0.5-2.0 gpm

22. ARCHITECTURE

a. General

i. Table 2-27 identifies the general Design and Construction Requirements for architecture and the Design-Builder’s means and methodology for meeting the Design and Construction Requirements.

Table 2-27 General Architecture

Parameter	Design and Construction Requirements	Means and Methodology
Height of Structures	The Design-Build Improvements should be kept as low in profile as is functionally possible. Where appropriate, the design shall de-emphasize verticality and encourage the grounding of planar elements of the Design-Build Improvements into the natural landscape. Low, horizontal site walls, berming, and the use of sloping wall planes shall be considered in achieving balance.	The buildings will be single story and each program will be no higher than the function of each program requires. The Design-Builder will be used native plants and planted hedgerows to integrate the facility into the site and a river viewing area for visitors and staff will be provided.
Reflective Exterior Finishes	Visible and highly reflective materials and surface finishes shall be avoided on the exterior of the Design-Build Improvements.	Although metal, Zincalume is not highly reflective, the design will use natural features, such as wood trellises, to soften the reflective nature of the façade in the garden area.
Exterior Walls	The use of low maintenance material, surface textures and horizontal banding of harmonious colors are some of the techniques to be considered in blending the Design-Build Improvements with its environment. Material coloration should be achieved through the use of integral coloration rather than applied coloration such as paint.	Zincalume is specified for all façade treatments. It is a highly durable and corrosion resistant material. Where possible, material coloration will be achieved through integral coloration rather than applied coloration.
Roofs	The design of roof systems shall be carefully developed to harmonize with the visual context of the Design-Build Improvements. Where flat roofs are appropriate, they shall be predominately hidden by parapet walls. Where pitched roofs are desired, consideration shall be given to selecting, pitch, materials, and coloration to harmonize with surroundings. Highly reflective roof materials shall not be visible from adjacent properties. Mansard and jogging roof lines shall be employed only when appropriate to the setting. The use of securable skylights for natural lighting is encouraged where feasible.	Flat pitched roofs are appropriate for this site because it is not in a residential area. Skylights provide daylight the circulation spaces in the administration building.

Parameter	Design and Construction Requirements	Means and Methodology
Windows	Where windows are appropriate to the design, they shall be selected carefully for energy efficiency, acoustic characteristics, and security. Glazing systems are designed to avoid light leakage to adjacent as direct glare or reflected glare from sunlight. Glass tinting and window frame colors shall be chosen for their consistency with the palette of materials and colors selected for the Design-Build	Energy efficient tinted windows have been used in the design, and the Trellis in the garden area reduces the reflective nature of the windows while visually connecting the interior space to the garden.
Exterior Insets, Grills, Trim and Accents	Insets, grills, trim material, and accents shall be employed judiciously and only where necessary or appropriate for compatibility with adjacent structures. Insets, grills, trim, and accents shall be consistent with the color palette chosen for the facility and shall avoid bold, strong, or reflective colors.	The Design-Builder has placed grills, trim material and accents carefully and only where necessary. The color of all trim material will be complementary to the color of the other elements.
Exterior Doors and Frames	Door and frame colors shall be compatible with the wall surface in which they are located	Door and frame elements will be compatible with all trim and cladding elements
Exterior Lighting	Lighting shall satisfy functional and security needs while not creating light pollution in the form of point sources of direct glare visible from a distance. Lighting shall be sensitive to the privacy of adjacent land uses. Fixtures shall be carefully selected for efficiency, cutoff, consistent lamp coloration throughout the project, and effectiveness in delivering only the light necessary to the task, while avoiding unnecessary spill lighting beyond site boundaries. Low level light fixtures that light immediate areas are encouraged.	Lighting design satisfies all functional and security needs while avoiding light pollution Lighting is sensitive to the privacy of adjacent land uses. Fixtures have been carefully selected for efficiency, cutoff, consistent lamp coloration throughout the project, and effectiveness in delivering only the light necessary to the task, while avoiding unnecessary spill lighting beyond site boundaries. Low level light fixtures that light immediate areas have been used throughout the design.
Natural Lighting	Natural lighting of building interiors in the form of skylights and clerestory windows is encouraged	The administration building utilizes skylights and high windows to facilitate natural lighting.
Equipment and Service Areas	All mechanical and electrical equipment should be located and screened from public view	The Design-Builder has screened all mechanical and electrical equipment from public view.

Parameter	Design and Construction Requirements	Means and Methodology
Materials of Construction	Construction materials and methods are established and defined in terms of their physical appearance and overall visual effect in harmonizing with the surrounding environment, their emergence from the basic structural system, and their appropriateness in accommodating the deployment of mechanical and electrical systems within the facility. Materials used in the construction of the Design-Build Improvements shall conform in composition and application to all applicable regulations, including those concerning volatile organic content, lead, mercury, CFCs and asbestos. Materials used for the roofing system and the building perimeter envelope shall be established for optimum durability over the full range of climatic variations typical to the region.	The Design-Builder will use materials that harmonize with the colors and textures of the local environment and meet California Building Code. The occupied area will include a 25,400 SF desalination plant and a 5,900 SF associated office building. Both buildings will be equipped with Automatic Sprinkler systems. The Desalination Building will be a mix of H4 and F2 occupancies. The office building will be B occupancy. Both buildings will require type 5B construction with fire rated walls between occupancies. Both buildings will be pre-engineered steel frame construction.

b. Anticipated Structures:

i. The major structures listed below are anticipated. Some facilities/buildings may abut others.

(1) Administration Facilities
(2) Reverse Osmosis Building (including Chemical Storage and Feed, Electrical Equipment, and UV Disinfection)
(3) Filter Building
(4) Remote Electrical Switchgear Building

c. Administration Facilities

i. The administration facilities include visitor reception area, control room, laboratory, offices, locker rooms, restrooms, and maintenance area. These facilities are to be provided on a single level adjacent to the RO Systems.

ii. All administration facilities are to be in compliance with all Applicable Law, including the Americans with Disabilities Act.

iii. Security Concern: Separate visitors from secure process

(1) Facility layout shall keep areas available to public tours and visitors separated from process areas.

d. Visitor reception / Exhibits

i. An area suitable for public access and viewing of exhibits related to water supply, treatment, distribution and conservation, shall be provided. The area shall be approximately 600 sf in size.

ii. Separate restrooms (one male, one female) shall be provided for visitors. Each restroom shall be provided with sink, mirror, toilet, and waste receptacle.

e. Offices

i. Plant Manager – 150 sf; including small conference table with four chairs; four (4) four drawer file cabinets for records

ii. Operation and/or Maintenance Supervisor– 120 sf each;

iii. Offices shall be secured.

f. Cubicles for Clerks

i. Provide two (2) cubicles for clerk type work; (50 sf each)

g. Restrooms and Locker Rooms

i. Provide separate locker room and restrooms for personnel.

ii. Male Locker Room: Provide 10 metal lockers with 12 inch width and 6 ft height; bench; double sink and countertop; two urinals, one toilet; shower.

iii. Female Locker Room: Provide 5 metal lockers with 12 inch width and 6 ft height, bench, double sink and countertop; two toilets; shower.

iv. Finishes: Tile floor.

h. Conf Room

i. Provide conference room suitable for 12 people.

ii. Provide ceiling mounted computer projector

iii. Provide electric coiled projection screen

i. Break Room

i. Purpose of the break room is to provide access to kitchenette and assemble for training.

ii. Break room shall be sized for 12 seated persons

iii. Provide kitchenette with sink, microwave oven, and 25 cf refrigerator/freezer. No stove top shall be provided.

iv. Provide 8 lf of countertop and cabinetry

v. Provide 46-inch flat screen monitor/television for training

j. Laboratory and Storage Room

i. A process control laboratory suitable for wet chemistry testing shall be provided sized at approximately 200 sf with 25 lf of countertop and casework.

ii. Metal casework

iii. Bacteriological testing will not be performed at this site

iv. Provide storage room for supplies, sample boxes, DI water supply, upright freezer/refrigerator (125 sf)

v. Safety eyewash and shower

vi. Dishwasher

vii. Provide a sample sink for continuously flowing samples of plant effluent, filtered saline water, Finished Water tank inlet. Recycle wastewater from the sample sink to the plant inlet.

viii. Provide a sanitary sink with hot/cold water; discharge to sanitary sewer following acid neutralization tank.

ix. Ventilation Hood – not required

x. Deionized Water supply – provide replaceable tank system

xi. Provide desk area suitable for computer use, and four (4) filing drawers

xii. Laboratory testing equipment, supplies, and glassware will be provided by the Owner.

k. Maintenance Shop

i. Provide a 240 sf area for maintenance.

ii. 20 lf of workbench

iii. No welding will be performed

iv. Provide overhead door to allow vehicle access.

v. Provide compressed air supply (5 hp compressor and 80 gallon receiver)

l. Equipment and Tool Storage

i. Locked room with shelving (80 sf)

ii. Locked fenced area for larger equipment/tools (150 sf)

m. Control Room

i. Control Room shall be suitable for two persons working concurrently. Control room shall be adjacent to laboratory. Control room shall be provided with viewing panels to allow views of the RO units and also allow public views into the control room. Control room shall be secured. (300 sf)

n. Secured Telecom Room

  i. Provide secured telecom room for location of computer servers and telecom access panels (150 sf).

o. Janitorial Room

  i. Provide janitorial room with water supply and sink, storage of mob bucket, mops, brooms, buffer, and maintenance supplies. (40 sf)

p. File and Drawing Room

  i. Provide secured room for storage of files, 24 x 36 flat file drawings, maps, and catalogs (125 sf)

q. Copier, printer area in coordination with Clerk Area

  i. Provide open area for location of copier, printer, and associated office machines. Provide 5 foot long work table or counter.

r. RO Building

  i. Materials of construction for the walls and roof shall be braced steel frame.

  ii. Electrical equipment such as switchgear and large motor starters shall be located in a room separate from the RO trains and piping.

  iii. RO piping shall be run in trenches to provide ready access to the RO systems. Trenches shall be sized to allow access to piping, pipe connections, and pipe supports for inspection, repair, and replacement.

  iv. Provide an overhead door to allow pumps, RO membranes, and other equipment to be removed/replaced.

  v. Center hallway should be adequately sized for a forklift and scissors lift to allow for maintenance and replacement of RO membranes.

s. Chemical Storage

  i. Liquid chemicals shall be stored in a building to provide security and protection of tanks, pumps, piping, and ancillary devices from the elements.

  ii. Generally, each chemical is to be located in a separate room to provide corrosion protection and avoid the potential of mixing of incompatible chemicals.

  iii. Each room requires lighting and HVAC.

  iv. Secondary containment is to be provided for liquid chemical storage. The floor of each chemical room to be depressed relative to a central hallway to provide sufficient secondary containment. The chemical equipment (tanks, metering pumps, etc) are located on the lower level. Stairs provide access from the central hallway to the lower level of each room.

v. Certain non-hazardous chemicals, such as polymers, may be located in a common area. Secondary containment is to be provided with a depressed (two to four inches deep) area covered with FRP grating flush with the surrounding floor.

vi. Fire suppression is to be provided per local requirements.

t. UV Disinfection

i. The UV reactors, flow meters, and associated valves and piping are to be housed in a secure building. Electrical equipment is to be located within a room separate from the UV piping.

ii. UV disinfection shall be contained in the RO building.

u. Filter Building

i. The filter valves and actuators for the granular media filters are to be protected within a building.

ii. The materials of construction for walls shall be zincalume metal panels and the materials of construction for floors shall be concrete.

v. Electrical Buildings

i. Significant electrical equipment such as motor starters (greater than 10 hp), motor control centers, and switchgear, shall be located indoors. Suitable lighting, ventilation, and security shall be provided. Generous access is desired to meet or exceed arc flash space requirements.

ii. Color coding of process piping (above grade, non-stainless), including chemical feed piping, is included in the Fixed Design-Build Price as part of the Design-Builder's base proposal. Actual colors will be discussed and determined later in the process.

iii. Table 2-27A describes the Design-Builder's proposed protective coatings to be used for piping, architecture, and structural components.

Table 2-27A Protective Coatings

Painting/Coating Type	Painting Coating Description	Paint/Coat Spec/Product
Above Grade Pipe Painting/Coating	All above grade pipe and fittings except stainless steel pipe and interior FRP piping in trenches. Color banding and flow arrows will be provided.	Primer - Devthane 201h Primer, Paint - Devthane 359H A high performance, low VOC, two-component chemically cured aliphatic urethane.

Painting/Coating Type	Painting Coating Description	Paint/Coat Spec/Product
Architectural Painting	Exterior Metal Panels	No additional coating…AEP Span Factory Zincalume™ Coating (zinc coating with polyvinyldiene fluoride PVDF Kynar finish coats) provided
	Interior GWB Paint	Latex - MPI 52 INT 9.2A-G3 – (Eggshell finish-not pertinent to cost)
	Interior Gypsum Ceiling Paint	Latex - MPI 54 INT 9.2A-G5 – (Gloss Finish-not pertinent to cost)
	Interior Exposed Ceilings - Administrative Building	Latex - High Performance Architectural - MPI 139 INT 5.1R-G3– (Eggshell finish-not pertinent to cost)
	Interior Exposed Ceilings - RO and Filter Buildings	Epoxy - DEVAN 282 – (Eggshell finish-not pertinent to cost)
	Hollow Metal Doors	Latex - High Performance Architectural - MPI 141 INT 5.1R-G5
	Wood Trellis	Stain - Semi-Transparent by Cabot #0300 Series, or approved equal
	Concrete Sealer	Meet MPI 141
	CMU Sealer	Meet MPI 141
	Interior CMU	Latex MPI 141. Gloss Level 5, with MPI 5 Block Filler
Structural Painting/Coating	Interior Structural Steel Paint/Coat	Expoxy - DEVAN
	Chemical Concrete Coating	Polyamine Novolac Epoxy - TNEME-GLAZE Series 282

23. GEOTECHNICAL AND STRUCTURAL DESIGN

a. Design-Builder shall be guided by the local, State, and federal building codes that are appropriate for the Design-Build Improvements. For cast-in-place concrete process structures, design shall be performed in accordance with ACI 350-Code Requirements for Environmental Engineering Concrete Structures.

   i. Basis-of-design should be based on the California Building Code 2013 (CBC) which is scheduled to become effective January 1, 2014.

ii. Base Wind Speed – 3 second Gust (V3S) = 115 mph

iii. Exposure Category = C

iv. Importance Factor (lw) = 1.15

b. Dead Loads

i. Dead loads consist of the self-weight of the structure and all equipment of a permanent or semi-permanent nature, including but not limited to: HVAC equipment and ductwork, and electrical wiring and lighting.

c. Live Loads

i. Uniform live loads need not be applied in addition to equipment loads to floor areas permanently covered with equipment. Equipment room floors are designed for the greater of uniform live loads or actual equipment loads.

d. Wind Loads

i. Wind loads are determined in accordance with the CBC and ASCE 7.

e. Tables 2-28 through 2-32 identify the Design and Construction Requirements for geotechnical and structural design and the Design-Builder's means and methodology for meeting the Design and Construction Requirements.

Table 2-28 Governing Codes and Standards for Structures

Governing Codes and Standards for Structures
California Building Code (CBC) – 2013 (based upon the International Building Code 2012)
ASCE/SEI 7-10 Minimum Design Loads for Buildings and Other Structures, American Society of Civil Engineers
ACI 318-11 Building Code Requirements for Structural Concrete, American Concrete Institute
ACI 350-06 Code Requirements for Environmental Engineering Concrete Structures, American Concrete Institute
ACI 350.3-06 Seismic Design of Liquid-Containing Concrete Structures, American Concrete Institute
CRSI Design Handbook, 2008, 10th Edition, Concrete Reinforcing Steel Institute
AISC 341-10 Seismic Provisions for Structural Steel Buildings, American Institute of Steel Construction
AISC 360-10, Specification for Structural Steel Buildings, American Institute of Steel Construction
AWS D1.1-08 Structural Welding Code – Steel, American Welding Society
AWWA D100-05 Welded Carbon Steel Tanks for Water Storage, American Water Works Association
AWWA D103-09 Factory-Coated Bolted Carbon Steel Tanks for Water Storage, American Water Works Association
AASHTO Standards – 2011 Standard Specifications for Transportation Materials and Methods

Governing Codes and Standards for Structures
of Sampling and Testing, American Association of State Highway and Transportation Officials

Table 2-29 Additional Standards for Tank, Equipment and Nonstructural Component Anchorage

Additional Standards for Tank, Equipment and Nonstructural Component Anchorage
ACI 355.2-07 Qualification of Post-Installed Mechanical Anchors in Concrete & Commentary
ACI 355.4-11 Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary
ICC AC308 Post-installed Adhesive Anchors in Concrete Elements—Approved June 2013
ICC AC193 Mechanical Anchors in Concrete Elements—Approved June 2012, Editorially Revised May 2013

Table 2-30 Risk Categories

Facility	Risk Category
Finished water storage tank and related equipment	IV
All other structures	III

Table 2-31 Design and Construction Requirements for Uniform and Concentrated Live Loads

Use or Occupancy	Uniform Load, psf	Concentrated Load, lb
Roofs	20	–
Office Areas	50	–
Stairways	100	300(1)
Personnel Assembly Areas, Lobbies and Exits	100	–
Building Mechanical Equipment Areas	100	–(2)
Other Equipment Areas	250	–(2)

(1) Apply concentrated load to stair tread only

(2) Refer to equipment manufacturer's drawings for concentrated load

Table 2-32 Wind Load

Parameter	Units	Design and Construction Requirements	Means and Methodology
Basic Wind Speed, 3 sec gust V_{3S}	mph	115	V_{3S} is substituted for V in ASCE 7 eq 27.3-1

Parameter	Units	Design and Construction Requirements	Means and Methodology
Exposure Category		C	
Importance Factor, I_w		1.15	

f. Seismic Design

i. Seismic considerations should apply to every building system, subsystem and component including electrical systems, piping systems, and water treatment processes. The Design-Builder is expected to develop a unified and cross-discipline approach within the design team to meet the Owner's expectations for seismic performance of the Design-Build Improvements. The assignment of roles and responsibilities is critical if the performance objectives are to be adequately defined and for integrated seismic design and construction to be achieved.

ii. The intent of this section is to convey to the Design-Builder the expectations of the Owner on the performance of the Design-Build Improvements during and following earthquakes.

(1) Performance based design shall at a minimum meet the Strength Procedures requirements.
(2) The most stringent requirements of the paragraph below shall apply to the design.

iii. The following objectives for this Project are adapted from FEMA 389 Communicating with Owners and Managers of new Buildings on Seismic Risk – Chapter 8 Design and Performance Issues Relating to Light Manufacturing Facilities.

(1) Protection of building occupants is a very high priority
(2) Building occupancy is relatively low. Visitors are typically low in number, and infrequent, but groups of visitors can be expected to tour the facility.
(3) Ensuring the survival of costly and difficult to replace equipment is an important concern
(4) Closure or non-operation of the Design-Build Improvements for an extended period represents a serious water supply problem
(5) The Design-Builder may need to go beyond the minimum code requirements to achieve the desired building performance.
(6) Continued operation is particularly dependent on nonstructural components and systems. These include electrical systems and chemical systems. Protection against significant chemical spillage is desired during an earthquake.
(7) Recent earthquakes have caused a high level of nonstructural damage, particularly to ceilings and lighting. This type of damage is costly and its repair is disruptive. Responsibility within the design team for nonstructural component support and bracing design should be explicit and clear.
(8) Performance Expectations and Requirements

(9) Persons within and immediately outside facilities must be protected at least to a life-safety performance level during design-level earthquake ground motions.
(10) Building occupants should be able to evacuate buildings quickly and safely after the occurrence of design level ground motions.
(11) Emergency systems in the facility should remain operational after the occurrence of design level earthquake ground motions.
(12) Emergency workers should be able to enter the building immediately after the occurrence of design level earthquake ground motions, encountering minimum interference and danger.
(13) Key equipment should be protected from damage.
(14) Large tanks holding chemicals, saline water, and Finished Water should remain operable. Flexible connections to piping should be provided to prevent damage at tank connections.
(15) There should be no significant release of treatment chemicals to the environment as a result of the occurrence of design-level earthquake ground motions.
(16) Finished Water stored in the clearwells/Finished Water tanks should be able to be pumped to the distribution system using purchased power or standby generator immediately following a design level earthquake.
(17) The Owner's expectations with respect to seismic risk is also provided in the checklist tables below. These checklists are adapted from FEMA 389 – Chapter 12.

g. Tables 2-33 through 2-40 identify the Design and Construction Requirements for seismic design and the Design-Builder's means and methodology for meeting the Design and Construction Requirements.

Table 2-33 Seismic Load Criteria

Seismic Design Parameter	Short Period	Long Period	Means and Methodology
Mapped Spectral Acceleration	S_s = 1.58	S_1 = 0.56	
Site Coefficients	F_a = 1.0	F_v=1.5	
Maximum Considered Earthquake Acceleration	S_{MS} = 1.58	S_{M1}= 0.84	
Design Acceleration	S_{DS}=1.06	S_{D1}=0.56	
Site Class	D		
Seismic Design	D		ASCE 7-10

Seismic Design Parameter	Short Period	Long Period	Means and Methodology
Category			
Importance Factor for Finished Water clearwells, tanks, and pumping systems	$I_e = 1.5$ $I_p = 1.5$		Risk Category IV per Addendum No. 3
Importance Factor for all other structures	$I_e = 1.25$ $I_p = 1.0$		Risk Category III per Addendum No. 3

Table 2-34 Soil Loads

Parameter	Units	Design and Construction Requirement
Active pressure – level backfill	pcf	40
Active pressure – 3H:1V backfill	pcf	50
At-rest pressure – level backfill	pcf	55
At-rest pressure– 3H:1V backfill	pcf	70
Allowable bearing pressure	psf	2,000

Table 2-35 Seismic Performance

Item	Level of Damage at Seismic Shaking Hazard Level			Means and Methodology
	Low	Moderate	High	
Structures	No Significant Damage	Repairable Damage; No Evacuation	Repairable Damage; Evacuation	For pricing purposes, the design uses code-based seismic loads. Final design shall address performance based design.
Nonstructural Components	No Significant Damage	Repairable Damage; No Evacuation	Repairable Damage; Evacuation	Equipment required to remain operable following the design earthquake ground motion shall be certified as such by the equipment manufacturer per ASCE 7-10 Section 13.2.

Item	Level of Damage at Seismic Shaking Hazard Level			Means and Methodology
	Low	Moderate	High	
Time to Reoccupy and Restart Facility / Function Continuance (Structural/Non structural)	Immediate	Up to 2 weeks	Up to 2 months	For pricing purposes, the design uses code-based seismic loads. Final design shall address performance based design.
Spectral Acceleration (Short period or 0.2 sec)	<0.167 g	≥ 0.167 g and < 0.50 g	≥ 0.5 g	
Spectral Acceleration (long period or 1.0 sec)	< 0.067 g	≥ 0.067 g and < 0.20g	≥ 0.2 g	

Table 2-36 Structure Materials

Parameter	Units	Design and Construction Requirements	Means and Methodology
Concrete			
Compressive strength (f'_c) for concrete exposed to salt water	psi	5,000	
Compressive strength (f'_c) for all other concrete	psi	4,000	
Reinforcing steel yield strength (f_y)	ksi	60	ASTM A615 Grade 60 Or ASTM A706 Grade 60
Waterstops - water containment		PVC	
Waterstops - chemical containment		TPV	
Masonry			
Masonry compressive strength (f'_m)	psi	1,500	ASTM C90, Type 1, medium weight concrete masonry units, open-end, laid in running bond, solid-grouted and reinforced
Reinforcing steel yield strength (f_y)	ksi	60	ASTM A615 Grade 60
Steel			
Structural W shapes yield strength: (F_y)	ksi	50	ASTM A992
Other structural shapes and plates yield strength: (F_y)	ksi	36	ASTM A36
Hollow structural sections yield strength: (F_y)	ksi	46	ASTM A500, Grade B

Parameter	Units	Design and Construction Requirements	Means and Methodology
High strength bolt tensile strength	ksi	120 for dia ≤ 1.0 in 105 for dia > 1.0 in	ASTM A325, 3/4-in dia min
Cast-in place anchor tensile strength	ksi	58-80	ASTM F1554, 5/8-in dia min
Welding filler metal strength	ksi	70	AWS D1.1

Table 2-37 Special Inspection

Special Inspection Element	Per Code
Steel construction	CBC section 1705.2
Concrete construction	CBC section 1705.3
Masonry construction	CBC section 1705.4
Soils	CBC section 1705.6
Wind resistance	CBC section 1705.10
Seismic resistance	CBC section 1705.11

Table 2-38 - Earthquake Performance of Structures

	Damage			
Seismic Shaking Hazard Level	No Life Threat, Collapse	Repairable Damage: Evacuation	Repairable Damage; No Evacuation	No Significant Damage
Low				√
Moderate			√	
High		√		

Table 2-39 Earthquake Performance of Nonstructural Components

	Damage			
Seismic Shaking Hazard Level	No Life Threat, Collapse	Repairable Damage: Evacuation	Repairable Damage; No Evacuation	No Significant Damage
Low				√
Moderate			√	
High		√		

Table 2-40 Function Continuance: Structural/Nonstructural

	Time to Reoccupy and Restart Facility			
Seismic Shaking Hazard Level	6 Months +	To 2 Months	To 2 Weeks	Immediate
Low				√
Moderate			√	
High		√		

Notes:

Seismic Shaking Hazard Level	Spectral Acceleration (Short period or 0.2 sec)	Spectral Acceleration (long period or 1.0 sec)
Low	<0.167 g	< 0.067 g
Moderate	≥ 0.167 g and < 0.50 g	≥ 0.067 g and < 0.20 g
High	≥ 0.5 g	≥ 0.2 g

24. HVAC SYSTEM

a. The design of HVAC systems shall be based on site and process specific conditions. Design-Builder is to identify weather and design conditions. Design-Builder is to follow the codes identified below in the design of HVAC systems. Energy efficiency shall be considered in design of HVAC systems.

b. Tables 2-41 identifies the governing codes and standards for the HVAC system.

Table 2-41 Governing Codes and Standards

Governing Codes and Standards
2013 California Mechanical Code based on the 2012 Uniform Mechanical Code of the International Association of Plumbing and Mechanical Officials (IAPMO)
2013 California Energy Code
CALGreen 2010: CBC Title 24, Part II, Mandatory Measures
American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standards 90.1-2010 for Energy Conservation
American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standards 62-2013 for Ventilation of buildings
NFPA Standard 90A - Installation of Air-Conditioning and Ventilation Systems
UL: Underwriters Laboratories, Inc.
U.S. Green Building Council LEED-NC Reference Guide 2.2
Sheet Metal and Air Conditioning Contractors National Association (SMACNA). Standards
Air Moving and Conditioning Association (AMCA)
National Environmental Balancing Bureau (NEBB)

c. General

i. The administration areas are to be air conditioned and provided with heat to control temperature and humidity. Thermostats are to be provided in each room for local control. Design-Builder shall identify the equipment and systems to be provided.

ii. Ventilation is outdoor air brought into a building to maintain the space temperature, control moisture, replace exhaust air, protect building components, and remove indoor pollutants.

iii. Equipment is to be located where it can be readily and safely maintained.

iv. Electrical rooms will be provided with air ventilation system to control temperature to within electrical manufacturer limits. Air conditioning is not universally required for electrical rooms. Design-Builder shall identify ventilation and temperature control design criteria.

v. Rooms with large pumping units, and heat rejection, shall have appropriately sized makeup air ventilation system. Provide unit heaters for freeze protection. Design-Builder shall identify design criteria.

vi. Chemical storage and feed rooms require year round ventilation. Low rate continuous ventilation shall be provided. High rate ventilation shall be provided for each chemical room triggered by 1) high temperature, 2) personnel entry, and 3) operator manual initiation. Operator need not enter the room to initiate high rate ventilation. Heat shall be provided as required to maintain minimum temperatures.

vii. Onsite hypochlorite generation process generates hydrogen gas. The hydrogen gas is vented outdoors. Only under unusual conditions would hydrogen gas enter the building. It is proposed that with the combination of hydrogen gas detectors and continuous ventilation, that explosion proof electrical system is not necessary.

viii. Ventilation design shall limit noise to non-objectionable levels.

ix. Ductwork material shall be appropriate for the conditions.

x. Installation and support of all HVAC systems shall be coordinated with other disciplines, including seismic design.

xi. In addition to building envelop and lighting high efficiency design and use of high efficiency motors throughout the site, the Design-Builder shall design the building HVAC systems to meet or exceed the energy efficiency standards as stipulated by Applicable Law.

xii. In addition to keeping with the high energy efficiency design practice, sustainable design considerations are being utilized by not installing unit heaters which would otherwise expend additional fossil-fuel based heating resources and instead relying on the waste heat being generated by the motors and drives to heat the building to acceptable temperature levels for this generally mild area.

xiii. By determining that the installation of the unit heaters, associated piping, insulation, supports, wiring, conduit and controls, a significant impact to sustainable design is being implemented through not only a capital cost avoidance, but also the avoidance of the construction of these new materials and the energy to produce, install and operate these components.

d. Tables 2-42 identifies the Design and Construction Requirements for the HVAC system and the Design-Builder's means and methodology for meeting the Design and Construction Requirements.

Table 2-42 HVAC System

Parameter	Unit	Design and Construction Requirements	Means and Methodology
General			
Ventilation definition		Outdoor air brought into a building to maintain the space temperature, control moisture, replace exhaust air, protect building components, and remove indoor pollutants	
Ventilation noise		Non-objectionable levels	
Ductwork material		Non-corrosive area: Galvanized Steel Corrosive Area: Fiberglass Resin Polymer (FRP)	Galvanized steel will be used for all areas except for the Chemical Storage Areas, where ductwork will be FRP.
Equipment location		Located where it can be readily and safely maintained	
Installation/Support		Coordinated with other disciplines, including seismic design	
Administration			
Control for temperature and humidity		A/C and heat	The Maintenance Shop will only have ventilation and heating.
Thermostat		1 in each room for local control	File Room on Office #3 thermostat. Male and Female toilets on the Break Room thermostat.
High efficiency split system heat pump. EER = 14.7 & 15.1.		CA Building Energy Efficiency Standards: Min. EER = 11.0	Units exceed (are more efficient than) minimum EER required Ref: HVAC Equipment
Split system air handler with air-side economizer.		CA Building Energy Efficiency Standards: Economizer required.	Ref: HVAC Equipment

Parameter	Unit	Design and Construction Requirements	Means and Methodology
VAV system with reheat.		AC & Heat to control temperature and humidity.	
High efficiency condensing boiler . AFUE = 95%.		CA Building Energy Efficiency Standards: Min. AFUE = 82%	Ref: HVAC Equipment Condensing Boiler exceeds minimum required AFUE.
Constant minimum fresh air supply to system.		Ventilation for exhaust air make-up and removal of pollutants.	Ref: HVAC Sequence of Operation.
Equipment/Systems selected for max. NC of 30.		Limit noise to non-objectionable levels.	Ref: HVAC Equipment Cuts
Galvanized Steel Ductwork		Appropriate ductwork materials.	Ref: Admin. Bldg. HVAC Duct Plan.
Equipment, Ductwork and Piping to be supported and braced.		HVAC Systems coordinated for seismic design.	
Electrical Rooms			
Control temperature to within electrical manufacturer limits		Air ventilation system	
Identify ventilation and temperature control design criteria		Staged, multiple, single speed exhaust fan operation with Room thermostat control.	Capacity of ventilation-only cooling: limit average temperature rise to within 10 deg F above ambient temperature. See explanation of indoor design temperatures above.
Rooms with Large Pumping Units and Heat Rejection			
Makeup air ventilation system size		Multiple, single speed fan operation with local thermostat control.	Capacity is based on a 10 deg F differential above ambient
Freeze protection		Provide heating, if required to maintain space temperature above freezing.	Heating to prevent freeze protection determined as not being required. Heat rejection from equipment exceeds/meets the heating load for winter conditions. See room design criteria above.

Parameter	Unit	Design and Construction Requirements	Means and Methodology
Identify design criteria		Maintain between minimum and maximum temperatures.	Heating load is offset by heat rejection from equipment. Cooling load is met by ventilation exhaust.
Chemical Storage and Feed Rooms			
Ventilation duration		Year round	
Ventilation type		Low rate continuous	
High rate ventilation triggers		1) high temperature, 2) personnel entry, and 3) operator manual initiation	
High rate ventilation control		Operator need not enter the room to initiate high rate ventilation	
Minimum temperature maintenance		Heat is only provided to the tanks needing to be kept at a minimum temperature.	These tanks will be insulated and heat traced. No room heating is provided.
Hydrogen Gas Generated by Onsite Hypochlorite Generation Process			
Venting		Outdoors	
Ventilation duration		Continuous	
Number of hydrogen gas detectors		Four total including (2) for generator room and (2) for Storage Tank room.	Refer to P&IDs I-31,I-32, I-33 and I-34
Type of hydrogen gas detectors		Conspec CN0642-1 or equal	

25. PLUMBING SYSTEM

a. Plumbing systems include domestic cold and hot water, sanitary, vent, natural gas, laboratory de-ionized water supply and laboratory waste handling, and includes in-plant service water, and in-plant permeate water supply. Plumbing also includes water supply to micro-irrigation system.

b. Plumbing for potable systems must be lead-free in accordance with California Health and Safety Code Sections 116875-116880 and federal Public Law 111–380 that takes effect in January 4, 2014.

c. Domestic Hot and Cold Water, Nonpotable Water, and Pressure Drain Piping

    i. Above Grade: Piping must be Type L hard drawn copper tubing, ASTM B88, with wrought copper solder type fittings conforming to ANSI B16.22, or cast copper alloy solder joint fittings conforming to ANSI B16.18, or cast copper alloy flanged fittings Class 150 conforming to ANSI B16.24. Screwed joints in piping are restricted to pipe sizes 2" and smaller.

(1) Copper or Bronze Pressure-Seal Fittings: Copper or bronze housing, factory-installed Ethylene Propylene Diene Terpolymer sealing element, 200 pounds per square inch (psi) working pressure with a 0 to 250°F temperature rating. ASME B16.18 and B16:22, ASTM B88, and D 2000. Rigid ProPress™, or Stadler-Viega, or NIBCO® INC

ii. Below Grade: Type K copper tubing must be used. When piping is installed within a building and within or under a concrete slab, it must be installed without joints. Where joints are unavoidable, they must be brazed.

(1) Protective pipe covering must be factory- or field-applied according to manufacturer's written instructions.

(2) 2½ Inches and Larger: Products must be Polyken® No. 1027 primer and Polyken No. 930-35 tape coating, 35 mil, 21kV dielectric strength, as manufactured by Tyco adhesives, Corrosion Protection Group. Minimum one-inch overlap required.

(3) 2 Inches and Smaller: Products must be 27 MIL plastic sleeve-protector. LSP® Products Group, Plasti-Sleeve or equivalent.

d. Soil, Waste, Drain, and Vent Piping: Cast iron soil pipe, fittings, and connections must comply with CISPI guidelines

i. Below Grade: Piping must be service weight hub and spigot (with gasket) coated cast iron and must conform to ASTM A74.

ii. Above Grade: Piping must be Schedule 40, galvanized steel pipe, ASTM A53, with threaded, galvanized cast iron Durham drainage fittings, ANSI B16.12; or drain-waste-vent (DWV) copper pipe with solder joint DWV wrought copper fittings; or service weight hub-spigot (with gasket) coated cast iron pipe and fittings conforming to ASTM A74; or hubless cast iron pipe and fittings conforming to CISPI 301.

e. Backflow prevention:

i. The domestic water system is to be protected with a single reduced pressure zone (RPZ) type backflow preventer.

ii. Potable water supply to process facilities is to be protected with RPZ backflow preventers in parallel.

iii. Bypass of a RPZ device is not allowed.

iv. RPZ devices are not to be installed in below grade pits.

v. RPZ devices can discharge water at a high rate. Suitable drains and curbs are to be provided to minimize potential for flooding. Funnels may not be adequate.

vi. Pressure indicators are required upstream and downstream of RPZ devices.

vii. Hose bibs are to be equipped with vacuum breakers to prevent back-siphonage.

viii. The design of continuous dilution water for chemical systems is to prevent backflow and contamination of in-plant water system.

f. Metering:

i. A high degree of metering of water consumption is desired to carefully monitor water use within the facility. Plant service meters are to be integrated with SCADA to allow continuous monitoring and reporting of in-plant water consumption. Where loss of water supply cannot be tolerated, a meter bypass piping and valves are to be provided to allow for meter changeout and testing.

g. Tempered Water System:

i. A tempered water system is required to supply emergency eyewash and emergency showers. The tempered water system shall be designed to provide tempered water quickly after activation of the eyewash/shower valve. Long branches of piping with untempered water are not acceptable. Drains shall be provided to carry away eyewash or shower water. Tempered water systems shall be designed in accordance with the latest version of American National Standard for Emergency Eyewash and Shower Equipment (ANSI Z358.1). The design and installation guidance in Appendix B, provided with the Standard, are to be followed. Electric instantaneous heaters are undesirable due to high electric demand.

h. Water hammer arrestors are to be provided where solenoid valves are installed.

i. Saline waste streams are not to be sent to sanitary sewer. The saline waste streams will be sent to the Brine Equalization Basin and ultimately to the Monterey Regional WPA Discharge.

j. Sanitary drainage system is to be coordinated with process elements so that drains are located in appropriate locations.

k. Floor drains are not permitted in chemical secondary containment areas.

l. Each lavatory is to include a floor drain.

m. Sump pumps in critical locations are to be duplex type with high level alarm to SCADA.

n. Process wastes such as continuous sample streams, are to be recycled or sent to process waste handling rather than discharged to sanitary. Sample streams are not to be discharged onto the floor.

o. A laboratory de-ionized water system is required with a single tap in the laboratory.

26. ELECTRICAL SYSTEM

a. The key reference drawings in Attachment 12 to this Appendix associated with this section are:

- E-1 ELECTICAL SITE PLAN
- E-2 TRANSFORMER PLAN AND ELECTRICAL ROOM LAYOUT
- E-3 OVERALL SINGLE-LINE DIAGRAM
- E-4 SWRO BUILDING AREA CLASSIFICATION AND NEMA DESIGANATIONS
- E-5 PRESSURE FILTER GALLERY, ADMINISTRATION BUILDING & PUMP SLAB AREA CLASSIFICATION AND NEMA DESIGNATIONS

b. Introduction

i. The conceptual electrical equipment sizes and configurations presented in this document are preliminary and are meant to convey the expected features of the Work. The Design-Builder shall be responsible to evaluate the overall power system loading in selecting appropriate electrical service and distribution to provide the final design required.

ii. A power factor of 0.93 or greater is desired for the Design-Build Improvements when operating at design capacity.

iii. See Attachment 6 for suggested electrical equipment manufacturers

iv. See Attachment 7 for basic electrical materials and design criteria to be included in the design of the Design-Build Improvements.

v. See Attachment 8 for power system study requirements. This study is to be performed during design to help optimize power system performance and minimize arc flash hazards. Submittals as outlined are to be included during the design phases associated with the Project. Final adjustments and record document modifications are to be included in the final study prior to printing and labeling of the equipment by the Engineer.

vi. Major electrical loads include:

(1) Filtered feedwater pumping
(2) RO high pressure pumping
(3) Finished Water pumping

vii. The following codes shall apply to design of electrical systems:

(1) National Electrical Code (2011 Edition)
(2) International Building Codes (conduit spacing in structural elements – 3 times diameter spacing
(3) California Title 24 Building Codes (2013)
(4) NFPA-1-1 (emergency lighting for occupied spaces)

(5) IES Lighting handbook (latest edition)
(6) California PUC General Orders 95 (overhead work) and 128 (underground work) in public spaces
(7) IEEE 519-1992 (Recommended Practices and Requirements for Harmonid Control in Electrical Power Systems)

c. Electrical Service

i. The Design-Builder is required to connect the Design-Build Improvements to the Utilities at the Project Site boundary.

ii. The Design-Builder assumed that the plant will be powered from a single Utility service utilizing the existing 21 KV in the area to supply two (2) 5 MVA *(preliminary sizing only; final sizing to be developed by Design-Builder)*, (55/65/65 C rated), liquid-cooled (non-flammable), 21 KV (WYE) to 4160 V (WYE) substation transformers (provided by the Design-Builder). Any changes upstream of the utility meter are not included in the Fixed Design-Build Price.

iii. This service to be Utility metered as a single service application under this proposed scope of work. These transformers are to be protected with pad-mounted, outdoor 35 KV fusible disconnect switches unless it is determined medium voltage (MV) 27KV or 35 KV circuit breakers are otherwise required.

iv. It is expected that each of the (21 KV / 4160 VAC) service transformers, feeders, and breakers will be sized to have the following approximate capacities:

(1) Each transformer, feeder, and breaker can supply approximately 100% of plant capacity at a plant rated capacity of 6.4 MGD.
(2) Each transformer, feeder, and breaker can supply approximately 65% of plant capacity at a plant rated capacity of 9.6 MGD.
(3) Each transformer, feeder, and breaker can supply approximately 50% of plant capacity at a plant rated capacity of 12.8 MGD.

d. Medium Voltage Switchgear

i. From the outdoor electrical service transformers, 4,160 VAC is to be extended via concrete-encased conduit ductbanks into 5 KV rated MV circuit breaker switchgear located within a building. Automated transfer control of the main-tie-main arrangement is to be incorporated into the operational design requirements; initiated through the SCADA system but capable of being fully automated in the future should dual Utility services eventually be developed.

ii. The high pressure pump motors will be supplied power at 4,160 volts from MDS-1.

e. Alternate Electric Service:

i. Additionally, manual (key-interlocked) provisions are to be included to allow future utilization of an alternate 5 KV power supply from the adjacent landfill power generation system on one side of MDS-1. It is anticipated that the alternate supply would not be sufficient for the entire facility at all times, but may be capable of supplying a portion of the facility.

(1) The routing and details of a future alternate 5 KV power supply from the adjacent landfill power system are not available at this time. The Design Builder should make allowance for routing of the power supply underground via duct bank in site layout. If the power supply is implemented, the duct bank and cabling will be added to the Project scope by a change order.

ii. Standby Electric Generator – It is expected the standby electric generator will supply power to the 480 volt bus that supplies Finished Water pumps and other loads. Standby electric generator design criteria is presented in another section.

(1) Provide a central control and metering/monitoring system to sequence and properly interlock the proposed generator with the switchgear and loads.

f. Supply to Filtered Water Feedwater Pumps and Finished Water Pumps

i. Power from this MV switchboard (MDS-1) is to be routed via concrete-encased ductbanks to two (2) outdoor, liquid-filled pad mount type transformers; (4,160 VAC – 480Y277 VAC). From these transformers, provide concrete-encased ductbanks and cabling to a low voltage, main-tie-main, 480 VAC switchboard assembly (MDS-2) to supply power to Finished Water pumping equipment, filtered water feedwater pumping equipment, and other 480 volt loads. This switchboard to utilize draw-out, power circuit breakers for the main-tie-main and molded-case solid-state trip circuit breakers to supply the sub-distribution to the various loads and motor controllers in this building.

ii. Manual transfer control (normal power situations only) of the main-tie-main is to be incorporated into the operational design requirements; initiated through key-interlocks on the circuit breakers. Regardless, these main breakers are to be electrically operated in developing an automatic transfer control associated with the 480 VAC standby power generator. It is intended that the standby power source be used in energizing one side of the double-ended switchboard assembly to allow limited operational capabilities in the event of a Utility power failure as well as for load-testing of the generator unit. Selection of which automated transfer interface will be utilized is to be provided through SCADA along with manual selection via a three-position selector switch on the switchboard assembly.

(1) Local building power (480/277 and 208/120 VAC) to be developed within the building(s) as required to serve support system loads. It is proposed that general power / lighting loads be separated from instrumentation and sensitive electronic equipment loads by means of providing separate step-down transformers;

electrostatically isolated for “clean-power” loads / conventional for general power and lighting equipment.

(2) Surge protective devices (UL-1449, Rev 3 Listed/Labeled) are to be provided on panels serving “clean-power” systems.

iii. The Design-Builder shall meet the requirements in section 27 below (Standby Power) by energizing both sides of the double-ended switchboard to all the loads to operate as needed. The SCADA system shall be used to prevent the generator from being overloaded.

g. Owner Metering and Protective Relays

i. Power quality meters (SEL 735) with fiber optic communications to the SCADA system shall be utilized for monitoring the utility service parameters. Feeder protection relays (SEL 751A and medium voltage motor protective relays (SEL 710) where applicable, shall also be interfaced using dualport, fiber optic communications.

ii. Each RO high pressure pump motor shall be monitored with an appropriate SEL device and ancillary sensors to monitor power consumption data in real time. Power consumption and other electrical parameters shall be monitored through SCADA.

iii. Each pumping stage (Raw Water, filtered feedwater, and Finished Water) shall be monitored with an appropriate SEL device and ancillary sensors to determine the power consumption for the pumping stage (not the individual pump). Power consumption and other electrical parameters shall be monitored through SCADA.

h. Additional Electrical System Information

i. **Voltage Drop**

(1) Conductors shall be sized for a maximum voltage drop of 2% for feeder conductors and 3% for branch circuit conductors at full-connected load. Total maximum voltage drop allowed will be 5%.

ii. **Motor Control Centers**

(1) NEMA 1, 480 Volt, 3-phase MCCs will be provided for indoor installations. All MCC’s will be located indoors. MCC wiring shall be Class II type B. Main horizontal and vertical buses shall be tin plated copper. MCCs will be equipped with the following:

- Motor starters, full voltage, for 125hp and below
- Motor starters will be soft starters (RVSS) for 150hp and above. This value may change based upon the electrical power system study done during the design which is when voltage dip will be evaluated on motor startup.
- 6 pulse variable frequency drives up to 500 HP.
- Circuit breakers sized according to the loads they protect per all applicable codes.

(2) When provided, equipment protective devices such as motor or bearing high temperature switches, PSH, PSL and emergency stop controls shall be hardwired directly to the motor controls to shut down the equipment in either remote or local mode.

(3) Motor control centers shall be intelligent type and communicate using Ethernet/IP protocol. Ethernet switches located in the MCC's shall be Hirschman.

iii. **Dry Type Transformers**

(1) Dry type transformers will be energy efficient, three phase 480 Volt delta primary, with four 2-½% full capacity taps(2 above rated voltage and 2 below rated voltage), 120/208 Volt wye secondary. Open type transformer cases are not allowed. All units located in wet or chemical areas will be of sealed type construction. Provide open ventilated type enclosures for other general dry, environmentally ventilated/conditioned spaces. All transformers to utilize copper windings; 115 degree C rated. The Engineer will examine the need to install transformers with a higher than average Basic Impulse Level (BIL) that is not normally required in the 480V class.

iv. **Panelboards**

(1) The panel boards will be rated for 120/208 Volt, 3 phase, four wire, and 10,000 Amp interrupting capacity and will have solid-grounded neutral rated 100% of phase bus and copper buses. Circuit breakers will be of the "Bolt-On" type; "Push-On" / "Plug-On" type circuit breakers are not allowed. Use tin plated copper type bus and ensure U.L. labeling of entire system.

v. **Surge (transient) Protection**

(1) Surge protection will be provided on the MV switchgear, LV switchboard, and the MCC's to provide cascaded protection. The surge protective device will be installed on the load side of a circuit breaker.

vi. **Lighting and Illumination**

(1) Interior and exterior lighting shall be provided. The interior lighting system shall be designed in accordance with IES and Title 24 2013. Exterior lighting shall be located above each exterior door and throughout the site.

(2) Interior lighting shall be consist of high-efficiency T-5 HO, and T8 fluorescent light fixtures with electronic program-start ballasts. The T5-HO fixtures have an efficiency of 0.92 and the T8 fixtures have an efficiency of 0.90. Indoor enclosed and gasketed fluorescent for Damp and Wet Locations (Process and Chemical Rooms), other areas will be rated for indoor dry applications.

(3) Exterior lighting shall be designed by the Design-Builder for safety and security purposes in accordance with local requirements and expectations, and to allow proper functioning of security cameras. Exterior Lighting shall satisfy functional and security needs while not creating light pollution in the form of point sources of direct glare visible from a distance. Lighting shall be sensitive to the privacy of adjacent land uses. Fixtures shall be carefully selected for efficiency, cutoff, consistent lamp coloration throughout the project, and effectiveness in

delivering only the light necessary to the task, while avoiding unnecessary spill lighting beyond site boundaries. Low level light fixtures that light immediate areas are encouraged. Exterior lighting shall utilize pole mounted or wall pack type fixtures with high-pressure-sodium (HPS) lamps. HPS fixtures have an efficiency of 0.75. Exterior lights used to illuminate roads, sidewalks, or traffic areas will be controlled using a photocell switch. Exterior task lighting to illuminate equipment will be switched.

(4) Emergency lighting and exit signs shall be provided to identify and illuminate the paths of egress. The emergency lighting will use internal batteries to provide 60 minutes of backup time.

(5) Interior and exterior lighting shall be operated on 120 Volts. Roadway lighting will be operated at 480 volts to limit voltage drop.

vii. **Grounding**

(1) The electrical system and equipment will be grounded in compliance with the National Electrical Code. A buried grounding grid will be provided for the new switchgear and generators. Conductors shall be No. 3/0 AWG copper, minimum, for interconnecting ground rods and for connection to transformers, MCC's, and other major electrical equipment. Electrical equipment, devices, panel boards, and metallic raceways will be connected to the ground conductors. 480 Volt electrical system neutral will be solidly grounded. 4160 Volt electrical system neutral will be resistance grounded.

viii. **Wiring Methods**

(1) Conductors

(a) Conductors for low voltage power and control will be 600 Volt, rated 90 degree C, wet or dry location, moisture resistant, flame-retardant, thermosetting insulation, Type XHHW-2. Conductor sizing shall be based on 30 degree C ambient temperature, and only allowing the conductor to heat up to 75 degrees C, even though the conductor is rated for 90 degrees C. This is to prevent overheating any of the connectors and lugs. Power conductors for medium voltage circuits will be aluminum conductor. Power conductors for low voltage circuits greater than 115 amp shall be aluminum. Power conductors for low voltage circuits 115 amp and less, shall be copper. Conductors for grounding, controls, instrumentation, and communications will be copper.

(2) Raceways

(a) Raceways will be as called for by Appendix 2, Attachment 7, General Electrical Design Criteria and as shown on the electrical site plan.

(3) Electrical Enclosures

(a) Electrical enclosures (Control panels) and related enclosures will generally be non-metallic type with non-metallic hardware; NEMA 12 minimum or 4X in corrosive areas. The use of Stainless Steel enclosures will be limited to areas not exposed to a chlorine gas or fluoride areas. Electrical enclosures located outdoors will be non-metallic NEMA 4X. Electrical enclosures and control panels located in electrical rooms and the Admin building will be NEMA 1 and NEMA 12 respectively.

(4) Receptacles

(a) Receptacles and switches will be heavy-duty rated, 20 ampere minimum rated; material type and configuration to be suitable for the application.

(5) Variable Frequency Drives

(a) The variable frequency drives shall consist of IGBT modules with PWM output. The VFD's harmonics level shall be IEEE 519-1992 compliant. Low voltage VFD's will be 6 pulse with 3% input line reactors. An active harmonic filter will be provided on each MCC bus that has VFD's connected. The active harmonic filter will mitigate harmonics and correct power factor. Medium Voltage VFD's will be provided with phase shifting transformers and be a minimum of 18 pulse. for MCC-1 and MCC-2. The motors controlled by VFDs will be inverter duty, per NEMA MG-1 Parts 30 and 31.

(6) Induction Motors

(a) Induction motors shall be 120 or 208 Volt, single phase for fractional horsepower sizes, and 460 Volt, three phase for ½ hp to approximately 500 hp. Motors shall be 4160 volt for approximately 600 hp and above. Three phase motors shall be high efficiency, 1.15 service factor, open drip proof or totally enclosed fan cooled, with a thermal temperature switch in each winding for VFD driven motors smaller than 200 hp. Three phase motors shall have anti-condensation heaters for motors located outside and above 10hp.

(b) Motors that are 200 hp or above shall be equipped with temperature and vibration data collection systems.

(c) SEL 710 motor protective relays will be used for motor loads larger than 100 horsepower, and will be connected to the plant control system for monitoring, trending and archiving.

(7) Cabling for Information Technology, Security, and SCADA System Communication

(a) Attachment 14 to this Appendix shall be followed for products, general design considerations, and installation of digital communication cabling.

27. STANDBY POWER

i. Standby power shall be provided with a diesel fueled generator. The Design-Builder has proposed to meet this requirement using a 750 kW generator.

ii. Standby power shall be provided to power the following loads:

(1) any one (1) Finished Water pump (including largest capacity pump)
(2) administration facilities,
(3) interior and exterior lighting
(4) sump pumps
(5) RO flush pumps,
(6) instrumentation,
(7) compressed air supply for valve actuators,
(8) security systems
(9) critical valves

iii. Genset shall start automatically upon loss of power. Interlock with facility switchgear.

iv. Provide double wall fuel storage tank with 24 hours run time at full load.

v. Provide SCADA monitoring of genset performance

vi. Genset is to installed such that it can be tested under load on a routine basis

vii. Noise control shall comply with local ordinances and codes.

viii. Provide stairs as required to access controls and equipment

ix. Provide UL 2200 listed packaged genset

x. Provide walk-in sound attenuated, weatherproof enclosure, designed to reduce noise levels to less than 75 dBA @ 23 feet at 100% load, or local criteria whichever is more stringent. Super critical grade exhaust silencer mounted internally in enclosure. Genset and enclosure to be IBC rated for local wind and seismic conditions. Provide corrosion protection against salt in air corrosion.

xi. Provide Pritchard Brown Sound Attenuating, Weather Proof Genset Enclosure as described in Pritchard Brown Specification No. 2130. Allow Owner to select color at no additional cost to Owner.

xii. Provide synchronous, four pole, brushless generator, 105 deg temperature rise

xiii. Factory test at 0.8 lagging power factor

xiv. On-site test with load bank at 0.8 lagging power factor

28. CONTROL STRATEGY OVERVIEW

i. Design-Builder is to identify control strategies for all processes, including for the following unit processes:

(1) Beach Wells
(2) Granular Media Filtration Pretreatment and Break Tank
(3) Cartridge Filters
(4) Reverse Osmosis – Startup, Operation, Shutdown
(5) Reverse Osmosis Clean in Place
(6) Post Treatment and Stabilization
(7) Finished Water Storage and Pumping
(8) Chemical Storage and Feed
(9) Concentrate Disposal

ii. The operating requirement for the SWRO plant is continuous operation (24/7/365) at design capacity of 9.6 mgd for the base case. If a train is down for maintenance the redundant unit can be placed in service to maintain production. If the SWRO plant is shutdown or capacity is reduced for a period of time then when the system is restarted it shall have the capability to operate all equipment to produce 11.2 mgd. This will allow the system to produce 10,750 ac ft of treated water per year. A high level overview of how the system is expected to operate is summarized below.

iii. Owner distribution system needs additional water and the plant operators increase the treated water pumping rate by adjusting the treated water pump station flow setpoint or VFD speed.

iv. The level in the treated water tanks decreases and this calls for starting another SWRO unit.

v. Seawater supply wells are started and pump to waste for several minutes and then are diverted into the raw water supply pipe to an off-site seawater raw water reservoir designed by others

vi. When the level in the raw water tank begins to rise then additional offsite raw water transfer pumps are started. Concurrently the next seawater RO unit is called to start and begins allowing filtered water to flow into the SWRO unit (call to operate to purge air out of the pressure vessels and establish forward flow.)

vii. The raw water flow delivery to the desalination site increases and is pumped through the pressure filters to the Filtered Water tanks. Declining rate filtration, in conjunction with a variable service interval to maintain a setpoint differential pressure, provides energy efficient filtration and better effluent quality compared to fixed rate filtration.

viii. At a fixed service interval individual filters will be taken out of service mode for backwash. An offline filter will be brought into service as the filter to be backwashed is removed from service. When a pressure filter backwash sequence is initiated, overall filtered water production is not reduced. The filter service interval is the manipulated variable in a control system PID loop which maintains the setpoint media-filtration headloss at a fixed target value consistent with the optimum average media retentate inventory corresponding to minimum filter-effluent fouling potential. In the event of an excursion in headloss outside of allowable deadband around the headloss setpoint, the interval between last and next filter backwash will be shortened or lengthened as a step correction until operation is returned to within the acceptable deadband.

ix. The valve sequence for backwashing a pressure filter is as follows:

(1) Close raw water inlet valve
(2) Close filtered water outlet valve
(3) Open waste backwash valve to partially drain filter
(4) Open the air scour inlet valve and simultaneously start air scour blower if provided
(5) Open the backwash supply inlet valve and start backwash supply pump at slow speed
(6) Concurrent air and water backwash
(7) Stop air scour blower and ramp backwash supply pump up to high rate operator set point.
(8) After high rate backwash timer expires than ramp backwash flow rate to low stratification flow rate

(9) Close backwash supply valve and stop backwash supply pump
(10) Close backwash waste drain line and open the filter inlet valve
(11) Open the filter to waste valve and discharge filter to waste for a fixed interval corresponding to adequate forward rinse.
(12) Close the filter to waste valve and either open the filtered water discharge valve to return the filter to service or close all valve to put the filter into stand-by

x. As the water level in the Filtered Water Tank rises the next SWRO Train ERD booster pumps start to ramp up to speed. Practically all of the low pressure feed water flow through the pressure vessels and is discharged as brine since the feed pressure is less than the osmotic pressure and there is minimal permeate production. After flow has been established through the SWRO train and ERD system, feed water pump starts at low speed and begins to ramp up to the pre-set speed set point initiating permeate production. As the feed pressure increases the ERD transfers pressure from the brine to the ERD feed water flow and the ERD booster raises the pressure to match the feed water pump discharge pressure. The speed of the Feedwater Pump continues to increase until permeate flow rate is achieved. Brine discharge valve, ERD booster and feed water pump speed are adjusted until the specified ERD parameter values and permeate flow rate and recovery of 42% are achieved.

xi. The treated water, seawater supply and treated water pumps are designed to operate in 1.6 mgd increments.

xii. Each SWRO unit has a low TDS permeate discharge and a high TDS permeate discharge. The high TDS permeate discharge can be up to 40% of the overall permeate production in the base case. The flow split is controlled by adjusting the VFD speed for the BWRO feed water pumps until the desired permeate production is a achieved. There are numerous interlocks on the number of units operating and minimum flow rates per unit.

xiii. Need approximately 15 minutes to start a large seawater RO unit, so the degree of overlap between the seawater RO units and the seawater supply wells or raw water supply pumps will need to be closely timed.

xiv. Low TDS permeate from the SWRO units is combined with the permeate from the 2nd Pass BWRO units to produce an average blended permeate with less than 0.5 ppm of boron and 60 ppm of chlorides. Available residual pressure from the SWRO Units is used to push the blended permeate (9.6 mgd at design capacity) through the UV disinfection system to post treatment stabilization area. The permeate is either discharged to the Calcite contactor tanks or dosed with lime. If the calcite contactors are used then the blended permeate flow is split using a passive hydraulic flow splitting. After passing though the calcite bed the flow is discharged from the calcite tanks and flows by gravity to the Treated Water tanks after final pH trim with CO2 and 50% caustic soda.

xv. Brine from the 1st pass RO is discharged directly to the discharge force main at a pressure of 15 psi and flow directly to the junction box at the Monterey Regional WPF. Brine can be discharged to the Brine EQ basin for 5 hours when the plant is producing 9.6 mgd of treated water.

xvi. Brine from the 2ed pass BWRO units can be discharged directly to the Brine discharge force main or returned to the Filtered Water Inlet pipe where it enters the SWRO Building.

xvii. The raw water sodium hypochlorite feed rate is based on an operator dosage set point and flow paced

xviii. Sodium Bi-sulfite federate is based on chlorine residual, flow rate and dosage set point

xix. Scale inhibitor is based on Filtered Water flow rate and operator set dosage

xx. If used the sulfuric acid feed to the SWRO feed water is based on operator dosage setpoint and flow paced

xxi. Permeate UV dosage is determined by the operator and input into the equipment supplier control system. UV lamp intensity and number of lamps is controlled by the Vender control panel

xxii. Lime Dosage is based on operator lime dosage setpoint and flowrate

xxiii. CO2 dose and feed rate is determined by operator set pH and flowrate

xxiv. Polyphosphate, ortho-phosphate or phosphoric acid is injected into the treated water pipe based on operator dose setpoint and treated water flowrate

xxv. Treated water sodium hypochlorite feed rate based on operate setpoint, flowrate, and chlorine residual.

xxvi. The on-site hypochlorite generation is controlled by the vender supplied package system PLC based on hypochlorite tank level. When the hypochlorite level drops below the operators defined set point the generator(s) start and refill the tank.

xxvii. There are control loops for the Brine EQ Basin Pump station and the Backwash reclamation Pump station. These are independent of the SWRO treatment plant control sequence

xxviii. When there is a loss of power, the emergency generators starts and is used to operate the permeate flush pumps and SWRO unit flush valves.

xxix. During a normal shutdown of an SWRO unit with power the SWRO unit is flushed with filtered water to remove high concentration of salt from the membrane array and brine piping. After the filtered water flush the operator can initiate a permeate water flow to future purge the unit of water with high dissolved solids.

29. PROCESS CONTROL

a. Table 2-43 identifies sample points, analyzers, and points of chemical addition.

Table 2-43 Process Control

Process	Chemical	Chemical Addition		Continuous analyzers	
		Continuous	Intermittent	Flow requirements	Disposal
Pretreatment iron removal	Sodium hypochlorite	X		Chlorine residual analyzer	Waste sump
Filtered Water dechlorination	Sodium bi-sulfite	X		• Chlorine residual analyzer • ORP	• Waste sump • NA
Seawater RO Feedwater	Scale Inhibitor	X		No analyzer	
Seawater RO pH adjustment	Sulfuric acid		X	pH	NA
Brackish Water pH adjustment	Sodium hydroxide	X		pH	NA
RO Permeate Stabilization	Lime or Calcite	X		pH Alkalinity	NA Septic
RO Permeate pH adjustment	Carbon dioxide	X		pH	NA
Finished Water Disinfection	Sodium hypochlorite	X		Chlorine residual analyzer	Waste sump
Finished Water corrosion control	Phosphoric acid or orthophosphate	X		No Analyzer	NA

30. INSTRUMENTATION AND CONTROL

a. The key reference drawings in Attachment 12 to this Appendix associated with this section are:

- I-47 SCADA NETWORK BLOCK DIAGRAM
- I-48 PLC COMMUNICATION ARCHITECTURE

b. General

i. The treatment and pumping facilities shall be operated through a distributed instrumentation and control system (the “DCS”), also termed SCADA, allowing for automated and manual control of the overall system, subsystems, and individual pieces of equipment. Control logic will be distributed throughout the control network and will be designed in a manner to allow sub-systems to operate independently of communications to other PLCs and computers. The HMI computers are to be used for monitoring and operator input only; all control logic is to reside within the PLCs. The HMI software is to be designed in a redundant configuration so that loss of a single computer does not interrupt operator monitoring or control. Two databases will be maintained for historical data, alarm history, and SQL information.

ii. The Design-Builder shall procure the services of a single process control system supplier and integrator (the “Integrator”) to furnish and install the process control system.

iii. System Architecture: The process control system for the proposed facility shall consist of PLCs located in all major process areas communicating via fiber optic cable to a WTP central control and monitoring facility located in the administration facilities.

iv. The following codes and standards shall apply to design and installation of instrumentation and control system:

(1) National Electrical code (NEC)
(2) National Fire Protection Association (NFPA)
(3) International Society of Automation (ISA)
(4) American National Standards Institute (ANSI)
(5) National Electrical Manufacturers Association (NEMA)
(6) Underwriters Laboratories, Inc. (UL)
(7) Factory Mutual Global (FMG) where required

c. Tables 2-44 identifies the Design and Construction Requirements and the Design-Builder's means and methodology for meeting the Design and Construction Requirements of this section.

Table 2-44 DCS System

Parameter	Design and Construction Requirements	Means and Methodology
Control System Standards	Distributed Control Concept, where process is controlled by a PLC in that area. The control program is resident in the PLC, while control set points can be adjusted through the operator workstations or HMI Operator Interface Terminal (OIT)	
System Configuration	Redundant HMI Servers and workstations so that loss of a single computer does not interrupt operator monitoring or control	
Redundant Database	Two database will be maintained for historical data, alarm history and SQL information	
SCADA Hardware and Software	• 1 iFix Server, unlimited tags, redundancy, developer • 1 iFix Server, unlimited tags, redundancy, runtime • 1 iFix Developer client (MS Office Software includes) • 2 iFix Runtime clients (MS Office Software includes) • 1 Proficy Historian Server, 1000 tags, redundant iFix collectors, calculation collector, OPC collector	GE-Intellution iFIX is listed as HMI Software Manufacturer in Appendix 2, Attachment 4, Typical Equipment Manufacturer (Page B-4)
PLC Hardware and Software	PLC will be Allen-Bradley CompactLogix PLC for a minor process and A-B ControlLogix for a larger process. The software for the proposed PLCs will be RSLogix 5000	

Parameter	Design and Construction Requirements	Means and Methodology
Network Architecture	PLCs are to be interconnected using an Ethernet network. Network connections between buildings will be through Ethernet to fiber converters and fiber optic cables. A self-healing fiber optic ring is provided to maintain a high degree of reliability in the control network	
Remote Wells Communication	Communication to the remote wells will be Ethernet TCP/IP via fiber optic (FO) cable. Off-site FO cable installation and PLCs including programming for control of the wells pumps are provided by other. Control strategy for the wells and data (transmitting/receiving) from wells to the treatment plant will be developed by the treatment plant designers.	
Communication with MRWPCA	Digital communication/spread spectrum radio link with MRWPCA will be provided to monitor and control the RO concentrate from the plant discharged to the MRWPCA	
Instrumentation	In the interest of standardization, instruments will be selected to maximize interchangeability across similar process functions within the plant, thus minimizing maintenance requirements and spare parts.	Instruments for the packaged systems will be provided by the vendors per their recommendations.
Power Quality Metering and Protective/Monitoring Relays Monitored through SCADA	Power quality meters and monitoring/protection relays are to be interconnected using a separate Ethernet network with Ethernet/Modbus TCP/IP Protocol such that power consumption and electrical parameters are monitored through SCADA	

d. Programmable Logic Controllers (PLC):

i. Process controllers shall be Allen Bradley – Logix Series. All OEM Equipment requiring controllers shall also be Allen Bradley.

ii. PLC Cabinets: Include compact lighting fixture activated by a door switch. Each PLC shall have a UPS. PLCs shall be located indoors in a controlled environment with fans and heaters wherever possible. PLCs located outdoors shall have outdoor rated enclosures (NEMA 4X, SS) with sunshades, thermostatically controlled heaters and cooling.

iii. Network: PLCs are to be interconnected using an ethernet network. Network connections between buildings will be through ethernet to fiber converters and fiber optic cables. A self-healing fiber optic ring will be created to maintain a high degree of reliability in the control network.

iv. Keypads: No keypads shall be used; OITs are preferable. Provide a touch-screen type operator interface unit on suitable cabinet.

v. Terminal Blocks: multilevel terminal blocks are permitted

vi. Spare Wired Terminals: Provide a minimum of 20% of each I/O type in each cabinet.

vii. Convenience Receptacles: Puse ground-fault interrupter type or RVSS as applicable to the installation.

viii. Separation of Power Cable and Signal Wires: 120VAC control cable shall be physically separated from 4-20 ma signals and 24 volt cabling as much as practicable inside control cabinets; provide barriers for compliance with ISA standards. Field wiring into the control panel, including junction boxes, shall be labeled as per the P&ID drawings (not wiring numbers).

ix. Number of I/O slots: As required plus minimum 20% spare

x. 3 Wire Control of Motors: Required for all motor driven equipment; consisting of one normally-closed contact for stop and one normally-open contact for start, etc, except for chemical metering pumps.

xi. Modulating valves: Analog control with full open and full closed feedback or open/closed control with position feedback and full open and full closed feedback.

xii. Fieldbus valve control and communication is not permitted.

xiii. Analog inputs shall be 4-20 ma; discrete inputs shall be 24 VDC. Isolated dry relay contacts shall be furnished for all discrete outputs-relays may be integral to the I/O module. Interposing relays shall be furnished in cases where the I/O module relay contacts do not have adequate electrical ratings.

xiv. I/O modules: provide high density I/O modules

xv. Arc Flash Safety: Instrumentation is to be separated from power in separate enclosures. 480 volt starters shall not be located within instrumentation enclosures.

e. Uninterruptible Power Supply (UPS):

i. A central UPS power supply shall be furnished to serve the control room personal computers, printers and server room, switches, routers, firewalls and other network equipment. The UPS equipment shall include a static bypass switch along with a separate maintenance bypass switch to fully isolate the unit for maintenance and/or replacement.

ii. The bypass feed shall be provided with transient voltage surge suppression and shall be served from a shielded isolation transformer to provide "clean power" to this system.

iii. Provide the UPS equipment with IP communication to the HMI for status and alarm reporting. Minimum reporting shall include alarms for overload, equipment over temperature, low batter, load on bypass and load transferred to the maintenance by-pass.

iv. All PLCs and analyzers containing programming shall be powered from individual UPS units provided with each enclosure. UPS's for PLCs and field analyzers shall be mounted in the PLC panels as applicable. AC power source to be provided from normal/standby power system.

v. UPS Power Duration; The UPS shall provide a minimum of 15 minutes of backup power.

f. Operator Interface Hardware and Software

i. Human-Machine Interface (HMI) software shall be GE-Intellution iFIX.

ii. LAN Connection: shall be provided in all control panels using 8 port DIN rail mounted ethernet switches. LAN connections shall be wired to a separate network independent of the SCADA LAN and the Business WAN.

iii. Local Area Network: Personal computers and printers shall be placed on a process control local area network ("LAN"). The LAN shall be implemented using ethernet type cards in each operator interface personal computer. The LAN shall be interconnected to various computers using a 100-base T stackable hub. The cable between devices on the LAN shall be a Category 6 type cable or fiber optic cable. LAN cables between devices in different buildings shall be fiber optic.

g. Modes of Operation:

i. Each piece of process equipment is to be equipped with a local-off-remote selector switch (at the piece of equipment) to allow the location of control to be changed. In order to ensure that the RTU/PLC in the remote manual or remote automatic mode has control, an additional contact block will be added on the remote leg of the selector switch. The output of the contact block will drive a digital input that will serve as a permissive in the DCS. If the DCS attempts to control a device from the RTU/PLC when it is not in the remote mode, a failure condition will be delineated at the operator interface. Equipment furnished as part of a package system with a local control panel may not require individual LOR selector switches.

ii. Local-Manual: An operator at a piece of process equipment will turn the device on and off and make adjustments. Required for all equipment.

iii. Local-Automatic: Controls are hardwired into pieces of equipment by a vendor (such as prepackaged process equipment).

iv. Remote-Manual: An operator turns items on and off via the operator human machine interface (the "HMI") connected to the DCS.

v. Remote-Automatic: The DCS turns items on and off and performs all control while monitored thru the HMI. Required for equipment as necessary for overall plant coordinated control.

h. Operator Interface Functions

i. Screens: The Design-Builder, following consultation with the Owner, shall include paragraph descriptions of the OIT and HMI screens (including a listing of each specific I/O point required on each screen) to give the system integrator an understanding of the level of detail required. Each screen shall utilize the Owner's standard color conventions for stop, run, open, closed and intermediate conditions. Text based screens shall be considered in the design. An operator (or supervisor only) shall have the capability to manually enter data onto the screen that is not generated by the system, but is appropriate to be displayed on a screen, such as a manual valve change for a chemical feed point of application. Control programs shall include limiting parameters for operator inputs, such as chemical feed dosages to prevent excursions. Only supervisors are to have access to modify those parameters. Provide a list of all screens to be created by the system integrator. Provide sample screens to establish the standard for layout and acceptable level of detail.

ii. Reports: Reports shall be generated to summarize plant operation, electrical consumption, water production, chemical inventory, and regulatory compliance. The reports shall be accomplished by creating the forms in Microsoft Access (latest release) format and downloading data directly from the system. When data that is not generated by the system is required on certain forms, the operator shall have the capability to manually enter this information into the report, or overwrite data that the system has downloaded. Assume that ten (10) reports are required with the ability to update them on a daily, weekly, monthly, quarterly, and annual basis as well as month and year to date basis.

iii. Alarms: An alarm summary table shall be developed by the Design-Builder and reviewed with the Owner during design. The table shall include specific initial values for all high and low alarm set points. Analog set points are also to be configurable on the graphic displays. The specific alarm software package that is ultimately selected must have auto dialing capabilities such that alarm conditions can notify on-call personnel without the need for separate auto dialer. Operators shall not be permitted access to modify alarm setpoints without special authorization.

iv. Database: Provide a SQL database package to store process data and act as a server to database users outside the process control system.

i. Factory Acceptance Test ("FAT")

i. The Owner and Design-Builder shall witness a complete FAT of the control system prior to its shipment to the Project Site. The specifics of the FAT are described in Appendix 4.

j. On-Site Testing

i. Specifics of on-site testing are described in Appendix 4.

k. Training:

i. Operator Training is to be provided to the Owner's staff to operate the Design-Build Improvements through the control system;

ii. Maintenance training to maintain the hardware of the control system;

iii. Administrative training to make basic security related changes.

iv. Specifics of training are described in Appendix 4..

l. Calibration Plan:

i. It is expected that a detailed calibration plan is to be developed during the construction phase (testing and commissioning) of the Project.

m. Protection of Sensitive Equipment

i. General: The Design-Builder shall follow the guidelines for powering and grounding of sensitive electronic equipment listed in IEEE Standard 1100-1999.

ii. Transient Voltage Surge Suppression (TVSS): Provide TVSS at point of use for all instrumentation loads. Required for all 4 wire instruments (such as chlorine analyzer), and placed on the 120VAC branch circuit and on the 4-20 mA portion of the circuit. The transient voltage surge suppression on the 4-20 mA wiring shall be located on the PLC end. For all two wire 4-20 mA instruments that have signal cable running from outdoor to indoor locations (or signal wire between buildings) transient voltage surge suppression on the field side of the 4-20 ma signal is required. All analog signaling shall be shielded cable.

iii. Grounding: Each PLC cabinet shall be provided with a direct connection to the ground grid via a driven rod in addition to the equipment safety ground required by the National Electrical Code. Daisy chaining of grounds is not acceptable if it is the only grounding source. A grounding detail showing the interface between the PLC cabinet and the proposed grounding system is required. Instrumentation shields shall be grounded at the PLC end only. The electrical grounding specifications must be cross referenced to the instrumentation and control specifications so that it is understood that the system integrator monitors the quality of system grounding. In order to facilitate an electrically active ground mass, provide connections to structural steel and interface them to the grounding system.

iv. Power Supplies: Separate power supplies shall be provided for analog inputs and PLCs, and digital outputs.

v. Conduit Spacing: Required between power and signal/control cables as listed in IEEE 518-1982.

vi. Enclosures shall be located away from chemicals and sources of moisture to the extent possible. Where enclosures are located in the vicinity of chemicals, provide fiberglass NEMA 4X enclosures with non-metallic hinges and latches.

n. Field Devices:

i. The following is a partial listing of the field instrumentation required.

ii. General: Output to be 4-20 mA with HART protocol where possible. Display shall be in engineering units. Mount indicator at height and location for ease of access and clear view. Provide remote indicator when warranted. Provide calibration accessories. Preferred manufacturers are provided elsewhere. All transmitter analog signals are to be input to SCADA for monitoring, trending, and logging.

iii. Pressure Transmitters: Microprocessor type; accuracy: 0.075% of span; Provide 3 valve manifold to allow field calibration check.

iv. Differential Pressure Transmitters: Microprocessor type; accuracy: 0.075% of span; Provide 5 valve manifold to allow field calibration check.

v. Flow Meters: Process flowmeters are to be magnetic type. Provide upstream and downstream straight run of pipe to allow high measurement accuracy. Provide grounding rings and ground per manufacturer’s recommendation. Provide removable electrodes where coating is possible. Meters shall not be submerged or direct buried. Provide remote indicator as needed. Select appropriate materials of construction.

vi. Level Transmitters: Provide ultrasonic or radar type to continuously monitor level. Units shall be corrosion resistant with appropriate rated enclosures.

Provide local indicator at ground level. Install per manufacturer's recommendations.

vii. Use of Pressure Transmitters for Level Sensing: A pressure transmitter may be used to sense water level where an ultrasonic or radar transmitter is not appropriate. Provide pressure indicator adjacent to transmitter.

viii. Level Switches: Level switches, independent of continuous level monitors, are required where overflows could occur. Level switches are to be used to sense and alarm when fluid has entered a sump. RF admittance type, with self test feature, are preferred in most applications.

ix. Weight Transmitters: Certain tanks (day tanks) shall be weighed to determine loss-in-weight over time to calculate/verify chemical feed rate.

x. Analytical Instruments: Analytical instruments include conductivity, pH, turbidity, ORP, particle count, and residual chlorine. Final selection of instruments to be made with consultation of Owner. Mount and provide sample supply, and sample conditioning for good operation. Where possible, provide digital output to SCADA for analytical instrument self diagnostic.

o. Control Panels

i. Design-Builder has prepared the preliminary schedule of control panels for the project and identified which CSI Division (Div 11, Div 13, Div 15, Div 16, etc) has primary responsibility for each panel. Control panels provided by vendors shall meet a consistent standard of design to be specified by Design-Builder with common equipment to the extent possible.

ii. Table 2-45 identifies the Design and Construction Requirements and the Design-Builder's means and methodology for meeting the Design and Construction Requirements for the control panels.

Table 2-45 Control Panel Schedule

Parameter	Units	Design and Construction Requirement	Means and Methodology
Pre-treatment PLC Control Panel	PLC-001	Division 13	
Treatment Plant Main PLC Control Panel	PLC-100	Division 13	

Parameter	Units	Design and Construction Requirement	Means and Methodology
RO Master PLC Control Panel and Remote I/O Panels	PLC-200 RIO-211 RIO-212 RIO-213 RIO-214 RIO-215 RIO-216 RIO-217 RIO-221 RIO-222 RIO-301	Division 11	Vendor Supplied Panels
Chemical/Brine Systems PLC Panel	PLC-300	Division 13	
On-Site Sodium Hypochlorite Generation and Feed Systems PLC Control Panel	PLC-400	Division 11	Vendor Supplied Panels
UV System PLC Control Panel	PLC-500	Division 11	Vendor Supplied Panels
CO2 System PLC Control Panel	PLC-600	Division 11	Vendor Supplied Panels
Post Treatment System PLC Control Panel	PLC-700	Division 11	Vendor Supplied Panels

31. PHYSICAL SECURITY, ELECTRONIC SECURITY AND SPECIAL SYSTEMS

i. The design of the Design-Build Improvements is to include implementation of physical facility protection features to deter, detect, and delay vandals, criminals, saboteurs, and insider threats.

ii. The Owner will provide input on security design at appropriate points during the design phase.

iii. The Owner will provide cyber protection and implement management practices.

iv. Site Fencing: The Project Site is to be fenced; 6 ft high fence, PVC coated galvanized steel for salt air corrosion protection. Architectural grade fencing is to be provided within 50 feet, either side, of the main entrance.

v. Gate: The main entrance is to be equipped with closed circuit camera, intercom, lighting, and card access. The gate is to be electrically actuated and shall be slide type with electric actuator manufactured by HY Security.

vi. All wiring and cabling is to be run in conduit and protected from tampering.

vii. Site Lighting: To be designed by the Design-Builder for safety and security purposes in accordance with local requirements and expectations, and to allow proper functioning of security cameras.

viii. Security features are to be incorporated into hatches, vents, and overflows on all water storage tanks

ix. Signs are to be placed at 50 ft intervals around the Project Site perimeter; wording to be determined by the Owner.

x. Chemical fill lines are to be locked.

xi. Site Areas:

(1) The outdoor electric service equipment is to be protected with anti-climb security fencing and provided with intrusion detection.
(2) Critical pumping equipment areas such as Finished Water pumps and filtered feedwater pumps that are located outdoors are to be protected with anti-climb security fencing and intrusion detection.
(3) Wastewater clarification and recycling areas are to be fenced and provided with intrusion detection.
(4) Concentrate equalization basin is to be fenced.

xii. Vehicle parking is to be away from the building.

xiii. Enterprise Electronic Security System

(1) The Owner shall extend its company wide EESS to the Project Site and the facilities on the site. The system shall include both an electronic security system and an electronic fire alarm system.
(2) The system shall be designed by the Owner's security subcontractor, Tyco, Inc. Tyco will provide design and installation details during the design phase.
(3) All buildings shall have an electronic access system. Card readers will be used to control access to buildings.
(4) Tyco shall furnish and install the terminal devices such as cameras and card readers.
(5) Security Cameras – The Design-Builder is to assume that up to 20 cameras will be provided. Cameras are IP type. Cameras will be located indoor and outdoor.
(6) External Doors – All external doors will be monitored electronically. Some doors will be equipped with card swipe entry devices. Some doors will be exit only. Each external door shall require four (4) low voltage cables (3-18/6, and 1-16/4) with back boxes. Final placement of back boxes will be based on the Tyco design and per Tyco design typical details.
(7) Internal Doors- Internal doors that bound the secure portion of the administration area shall be equipped with card swipe entry devices to prevent unauthorized access to process areas such as control room, computer room, etc.
(8) Glass Break System: Rooms with glass windows shall be monitored with a glass break detection system. These devices shall be wired per Tyco design typical details.

(9) Motion Detection System: The Owner shall locate motion detectors when room layouts are complete. For the purposes of the Proposal, the Proposer is to assume at least twenty (20) motion detectors are to be provided

(10) Security Panel and Computer Server Room (SCPS Room): Security panels shall be located in a secure room. All monitoring devices shall be routed as "home runs" to the security panels. All fiber optic cabling shall be routed to the SCPS room. This room shall also contain the network routers and equipment which will be provided by CAW. The room shall be a minimum of 10 ft by 15 ft. The room shall be temperature and humidity controlled.

b. Electronic Fire Alarm System:

i. The facility shall have an electronic fire alarm system installed by Tyco and manufactured by Edwards. All wiring, cabling, and conduit shall be provided by the Design-Builder. The Design-Builder shall base the amount of devices on a fire code compliant fire alarm system.

c. Telephone and Intercom System:

i. All telephone and intercoms devices shall be IP based and provided by the Owner. The Design-Builder shall assume 20 telephony locations.

32. LANDSCAPING AND IRRIGATION

i. Design-Builder has prepared a landscaping and irrigation/xeriscaping plan for the site.

ii. The Design-Builder has developed a landscaping and irrigation plan for the site and is located in the proposal drawing in the Architectural section. The landscaping plan includes an agricultural education garden. All of the plantings will be low water use plants for the entire facility. The beds between the buildings will be raised to seat height (16 or 18 inches), while the long beds at the street edge will be flush with grade. The materials for the raised beds will be decorative CMU block and are 12 inches wide with 14 inch wide cap. The entry path and overlook include more refined yet local materials, while the surrounding landscape will be simpler and natural in character and will have stabilized decomposed granite and driftwood (salvaged) wood walk over bioswale catchment area. The gardens will be planted with strawberry, kale, onion, artichoke and the plantings would be in raised beds. The planting would go in as flats or 4-in pots and be planted in a certified organic top soil/planter mix suitable for crops. The beds will be open to grade with some allowance for in-bed drain inlets should compaction limit natural drainage. The bioswale catchment area will contain a shallow basin 18 inches deep filled with sedges (4-inch pots at 12 or 14 inches on center). The sedges will follow the flow line. The edges and surrounding landscape will be back dune/maritime chaparral and is a combination of open sand with seasonal windflowers and low mounding shrubs such as manzanita. A drip irrigation system will be included in the construction estimate.

b. The key reference drawings in Attachment 12 to this Appendix associated with this section are:

- A-9 LANDSCAPE PLAN

33. SITE DEVELOPMENT

a. The key reference drawings in Attachment 12 to this Appendix associated with this section are:

- C-1 PROPOSED SITE PLAN
- C-2 SOIL BORING PLAN
- C-3 PAVING AND GRADING PLAN
- C-4 YARD PIPING PLAN
- C-5 FUTURE SURFACE WATER INTAKE OPTION
- G-7 HYDRAULIC PROFILE – 9.6 mgd BASE CASE WITH PRESSURE FILTERS

b. General

i. Site layout has a number of design considerations including cost, hydraulic profile, security, aesthetics, considerations for future improvements, and operations.

ii. The RO process is modular and allowance is to be made for expansion to 12.8 MGD.

iii. An area of the site is to be identified for potential installation of seawater pretreatment facilities.

iv. Paved roadways are to accommodate large loads of liquid treatment chemicals. Turning radii are to be suitable for the size of trucks and trailers. The chemical unloading area is to be on a slight upward grade to allow for drainage to the rear outlet of delivery vehicles.

v. The following items are generally not aesthetically pleasing, and should not be featured prominently to visitors:

(1) Chemical unloading
(2) Electrical service substation
(3) Aboveground Finished Water storage
(4) Wastewater treatment facilities

vi. Exterior lighting is to be appropriate for the location and comply with local codes, but also be sufficient for security.

APPENDIX 2, ATTACHMENT 1

AMERICAN WATER ENGINEERING STANDARD
T2: LIQUID CHEMICAL STORAGE, FEED, AND CONTAINMENT

Liquid Chemical Storage, Feed, and Containment

INTRODUCTION

Background

Water treatment chemicals are generally stored and fed in a concentrated form with many being strong acids or bases. While these chemicals are necessary to provide a safe potable water, mismanagement of the chemicals can have injurious consequences to the water consumer, company personnel, and the environment. In addition, many of these chemicals can damage company facilities if the proper equipment and safeguards are not provided.

Scope

This Standard covers the design of liquid chemical storage, feed, and containment facilities. The standard is meant to be used by engineers and other experienced personnel in the basic design and modification of liquid chemical systems. Selecting materials of construction and sizing of components are two examples where technical expertise is required. Guidelines for prioritizing improvements to existing chemical storage and feed systems are presented.

The contents of the Standard go beyond the minimum requirements of Ten State Standards by providing increased protection to consumers, company personnel, water company facilities, and the environment.

Purpose

An engineering standard is necessary to accurately demonstrate the required features of liquid chemical systems to consultants and water company staff involved in maintaining, modifying, and installing such systems. The Standard's goal is to minimize risk to consumers, workers, and the environment by presenting a standardized, proven method of storing, feeding, and containing liquid chemicals. Alternative designs must be carefully evaluated against the Standard before implementation and must not increase the risk of accidental chemical release, or increase the likelihood of human or environmental exposure to the chemical.

REFERENCE

1. Recommended Standards for Water Works (Ten State Standards)

TECHNICAL CONTENTS

Liquid Chemical System Elements

Description of Liquid Chemical System Elements

1. Materials of Construction

Materials used in chemical systems for tanks, piping, fittings, gaskets, hoses, protective coatings, in-situ instrumentation, etc. must be appropriately selected for each chemical. Material selection charts, chemical suppliers, and equipment vendors are a good source of chemical resistance information. Some water treatment chemicals may be mixtures, or may contain impurities that can increase corrosivity.

2. Safety Requirements

Identification of tanks, piping, and other equipment is necessary to make operators, maintenance personnel, and other workers aware of the chemicals being handled. Identification of chemicals and availability of material safety data sheets (MSDS) is an Occupational Safety and Health Act (OSHA) requirement as well as a state requirement in many cases.

Storage tanks and tank fill lines must be identified with signage identifying the usable capacity of the tank, contents of the tank, chemical hazards, and recommended safety gear.

Access to the fill connection for bulk tanks be must be restricted to prevent unintentional filling. Suggested hardware includes uniquely keyed locks through the fill connection flange or locked covers over the connection.

Piping is to be color coded according to Ten State Standards and identified with labels indicating the chemical with arrows pointing in the normal direction of flow. Pumps are to be identified to avoid possible confusion during operation or maintenance.

Eyewashes and/or emergency showers are to be provided for all liquid chemicals, and located adjacent to the chemical equipment. Proper protective clothing such as aprons, gloves, and eye protection must be provided.

3. Bulk Storage Tanks

Bulk storage tanks are provided where the chemical consumption justifies bulk storage over drum storage, or where the chemical being handled is particularly corrosive and handling of drums would be a safety hazard. Bulk storage tanks are generally sized for 31 days of storage at a maximum dose and average treated water flow, or average dose and maximum treated water flow, whichever is larger. Alternatively, for smaller facilities sizing is to be 125 - 150 % of a bulk shipment of chemical. Sizing for larger facilities should consider the normal delivery quantity and the local time required for delivery. Federal, state, and local regulations governing chemical storage may also be a factor in sizing bulk storage tank capacities.

Bulk storage tanks shall be constructed of high density cross linked polyethylene (HDXLPE) or be an appropriately lined steel tank. Fittings for HDXLPE tanks shall be bolted through the wall style with appropriate bolt and gasket materials. Storage tanks are to be equipped with a fill line, vent line, overflow, and discharge connection. Other accessories include nozzles for continuous level measurement, high level indication, and gasketed hatch. The function of the hatch is primarily for tank inspection, rather than tank entry. A means of access to the hatch, such as a ladder, should be provided.

A near-instantaneous means of determining tank level is to be provided. It is recommended that low level and high level alarms should also be provided. An independent high level switch indicating imminent tank overflow is required with local audible alarms that can be heard at the filling station. The high level switch, independent of the continuous level monitor, is required because of concern for the potential for miscalibration of the continuous level system resulting in a chemical overflow.

Tank overflow must be directed to secondary containment. In cases where the chemical has suspected corrosive or injurious vapors or mists such as hydrofluosilicic acid, ammonium hydroxide, and sodium hypochlorite, the overflow pipe must be fitted with a low headloss, vaportight check valve (flap valve, or Red Valve Series 33 Tide Flex Valve) to allow overflow while preventing the discharge of vapors.

All chemicals with the potential for corrosive or injurious vapors or mists are to be vented to the exterior. In general, this includes hydrofluosilicic acid, ammonium hydroxide, and sodium hypochlorite. The vent line shall not function as the overflow.

It is recommended a remotely actuated valve be installed on or near the tank outlet to allow the bulk tank to be safely isolated in the event of a leak. Without such a valve, personnel would be required to enter the containment area to operate a manual isolation valve which could expose personnel to considerable safety hazards.

4. Transfer Pumps

Transfer pumps are to be provided to deliver chemical from bulk tanks to day tanks or batch tanks. Transfer pumps provide control and safety in the transfer process as flow can be halted electrically from outside of the containment area. Transfer pumps may be of several types; centrifugal, positive displacement, drum pumps for small systems, etc. Redundant installed pumps are required for disinfectants and primary coagulants, and recommended for other chemicals. A single installed transfer pump is allowed for disinfection and primary coagulants if the production facility can be taken off line for repairs or replacement. Where only one transfer pump is installed, a second pump is to be held in inventory as a spare. A bypass around the transfer pump is not allowed, as it defeats the purpose of the transfer pumps.

Continuous local operator supervision of the transfer process is preferred. Typically, this is accomplished with a hold-to-run (momentary contact) push button switch. Transfer pumps are typically sized to fill the day tank within two minutes to avoid operator fatigue.

For day tanks larger than 100 gallons, a two minute fill period would require high capacity transfer pumps. High capacity transfer pumps have an inherent safety concern because of the rate of transfer, and are expensive. For day tanks larger than 100 gallons, automatic shutoff of the transfer pumps may be employed if the following conditions are met: 1) secondary containment is provided, 2) a high level sensor, a critical high level sensor, and a spill sensor are provided and interlocked with the transfer pump to provide at least three levels of overfill protection. With automatic shutoff, transfer pumps are to be sized to complete the transfer operation within 30 minutes.

Automatic start of the transfer pumps is not allowed under Standard T-2. Any deviation from the manual fill procedures outlined above must be developed through System Engineering.

Discharge piping from the transfer pumps is to be configured to prevent gravity flow or siphonage from the bulk tank. The fill piping downstream of the siphon break must be sized for gravity flow. See the schematic in Appendix A for the recommended piping configuration.

Direct piping from the bulk tank, through the transfer pumps, to the day tank, without an air break is permitted only for viscous chemicals such as polymers.

5. Day Tanks

A day tank is a refillable storage vessel smaller than a bulk storage tank, which directly supplies metering pumps. Day tanks serve two purposes: (1) to allow accurate determinations of chemical use, and (2) to minimize the volume of chemical which can be accidentally discharged into the treated water.

Day tanks are required when bulk storage is provided.

Day tank sizing is to be based on 125% (including freeboard) of the daily volumetric requirements of the maximum dose for the average daily treated water volume, or the average dose for the maximum treated water volume. Where chemical doses have a wide range, resulting in large day tanks, day tanks may be downsized and refilled more than once per day when high chemical demands are experienced.

Day tanks are to be equipped with a vented fill line, vent line, overflow, drain, and discharge connection. Other accessories include continuous measurement of level or weight, and an independent high level switch or probe. With many chemicals it is beneficial to provide a sight glass which can be cleaned to indicate liquid level.

Day tanks may be constructed of any chemically compatible material. Care should be taken when piping the day tank overflow to not allow the liquid level to rise such that the hydrostatic head exceeds the tank's design rating.

All chemicals with the potential for corrosive or injurious vapors or mists are to be vented to the exterior. In general, this includes hydrofluosilicic acid, ammonium hydroxide, and sodium hypochlorite. Tank overflow must be directed to secondary containment. In cases where the chemical has suspected corrosive or injurious vapors or mists such as hydrofluosilicic acid, ammonium hydroxide, and sodium hypochlorite, the overflow pipe must be fitted with a low headloss, vaportight check valve (flap valve, or Red Valve Series 33 Tide Flex Valve) to allow overflow while preventing the discharge of vapors.

Continuous level or weight monitoring is recommended with alarms for high and low level in the day tank. An independent high level switch indicating imminent tank overflow is required, with local audible alarm.

The day tank fill line is to be piped and vented to prevent the possibility of gravity flow or siphonage from the bulk tank to the day tank. See the schematic in the Appendix A for recommended piping configuration. Direct piping is allowed only for viscous chemicals such as polymer.

6. Metering Pumps

Where facilities cannot be taken off line, redundant installed metering pumps are required for disinfectants and primary coagulants, and recommended for all other chemicals. Where only one pump is installed, a second pump is to be held in inventory as a spare.

A calibration cylinder is to be provided on the suction side of the metering pumps to permit accurate determination of the pump's delivery rate.

Metering pumps that have the ability to produce pressures higher than the piping system can withstand, such as motor driven positive displacement metering pumps, must have a pressure relief valve on the discharge of each pump head. No valve may be located between the pump and the pressure relief valve.

Where pumps are feeding against low pressure, a backpressure/anti-siphon valve must be provided to help the pump deliver accurately, and prevent siphoning or gravity flow through the metering pump.

7. Special Valves

Special valves are needed to prevent siphonage, maintain backpressure, and provide pressure relief.

<u>Backpressure Valve</u>

A backpressure valve maintains a steady backpressure against a metering pump to ensure accurate delivery. A second function of this valve is to help prevent siphonage or gravity flow of chemicals from the day tank through the metering pump.

The backpressure valve consists of an adjustable spring loaded diaphragm and seat. The anti-siphon action is lost if the seat becomes fouled. <u>Therefore the backpressure valve requires preventive maintenance and periodic testing</u>.

<u>Pressure Relief Valve</u>

Where positive displacement metering pumps capable of pipe bursting pressure are used, a pressure relief valve is to be used upstream of the first valve on the metering pump discharge. The discharge of the pressure relief valve is to be directed to the day tank or drum. Some pressure relief valves also have a bypass feature to assist in priming the pump.

<u>Anti-Siphon Valve</u>

Anti-siphon protection is required for all liquid chemical discharge lines, regardless of normal operating pressure. Negative pressures can be produced in normally pressurized lines due to power failures, draining of lines, inadvertent valve operation, etc. and anti-siphon protection is particularly vital during upset conditions.

The surest means of providing anti-siphon protection is a physical siphon break as shown below. However, this arrangement is practical only for negative head or low head conditions. This arrangement is not suitable for chemicals that may plug feed lines.

Where the physical siphon break cannot be used because of discharge pressure, an anti-siphon valve is necessary. The anti-siphon valve consists of a spring loaded diaphragm and seat and is similar to a back pressure valve. The anti-siphon action is lost if the seat becomes fouled. Therefore, the valve requires preventive maintenance including periodic testing.

For low pressure conditions where the physical siphon break cannot be used, the anti-siphon valve will be used in series with a backpressure valve which also provides anti-siphon action. The intent is to use these devices to provide at least two barriers to siphoning or gravity flow of chemical from the day tank through the metering pump.

A review of several accidental releases revealed the releases occurred through the metering pumps while the metering pumps were off. A solenoid valve, linked to the metering pump starter, may be used as a secondary means of providing anti-siphon protection.

Four-Way Valve

Several vendors manufacture a four function valve which provides anti-siphon, backpressure, priming, and pressure relief action. The valve can replace separate pressure relief and backpressure valves. This valve is limited to low capacity metering pumps.

Valve Testing

The capability of back pressure and antisiphon valves to prevent siphoning is dependent upon the integrity of the valve's diaphragm and seat. It is imperative that the integrity of the seal be checked on a regular basis.

One testing method utilizes monitoring the pressure variations upstream of these valves with a permanently installed pressure gauge (and isolation diaphragm). When system pressure is less than the valve's pressure setting, the upstream pressure should not fall below the valve's pressure setting. Where system pressure is above the pressure setting of a back pressure or antisiphon valve, system pressure must be valved off and the pressure monitored while the metering pump delivers to a holding vessel or to the day tank.

Another method allows a portable vacuum pump and reservoir to be connected downstream of each valve to be tested which would collect leakage from a faulty valve. Any leakage through the valve must be trapped in the receiver as the liquids would damage the vacuum pump.

8. Feeding From Drums

In low capacity systems where both bulk tanks and day tanks are not used, the chemical may be fed directly from a non-refillable drum. A weighing scale or reliable level monitoring device shall be used to monitor the quantity of material remaining in the drum. It is recommended the system be equipped with a low weight alarm.

As with day tanks, it is prudent to limit the volume of chemical directly connected to the water supply in case of accidental release. A day tank is to be used if the drum represents more than a seven day average flow-average dose supply.

Adequate ventilation must be provided for drum feed areas. Separate rooms may be necessary for fuming chemicals such as hydrofluosilicic acid because drum systems cannot be sealed and vented as well as bulk and day tank systems.

The weight of drums typically presents safety concerns in handling. Where drums are used, it is recommended drum handling equipment be provided to minimize the risks associated with moving drums. Such equipment includes hoists, pallet trucks, and dollies. It is recommended that training be provided on the proper operation of this equipment.

See the secondary containment requirements for drums in Item 10.

9. Inventory Monitoring

A reliable and accurate means of monitoring inventory is required for bulk tanks, day tanks, and drums. Typically, a continuous level probe is used for this purpose in tanks. However, in a manned station, a sight glass may be sufficient for this purpose. In all cases, a means of physically verifying liquid level is required to perform physical inventory, and calibrate level instrumentation.

Weighing scales may be used for monitoring inventory. States may require day tanks for fluoride be placed on scales. Some disadvantages of scales are that scale platforms are typically placed within the containment area and are susceptible to chemical spills. The use of weighing scales also requires flexible connections for all piping connections. Additionally, a tare weight for the tank must be used to show net weight.

10. Secondary Containment

Primary containment is defined as the container holding the chemical. Secondary containment is the structure designated to hold spillage or leakage.

Secondary containment is to be provided for all bulk tanks, day tanks, batch tanks, metering pumps, and transfer pumps. Experience has shown that pipe connections to tanks and equipment are most prone to leakage. The function of secondary containment is to keep the spilled chemical within a confined area isolated from other processes and chemicals where it can be cleaned up. Therefore, a common or directly interconnected containment area is recommended for all components of a chemical feed system.

Minimum secondary containment volume is to be determined based on 110 percent of the largest storage tank capacity within the containment area. Freeboard should be added to the calculated minimum containment volume.

The secondary containment structure must be protected with a coating or liner if the chemical is corrosive to the containment structure.

Secondary containment is to be provided for all drums. The containment volume must hold 110 percent of the contents of the largest drum.

Secondary containment is to be provided for buried chemical solution lines to minimize the potential for accidental releases to the environment. Secondary containment is not required for lime slurry or powdered activated carbon slurry. Secondary containment systems include double wall pipe, or tubing or hose within a carrier pipe.

11. Dilution Water

Any water supply connected to a chemical system must have proper backflow protection. For filling of batch tanks, an air gap may be used. For direct connection to batch tanks or chemical piping, reduced pressure zone type backflow preventers must be used.

Continuous dilution water is sometimes recommended to improve dispersion at the feed point, to dilute the concentrated chemical to a more practical concentration, or where the chemical output is very low. Dilution water flow must be controlled as variations in flow will cause variations in feed rate. Also, the flow of dilution water must be known to enable setting a desired dilution rate. It is recommended that a solenoid valve be placed on the water supply line that would close if a leak was detected to prevent filling a containment area with dilution water.

12. Leak Detection

It is recommended that both manned and unmanned chemical feed systems be equipped with a sump equipped with a level switch to signal the occurrence of a leak. It is important that personnel be alerted of a leak as soon as possible. Further, it is recommended the leak sensor be electrically interlocked with the isolation valve on the bulk storage tank, the transfer pumps, and solenoid valves on the chemical feed water supply. Upon detection of a leak the valves should close and pumps should stop, until the leak condition is locally acknowledged.

13. Continuous Analyzers

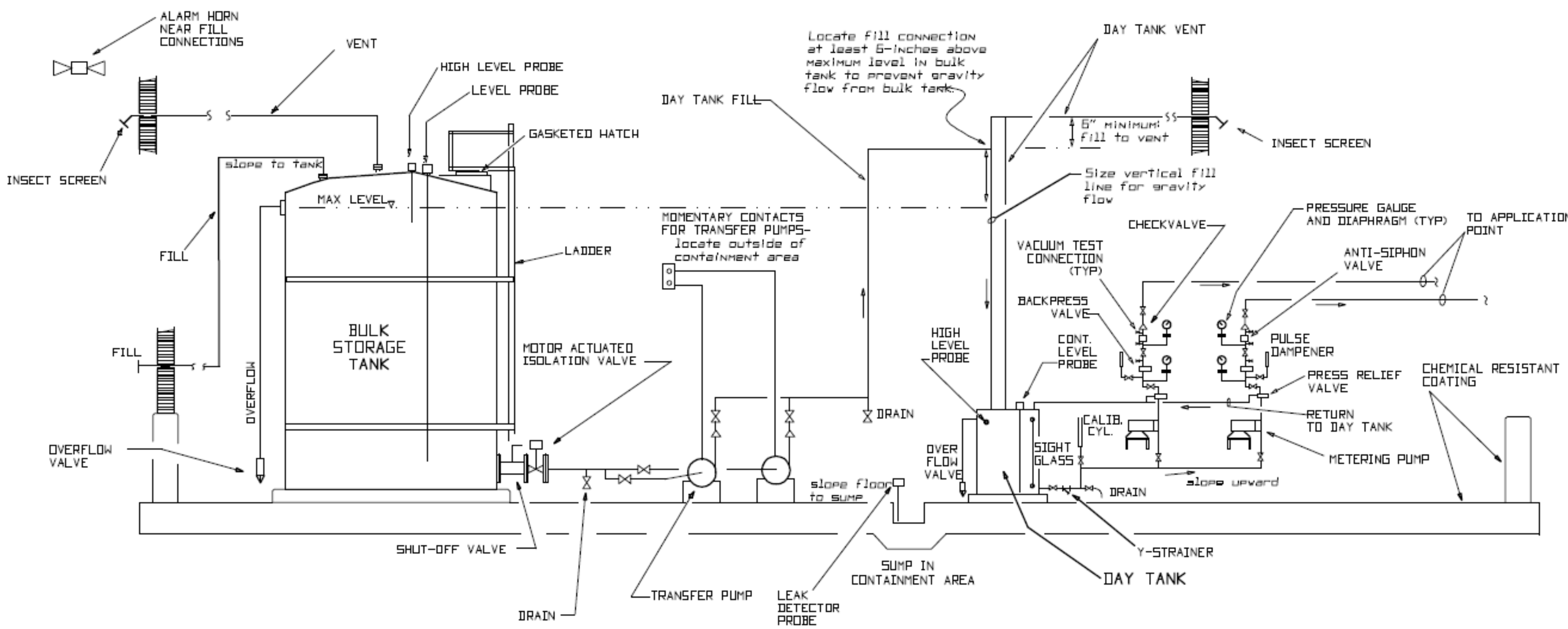
An important facet of protecting the consumer from accidental chemical releases is monitoring of the water quality downstream of the chemical addition point. For strong acids and bases, continuous pH monitoring can warn of an excessive chemical feed. Chlorine residual can be monitored to ensure a correct disinfectant concentration is present.

In a manned station, as a minimum, alarms from these analytical devices should warn the operator so appropriate countermeasures can be taken. In an unmanned facility, the alarms are to be provided for an appropriate action such as shutting off a well pump, or isolating the chemical feed system.

Chlorine residual analyzers are to be provided wherever chlorine or chlorination chemicals are added. Continuous pH monitoring is necessary where caustic soda is fed for post-filtration pH adjustment.

Appendix A - Bulk Liquid Chemical System Standard Schematic

Appendix B - Low Capacity Chemical System Standard Schematic



NOTES:

1. This schematic diagram is an appendix to AMERICAN WATER SYSTEM ENGINEERING STANDARD T-2 for LIQUID CHEMICAL STORAGE, FEED, AND CONTAINMENT. Refer to the Standard for specific requirements.

REVISIONS	
1. Added pressure gauges, test conn; revised day tank notes SEC 5/24/93	

APPENDIX A
BULK LIQUID CHEMICAL SYSTEM
STANDARD SCHEMATIC

ENGINEERING STANDARD T-2

AMERICAN WATER WORKS SERVICE COMPANY, INC.
SYSTEM ENGINEERING

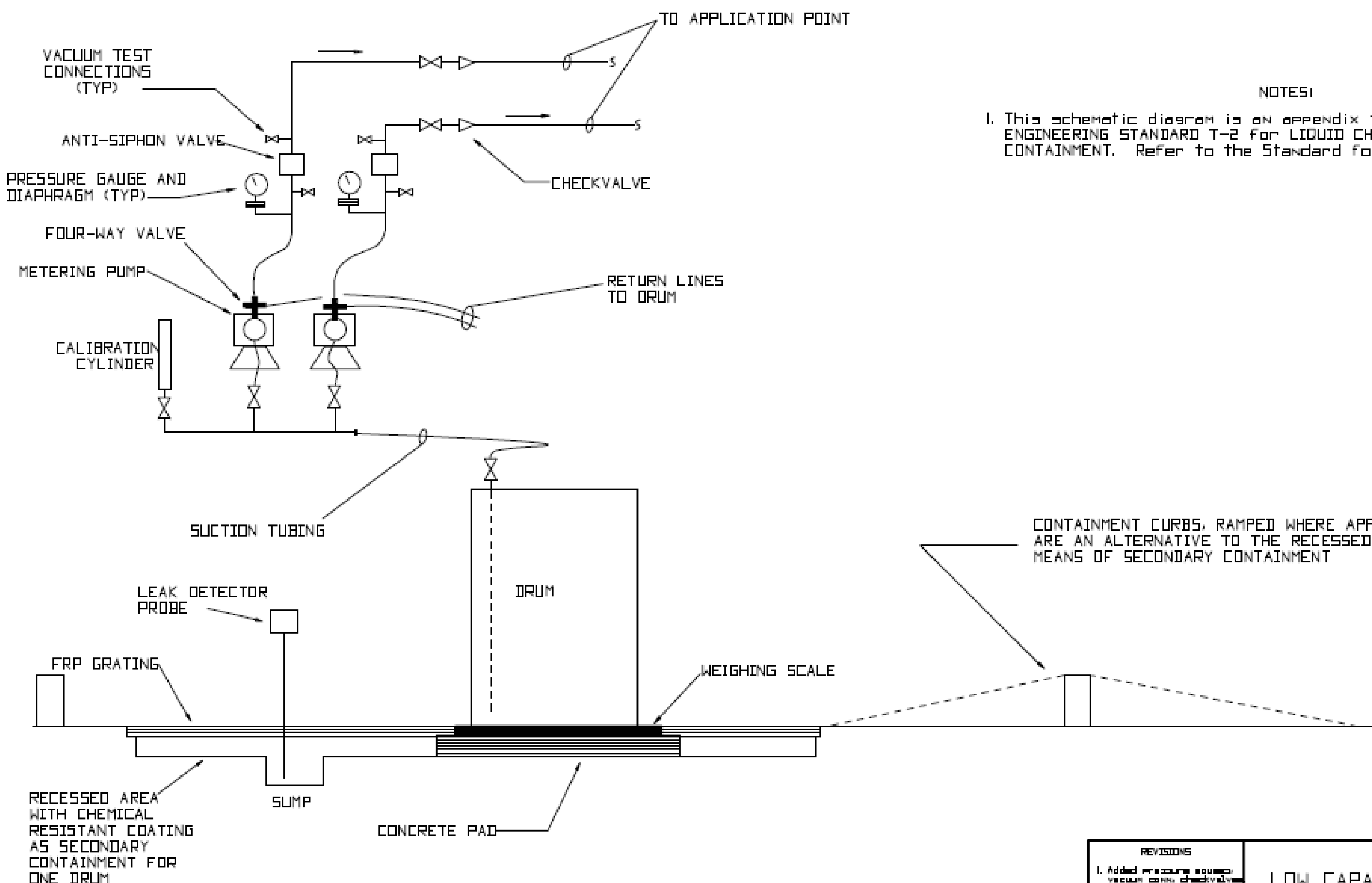
1025 LAUREL OAK RD. VOORHEES, N.J. 08043

DRAWN BY SEC
PROJECT ENG'R
APPROVED

DATE 4-10-92
PROJECT

USE DIMENSIONS ONLY
SCALE NONE

USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES



NOTES:

1. This schematic diagram is an appendix to AMERICAN WATER SYSTEM ENGINEERING STANDARD T-2 for LIQUID CHEMICAL STORAGE, FEED, AND CONTAINMENT. Refer to the Standard for specific reqirements.

REVISIONS

1. Added pressure gauges, vacuum conn, checkvalve SEC 5/24/98

APPENDIX B
LOW CAPACITY CHEMICAL SYSTEM STANDARD SCHEMATIC

ENGINEERING STANDARD T-2

AMERICAN WATER WORKS SERVICE COMPANY, INC.
SYSTEM ENGINEERING

1025 LAUREL OAK RD VOORHEES, NJ. 08043

DRAWN BY
PROJECT ENG'R DATE 4-10-92 USE DIMENSIONS ONLY
APPROVED PROJECT SCALE NONE

USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES

APPENDIX C

GUIDELINES FOR PRIORITIZING IMPROVEMENTS
to
EXISTING CHEMICAL SYSTEMS

Discussion

The primary intent of the Engineering Standard for Liquid Chemical Storage, Feed, and Containment is to present a design basis for new installations. However, guidelines are needed for assigning priorities in upgrading existing facilities.

The following is an outline of the Standard which assigns priorities to the Standard's requirements. A HIGH priority is assigned to features that impact safety for consumers or personnel. A MEDIUM priority includes features that would prevent spills within secondary containment. Medium priority items should be evaluated on a chemical and site specific basis. A LOW priority is assigned to items that are desirable but not essential.

1. Materials of Construction

It is a HIGH priority that tubing, piping, hoses, gaskets, etc. must be compatible with the chemical being handled.

2. Safety Requirements

It is a HIGH priority that all safety requirements be met.

3. Bulk Tanks

Modification of existing bulk storage capacity to comply with the Standard is a LOW priority. Existing storage tanks which are in good condition should not be changed out to comply with the Standard. Fiberglass Reinforced Plastic (FRP) tanks containing hydrofluosilicic acid have a higher than average failure rate, and replacement of the tanks is a MEDIUM priority.

For non-fuming chemicals, the hatch of an existing tank can serve as the overflow, provided the hatch is loosely covered. Installation of a permanent ladder is a LOW priority.

Installation of a near-instantaneous means of determining tank level is a HIGH priority. The addition of a critical high level switch and alarm indicating imminent overflow is a MEDIUM priority.

It is a HIGH priority that overflow from the bulk tank be directed to secondary containment. It is a HIGH priority that tanks containing ammonium hydroxide, hydrofluosilicic acid, or sodium hypochlorite have vaportight check valves on the overflows to prevent the escape of vapors to enclosed areas. Likewise it is a HIGH priority that these chemicals be vented to the exterior.

The need for a remotely actuated valve located on the bulk tank discharge has a LOW priority because spills would be contained within secondary containment. It is important that an emergency response plan be instituted that outlines how spills within secondary containment will be handled.

4. Transfer Pumps

The addition of transfer pumps to an existing gravity day tank fill system is considered a MEDIUM priority, because spills would be held within secondary containment. Where gravity systems are employed, at least two bulk tank shut-off valves should be accessible from outside the containment area.

Where transfer pumps are installed, it is a HIGH priority that redundant pumps be installed in disinfection or primary coagulant systems unless the production facility can be shut down. Bypass around transfer pumps is not allowed.

Where transfer pumps are operated with a push to run switch, it is a HIGH priority that the pumps have the capability to fill the day tank within two - five minutes. Experience has shown that personnel become mentally and physically fatigued if the time to fill the tank exceeds five minutes.

Where transfer pumps are installed, it is a HIGH priority that the pump discharge piping conform to the schematic in Appendix A to prevent unintentional flow into the day tank. Direct piping is allowed for viscous chemicals such as polymers.

5. Day Tanks

The need to install day tanks in existing post-chemical bulk storage systems is a HIGH priority. Installation of day tanks for pretreatment chemicals such as primary coagulants and polymers is a MEDIUM priority because an accidental release will be held within the confines of the treatment plant. For post-treatment chemicals, the sizing of existing day tanks should be reviewed with oversized tanks either replaced or operating procedures instituted to limit the volume of chemical within the tank.

A near-instantaneous means of determining tank level, or weight is a HIGH priority. The addition of a critical high level switch and alarm indicating imminent overflow is a MEDIUM priority.

It is a HIGH priority that overflow from a day tank be directed to secondary containment. It is a HIGH priority that tanks containing ammonium hydroxide, hydrofluosilicic acid, or sodium hypochlorite have vaportight check valves on the overflows to prevent the escape of vapors to enclosed areas. Likewise it is a HIGH priority that these chemicals be vented to the exterior.

6. Metering Pumps

It is a HIGH priority that redundant metering pumps be installed in disinfection and primary coagulant feed systems where a production facility outage cannot be tolerated. The installation of calibration cylinders is a LOW priority.

7. Special Valves

The installation of pressure relief valves on feed systems with the capability of producing pipe bursting pressure is a HIGH priority.

The installation of backpressure/anti-siphon valve, in series with a second anti-siphon valve is a HIGH priority in low pressure systems (<30 psi). The installation of a single anti-siphon valve is a HIGH priority in higher pressure systems. The installation of valve testing fittings is a HIGH priority.

8. Feeding From Drums

It is a HIGH priority that the weight, or level of an on-line chemical drum be monitored. The inclusion of a low weight alarm is a LOW priority.

The upgrading of existing ventilation systems for drum feed areas is a MEDIUM priority and must be evaluated on a site and chemical specific basis.

9. Inventory Monitoring

It is a HIGH priority that a near-instantaneous means of determining tank level or weight be provided for bulk tanks, day tanks, and feed drums.

10. Secondary Containment

It is a HIGH priority that secondary containment be provided not only for the bulk tank and day tank, but also for the transfer pumps and metering pumps and the interconnecting piping. It is a HIGH priority that the minimum secondary containment volume is 100 percent of the largest tank within containment. It is a HIGH priority that secondary containment be provided for drum storage areas.

The need for a protective coating, or liner on the secondary containment structure is a MEDIUM priority. In evaluating the need for a coating, the effect of corrosive chemicals on structural components such as walls, columns, and surrounding areas must be considered.

The need to provide secondary containment for buried chemical piping is a MEDIUM priority. The effect of long term leakage on ground water quality, or the effect of a sudden release to the environment must be evaluated in determining the need for secondary containment.

11. Dilution Water

It is a HIGH priority that proper backflow protection be provided for chemical dilution water. The installation of a meter to monitor dilution water flow for each chemical is a LOW priority, as is a solenoid valve to stop dilution water flow in the event of a spill into secondary containment.

12. Leak Detection

The installation of a leak sump and sensor within secondary containment is a MEDIUM priority for existing systems. The utility of a leak sensor is higher for unmanned systems than for manned facilities.

13. Continuous Analyzers

The installation of continuous pH monitoring downstream of post-filtration caustic soda feed point is a HIGH priority. The installation of chlorine residual monitoring is a MEDIUM priority. The health effects of an accidental release should be considered in the site specific evaluation.

APPENDIX 2 – ATTACHMENT 2

RAW WATER QUALITY CONDITIONS FOR BASIS OF DESIGN

Raw Water quality measurements made for nearby projects were reviewed, along with calculated seawater constituent concentrations based on three years of salinity measurements taken in Monterey Bay. A complete summary of Raw Water quality data from these sources is presented and discussed in a Technical Memorandum entitled "Raw Water Characterization for the MPWSP" found in the Background Documents for this RFP. The sources of these data are listed below:

(1) Desalination pilot studies conducted along the California coast—Moss Landing (MWH, May 2010) and Santa Cruz/Soquel Creek (CDM, April 2010),

(2) The Santa Cruz/Soquel Creek Watershed Sanitary Survey (Archibald Consulting et al., July 2010),

(3) Monterey Bay salinity and temperature data reported by the Central & Northern California Ocean Observing System (2013), and salinity and temperature data from the Santa Cruz Wharf reported by Southern California Coastal Ocean Observing System (2013)

(4) Vertical monitoring well data in the 180-Aquifer, from Well DMW-2, collected as part of the Regional Water Supply Project, and

(5) Source water well data for the Sand City Desalination Plant, screened in the shallow Sand Dune Aquifer.

The slant wells serving as the intake for the Project are expected to pull approximately 3% brackish groundwater from the shallow Sand Dune Aquifer and/or 180-Aquifer. The Owner will be constructing a test slant well in the vicinity of the proposed well field for the Project. Due to environmental constraints, it is anticipated that the test well will not be available until the 1st Quarter of 2014. While the well is operating, samples will be taken and analyzed and this data will be made available to the Design-Builder. However, even this water may not be an exact representation of the water that will be produced when the entire well field has been in operation for some time.

Since slant well data are not yet available, Table 1 was prepared which contains water quality data that the Design-Builder shall use as a basis for design. The data in Table 1 are a best estimate of the raw water conditions for the MPWSP. Facility design shall be based on the Design Maximum values in Table 1. Both the average and maximum values will be used during Acceptance Testing of the RO system, discussed in Appendix 7.

Additionally, proposers are free to seek approval on their own and obtain their own ocean and or shallow dunes aquifer samples in advance of the test well. California American Water will also provide a limited amount of raw source water to proposers from the Sand City Desal plant.

Table 1 –Raw Water Quality Conditions for Basis of Design

Parameter	Units	Design Value [1, 2] (mg/L seawater)	
		Average	Design Maximum
Applicable for the Pretreatment System			
Color	color units	-	9
Turbidity	NTU	-	10
Total Organic Carbon	mg/L	-	4
Iron, total	mg/L	-	2
Manganese, total	mg/L	-	0.2
Applicable for the Reverse Osmosis System			
Salinity	PSS	33.57	37.00
Temperature	ºC	12	8 to 20
Chloride	mg/L	19,030	21,000
Sodium	mg/L	10,604	11,700
Sulfate	mg/L	2,667	2,900
Magnesium	mg/L	1,262	1,400
Calcium	mg/L	405	500
Potassium	mg/L	392	570
Bicarbonate	mg/L	105	150
Carbonate	mg/L	16	-
Bromide	mg/L	71	110
Silica	mg/L	1.3	30
Barium	mg/L	0.013	0.16
Strontium	mg/L	7.81	15
Fluoride	mg/L	1.28	2
Boron	mg/L	4.8	5.4
pH	mg/L	8	8.3

[1] Hydraulic design of the RO system, including high-pressure feed pumps, 2nd pass feed pumps, and SWRO and BWRO membranes, shall be based on the maximum design values.

[2] Acceptance Testing of the RO system shall be based on computer model projected future performance after 5 years, for both average concentrations and maximum concentrations, taking into account increased salt passage over time as the membranes age (See Proposal form 18 for details).

References

Archibald Consulting, Palencia Consulting Engineers and Starr Consulting (July 2010). Proposed scwd2 Desalination Project Watershed Sanitary Survey.

CDM (April 2010). Seawater Reverse Osmosis Desalination Pilot Test Program Report.

Central & Northern California Ocean Observing System (2013). http://www.cencoos.org.

MWH (May 2010). Coastal Water Project Pilot Plant Report.

Southern California Coastal Ocean Observing System. (2013). "http://www.sccoos.org."

APPENDIX 2 – ATTACHMENT 3

FINISHED WATER QUALITY BASIS OF DESIGN STANDARDS AND WATER QUALITY ACCEPTANCE STANDARDS AND REQUIREMENTS

Finished Water quality standards and requirements and Acceptance Standards and Requirements that will be used as the basis of design and Acceptance Testing are shown in Table 2C-1, for the pretreatment effluent (RO feed stream), the combined RO permeate, and the Finished Water after stabilization for corrosion control and disinfection with chlorine. Proposers shall design the facility to meet the water quality standards and requirements shown in Table 2C-1. Acceptance Test Standards and Requirements are discussed in Appendix 7 of the draft Design-Build Agreement. During Acceptance Testing, all treatment systems will be monitored in accordance with the requirements of Appendix 7 to demonstrate continuous successful treatment as stipulated by the treated water Acceptance Standards and Requirements shown in Table 2C-1 below. Acceptance Testing of the RO system shall also be based on computer model projected future performance after 5 years, for both average and maximum raw water design concentrations (refer to Appendix 2, Attachment 2), taking into account increased salt passage over time as the membranes age.

Table 2C-1 – Treated Water Basis of Design Standards and Acceptance Standards and Requirements [10]

Parameter	Units	Pretreatment Effluent		Combined RO Permeate		Finished Water After Stabilization	
		Maximum Average Concentration [1, 2]	Not to Exceed Concentration [3]	Maximum Average Concentration [1, 2]	Not to Exceed Concentration [3]	Maximum Average Concentration [1, 2]	Not to Exceed Concentration [3]
General and Inorganic							
Total Dissolved Solids (TDS)	mg/L						300
Turbidity	NTU	0.15 [4]	1.0	0.1 [4]	0.5	0.5 [4]	1.0
Silt Density Index (SDI)	min^{-1}	3 [4]	4 [5]				
Boron[12]	mg/L			0.5	0.7	0.5	0.7
Chloride[12]	mg/L			60	100	60	100
Bromide[12]	mg/L			0.3	0.5	0.3	0.5
Sodium[12]	mg/L			35	60	35	60
Iron, total	mg/L	0.06	0.10				
Manganese, total	mg/L	0.03	0.05				
Product Water Stabilization [6]							

Parameter	Units	Pretreatment Effluent		Combined RO Permeate		Finished Water After Stabilization	
		Maximum Average Concen-tration [1, 2]	Not to Exceed Concen-tration [3]	Maximum Average Concen-tration [1, 2]	Not to Exceed Concen-tration [3]	Maximum Average Concen-tration [1, 2]	Not to Exceed Concen-tration [3]
Hardness, total [7]	mg/L as $CaCO_3$					40 to 100[11]	–
pH [7]	pH units					7.7 to 8.7[11]	–
Alkalinity, total [7]	mg/L as $CaCO_3$					40 to 100[11]	–
Orthophosphate [7]	mg/L as PO_4					Set by Owner within the range of 1.0 to 3.5 mg/L[11]	3.5
Disinfection and Disinfection Byproducts (DBPs)							
Total Chlorine Residual[7]	mg/L as Cl_2					Set by Owner for a target of 2 mg/L, within the range of 1.5 to 2.5 mg/L[11]	3.5 mg/L
Trihalomethanes, total (TTHM) [8]	µg/L					40	64
Haloacetic Acids, total of 5 (HAA5) [8]	µg/L					30	48
Total Nitrosamines [8, 9]	ng/L					5	8
Bromate	µg/L					5	8

[1] The **average** of the measured concentrations shall be below the Maximum Average Concentration at all times (see remaining footnotes). This footnote does not apply to (a) turbidity or SDI, or (b) finished water calcium hardness, pH, alkalinity, chlorine residual or phosphate; separate footnotes apply to these parameters.

[2] Maximum Average Concentration cannot be exceeded during the applicable period, which shall be (i) daily for continuous recording with results reported every 15 minutes (pH, chlorine residual and turbidity); (ii) annual running average for monthly samples of DBPs (TTHM, HAA5, Total nitrosamines, and bromate); and (iii) annual running average for weekly samples of the remaining parameters.

[3] No measurement shall exceed this value, at any time.

[4] Measured values must be less than the "maximum average" concentration 95% of the time.

[5] The maximum SDI limit applies unless more stringent requirements apply based on the SWRO membrane supplier warranty.

[6] The Owner will set the conditions for product water stabilization to minimize corrosion in the existing distribution system.

[7] Finished Water shall be within the "target range" at all times, where the target range is the target concentration set by the Owner, plus or minus the allowed variance shown in Appendix 7.

[8] TTHM, HAA5, and total nitrosamine concentrations shall be determined using the Simulated Distribution (SDS) test method in Standard Methods (Method 5710C). Samples of the finished water where it enters the distribution system shall be collected, with no adjustment of chlorine residual or pH, and held at the temperature of the finished water at the time of collection (±2ºC) for a 48-hour holding time.

[9] Total Nitrosamines includes the 6 nitrosamine compounds on the EPA's UCMR2-List 2; NDEA, NDMA, NDBA, NDPA, NMEA and NPYR.

[10] These basis of design standards are also the Additional Finished Water Quality Acceptance Standards and requirements set forth in Appendix 7 (Table A7-7 for Finished Water, Table A7-11 for Pretreatment Filtration and Table 7-13 for Combined RO Permeate) except that the applicable periods for the Acceptance Testing are defined in Appendix 7.

[11] Compliance with "target range" for calcium hardness, pH, alkalinity, chlorine residual, and phosphate shall be based on the median, rather than the average, of samples taken during the applicable monitoring period.

[12] For the Combined RO Permeate concentrations of boron, chloride, bromide and sodium, the Maximum Average and Not-to Exceed concentrations shall be met under the Average Design value and Design Maximum value shown in Table 1 of Appendix 2 Attachment 2, respectively.

APPENDIX 2 ATTACHMENT 4

Typical Equipment Manufacturers

1. GENERAL (applies to more than one area of the plant)

Equipment Description	Manufacturers
Ductile Iron Pipe	American Ductile Iron Pipe Griffin Pipe Products United States Pipe and Foundry
HDPE Pipe	CPChem Performance Pipe KWH Pipe Ltd. JM Eagle
Butterfly Valves w/Electric Operators	DeZurik Henry Pratt Company
Butterfly Valves w/Electric Operators (high pressure, super duplex, duplex and SS 316 valves for SWRO & BWRO skids)	Bray Keystone
Butterfly Valves w/Manual Operators	DeZurik Henry Pratt Company Clow Valve Company
Butterfly Valves w/Manual Operators (high pressure, super duplex, duplex and SS 316 valves for SWRO & BWRO skids)	Bray Keystone
Resilient Seat Gate Valves	Mueller Company Clow Valve Company United States Pipe and Foundry American Flow Control
Plug Valves	DeZurik Keystone Valve Company
Check and Air Valves	Golden Anderson Cla-Val APCO Val-Matic M&H Champion (RO Skids) Gulf (RO Skids) Chemline RO Skids)
Electric Valve Actuators 208 VAC, 3 phase	Auma Actuators, Inc. Rotork EIM Beck (for modulating service)
Electric Valve Actuators – Light Duty 120 VAC	Flowserve Worcester Apollo Electra

Pneumatic Valve Actuators	Kinetrol
Bronze Ball Valves	Conbraco Industries Nibco Watts Regulator Company
SS Ball Valves	Smith Cooper Sharpe (RO skids) Flow-Tek (RO skids)
Reduced Pressure Zone (RPZ) Backflow Preventers	Ames Company, Inc. Watts Regulator Company
Hoists and Cranes	Harrington Yale Shaw- Box ACCO

Air Blowers or Compressors	Ingersoll-Dresser Pump Company Roots Blower
Paint/Coatings	Carboline Paint Company M.A. Bruder and Sons (MAB) Sherwin Williams Company Tnemac Company, Inc. International – Devoe

2. PRESSURE FILTERS

Equipment Description	Manufacturers
Pressure Filters	Roberts Filter Group WesTech Hungerford and Terry

3. REVERSE OSMOSIS MEMBRANE SYSTEM

Equipment Description	Manufacturers
Cartridge Filters	Fil-Trek Parker Pentair
Thin Film Composite (TFC) Spiral Wound Reverse Osmosis Membranes	Toray Hydranautics Dow/Filmtec
FRP Pressure Vessels	Pentair Codeline Bekaert Progressive Composites Protec-Arisawa
Energy Recovery Devices	Energy Recovery, Inc Flowserve
High Pressure Pump	Afton, Goulds, Sulszer, KSB, Torishima, Flowserve,

4. FINISHED WATER PUMPING

Equipment Description	Manufacturers
Vertical Turbine Pumps	Flowserve Goulds Peerless
Horizontal Splitcase Centrifugal Pumps	Flowserve Goulds Peerless
Variable Frequency Drives	See Electrical Equipment
Pump Discharge Control Valves – Resilient Seated Ball Valve	Henry Pratt Company GA Industries

5. CHEMICAL STORAGE AND FEED

Equipment Description	Manufacturers
XLHDPE Chemical Storage Tanks	Poly Processing Company
Steel Chemical Storage Tanks	Highland Tank Southern Tank Steel Structures, Inc
Diaphragm Metering Pumps	Milton Roy Company Pulsafeeder
Peristaltic Tube Pumps	Watson Marlow
Peristaltic Hose Pumps	Watson Marlow Verder
Magnetic Drive Centrifugal Transfer Pumps	March Manufacturing Inc. Iwaki Walchem
Batch Tank Scales	Force Flow Equipment Eaton Scales
PVC and CPVC Piping	Certainteed Corp. Pipe and Plastics Group Spears
Chemical Ball Valves-Manual	Chemtrol Hayward Asahi
Chemical Ball Valves – Actuated	Nil-Cor

6. OTHER PUMPING EQUIPMENT

Equipment Description	Manufacturers
Sample Pumps – Centrifugal with Flooded Suction	Little Giant March Iwaki
Sump Pumps	Hydromatic KSB Weil ABS
Sludge/Wastewater Pumps	Flygt Hydromatic Yeomans ABS Weil ABS KSB Wemco Sulzer
Electric Motors	See Electrical Equipment

7. INSTRUMENTATION

Equipment Description	Manufacturers
Magnetic Flow Meters	Rosemount Siemens Krohne Endress Hauser ABB
Point Level Switch – RF Admittance	Drexelbrook ABB Endress Hauser
Ultrasonic Level Transmitters	Endress Hauser Drexelbrook Siemens
Radar Level Transmitters	Endress Hauser Ohmart-Vega Siemens Magnetrol
Turbidimeters	Hach
pH Analyzers	Hach Rosemount
Chlorine Residual Analyzers	Wallace & Tiernan/Siemens Depolox, Hach CL-17
Desktop Personal Computers	IBM Dell Hewlett-Packard
Laptop Personal Computers	IBM Dell Hewlett-Packard
Printers	Hewlett-Packard Epson
Modems	AMP (Allied Signal) Manmarc
Fiber Optic Modems	Hirshman
Microwave Radios	GE/Microwave Data Systems
Uninterruptable Power Supply	Best, APC
Human–Machine Interface Software	Iconics, GE Intellution IFIX
PLCs	Allen Bradley
PLC Cabinets	Hoffman, Rittal Saginaw Controls

\

APPENDIX 2

ATTACHMENT 5 [RESERVED]

APPENDIX 2 ATTACHMENT 6

Typical Electrical Equipment Manufacturers

Equipment Description	Manufacturers
MV Switchgear – Vacuum Breaker, Draw-Out	Cutler-Hammer Siemens General Electric Square D
Medium Voltage Automatic Transfer Switchgear (Circuit Breaker Transfer Equipment – Manual or Automatic)	Cutler-Hammer Siemens General Electric Square D Or Acceptable Manufacturer from above provided by Generator Equipment Manufacturer (subject to Owner approval)
MV Fusible Switchgear	Cutler-Hammer Square D *(Note - HVLcc Type Equip Not Accepted)* Siemens General Electric S&C
MV Switchgear – SF6 Type	*Not Preferred Equipment*
MV Motor Control Equipment, MC Lineups (FVNR, RVSS Equipment)	Cutler-Hammer Siemens General Electric
MV Variable Frequency Drives	Toshiba Cutler-Hammer Siemens/Robicon
LV Power Distribution Equipment – (Swgr, Swbds, Panelboards, Circuit Breakers, etc)	Cutler-Hammer Square D Siemens General Electric
Transformers – Dry Type, VPI, VPE Insulation	Cutler-Hammer Square D/Sorgel Siemens ABB
Transformers – Cast-Coil	Square D/Sorgel ABB
Transformers – Liquid-Filled	*Not Preferred Equipment*
Protection Relays & Monitoring Relays for Voltage, Current, Phase Loss, Etc.	SEL (Schweitzer Engineering Laboratories) *Other acceptable manufacturers may include the following (subject to prior approval by AW Engr / Owner)* All to be provded with Fiber-Optic Communications over Ethernet / Modbus TCP/IP
Power Quality Metering, Motor Monitoring & Feeder Protection Relays	SEL 735, SEL 710, SEL 751A Other SEL devices as applicable for the design of the power distribution system. All to be provded with Fiber-Optic Communications capability Ethernet / Modbus TCP/IP

Low Voltage Motor Control Centers	Cutler-Hammer Square D Siemens
	General Electric
Full Voltage Motor Starters	Cutler-Hammer Square D Siemens General Electric
Reduced Voltage (Solid-State, Soft Start) Motor Starters	Cutler-Hammer Square D Siemens General Electric Danfoss Benshaw
Low Voltage Variable Frequency Drives – Stand Alone Applications (Free-Standing or Wall Mounted Units)	<u>Free-Standing – Wall or Floor Mounted</u> Toshiba ABB Siemens/Robicon Danfoss Benshaw Yaskawa <u>NEMA 4X Type (where required)</u> Yaskawa T B Woods *(Power distribution equip manufacturers equipment with Owner acceptance only)*
Low Voltage Variable Frequency Drives – Part of MCC Lineup/Equipment	Cutler-Hammer Square D General Electric Seimens
Low Voltage Automatic or Manual Transfer “Switches”	Cutler-Hammer ASCO 7000 Series (unless otherwise suitable) GE/Zenith Russelectric
Low Voltage Service Entrance Rated Automatic Transfer Equipment (Circuit Breaker Transfer Equipment – Manual or Automatic)	Cutler-Hammer/Eaton Russelectic Switchgear General Electric ASCO 7000 Series
Uninterrupted Power Supplies	APC Powerware General Electric Mesta Liebert MCG
Surge Protective Devices (UL-1449, Rev 3 Compliant and Listed/Labeled)	APT – Advanced Protection Technologies MCG APC

Lighting Fixtures – T-8 lamps, Program-Start Ballasts, Indoor Enclosed and Gasketed Fluorescent for Damp and Wet Locations (Process and Chemical Rooms)	EPCO GFF Series w/SS Latches Simkar EN 2 or 3 w/SS Latches Holophane ERS Series Lithonia FSW or FHE Series Others as accepted by Owner
	(Note – the use of fixtures similar to Lithonia DMR Series, Columbia LUN Series, Simkar OV450, etc are generally prohibited due to on-going physical / performance issues associated with this type of design (limited latches retaining sealed integrity of the assembly)). Fixture selection is to take into consideration lamp output, lumen maintenance, and environmental factors associated maintainability of the overall system.
Lighting Fixtures – T-8 lamps, Program-Start Ballasts, Indoor dry applications	Day-Brite, Benjamin, Keene, Lithonia and Others as accepted by Owner
Lighting Fixtures – T-8 lamps, Program-Start Ballasts, Indoor Hazardous Locations	Appleton Crouse-Hinds Killark Others as accepted by Owner
Lighting Fixtures – Outdoor	Holophane Infranor Devine Others as accepted by Owner
Lighting Control - Occupancy Sensors	Sensor Switch (High Humidity / Low Temperature Type) – process & chem. Areas Leviton, Hubbell, P&S along with others mfgrs and products to be provided as determined suitable for the location and environment where installed. *NOTE: Technology (passive IR, ultrasonic, or dual) to be based on location where installed*.
Lighting Control – Daylight Harvesting and/or Special Function and Dimming	Lutron Wattstopper Day Light Controls Others as accepted by Owner
Control and Timing Relays (“Ice-cube” relay style)	Diversified Potter Brumfield Syrelec Allen Bradley Square D Cutler-Hammer Seimens Releco Others as accepted by Owner
Push Buttons, Selector Switches & Pilot Lights (30 mm minimum size devices, NEMA 4X style preferred and high-intensity LED pilot lamps)	Cutler-Hammer Square D Seimens Allen Bradley Kraus & Naimer

Definite Purpose Relays and Contactors	Cutler Hammer Square D Siemens Allen Bradley
Industrial Plugs & Receptacles (Generators)	Meltric Corp. Hubbell Leviton Others as accepted by Owner

PVC Coated Rigid Steel Conduit	Ocal Robroy
Power Generation Equipment – (Diesel engine driven units)	Onan/Cummins Caterpillar Kohler Others only as determined accepted by Owner

APPENDIX 2 ATTACHMENT 7

GENERAL ELECTRICAL DESIGN CRITERIA

1. Basic Electrical Materials and Raceways:
   a. All materials shall be suitable for the location and environment where installed.
   b. Control panels and related enclosures shall generally be non-metallic type with non-metallic hardware; NEMA 12 minimum or 4X in corrosive areas unless otherwise accepted. The use of Stainless Steel enclosures should be limited to areas not exposed to a chlorine gas or fluoride areas / environments.
   c. All feeders (and branch circuits rated 100 amps and larger) shall be provided in RGS conduit. Other building areas to utilize raceway materials as outlined herein (see 2 below) unless otherwise indicated. Exposed exterior locations may utilize rigid aluminum conduit where determined suitable for the application. The use of IMC is prohibited.
   d. All conduit fittings to utilize gasketed screw covers; clip-type cover fastening type fittings are prohibited. Provide “Myers hub” type connectors associated with exterior and wet location enclosures.
   e. Raceway penetrations into below grade located equipment / enclosures shall not enter the top; they shall enter the bottom side and be provided with a means for draining moisture from the raceway and sealed between the raceway and the enclosure with duct-seal material. These enclosures shall be provided with a vapor corrosion inhibitor (Cortec, or equivalent) sized appropriately for the interior volume of the cabinet.
   f. Receptacles and switches to be heavy-duty rated, 20 ampere minimum rated; material type and configuration to be suitable for the application.
   g. Control Station devices should be NEMA 4X rated where available; all devices to be 30 mm minimum size for gloved operation. All pilot lights are to be high intensity LED type; red for “run”, green for ‘off”. Other colors to be coordinated with the Water Company; generally in accordance with NFPA-79, Table 10.3.2.

2. Raceway material and general applications:

   The following general criteria are to be used for raceway material selection and installations. This listing is not intended to address all applications and/or specific equipment requirements which may be outlined elsewhere on the Engineer's Drawings or indicated in the Specifications.

   a. Industrial Buildings and Related Type Facilities or Areas
      1) Chemical Storage and Dispensing (non-hazardous materials)
         1. Exposed from Finished Floor to 8"-0" AFF
            a. PVC Coated RS Conduit and Liquidtight Flexible Metal Conduit
            b. Outlet and Junction Boxes - PVC Coated, Cast Type, FD capacity for use with the PVC Coated RS Conduit
            c. All outlet cover plates to be "in-use", weather-protected type and gasketed
         2. Exposed 8'-0" AFF and above within the room
            a. PVC Schedule 40 Conduit may be used in lieu of PVC Coated RS Raceways. Where provided, the Contractor shall include the use of expansion and axial connectors as recommended by the non-metallic raceway Manufacturer (not just at building expansion points)
            b. Junction Boxes - PVC, FD capacity for use with the PVC Conduit System
         3. *NOTE: No "in-floor" conduit or floor penetrations are permitted within chemical containment areas.*

Engineers NOTE - Potentially, a listing or some other form for identifying which chemicals / areas require the use of seal-offs will need to be determined and included in the Contract Documents (below)

2) Transitions from Chemical Storage and Dispensing Areas to other building areas shall utilize PVC Coated RS Conduit within the area and transition to RGS material where extending to a non-chemical area. Provide seal-off fittings and appropriate sealing material (as specified) to prevent vapor transmission through the raceway system at this transition point inside the chemical area.
3) Hangers, Supports and Fasteners
    1. FRP Threaded Rod with non-metallic FRP channel supports and fasteners. In areas other than Chlorine and Fluoride environments, the use of 316 Stainless Steel threaded rod and fasteners also is permitted. Where the weight of the installation exceeds that permitted by the FRP materials, the use of 316 SS channel supports and threaded rod will be considered acceptable. PVC Coated steel channel supports is not accepted.

Engineers NOTE - "Damp" and "Wet" terms will need to be defined and included in the Contract Documents

4) *GENERAL NOTE: Raceways are not permitted to be installed concealed in water-bearing walls. All equipment, devices and raceways shall be installed on the dry-side wall surface using nominal 7/8" non-metallic channel support stand-offs installed vertically to all ventilation air to pass behind equipment and raceways. Fastening hardware to be 316 Stainless Steel*
5) "Damp" Areas, including those where the ambient temperature of the space is to be maintained at less than 65 degrees F
    1. Rigid Galvanized Steel (RGS) Conduit and fittings
    2. Liquidtight Flexible Metal Conduit
    3. Exposed outlets - Cast Type, FD capacity
    4. Recessed Outlets (where permitted) - one-piece galvanized steel (expandable metal outlets not permitted)
    5. Coverplates - type as specified and/or indicated on the Drawings
6) "Wet" Areas, including those where the ambient temperature of the space is to be maintained at less than 65 degrees F
    1. Rigid Galvanized Steel (RGS) Conduit and fittings or PVC Coated RS Conduit and PVC Coated fittings as indicated on the Drawings
    2. Liquidtight Flexible Metal Conduit
    3. Exposed outlets - Cast Type, FD capacity (PVC Coated where coated raceway systems are indicated on the Drawings
    4. Recessed Outlets (where permitted) - one-piece galvanized steel (expandable metal outlets not permitted)
    5. All outlet coverplates to be "in-use", weather-protected type and gasketed
7) Electrical, Mechanical (HVAC) and General Equipment Storage Rooms
    1. Rigid Galvanized Steel (RGS) Conduit and fittings
    2. Flexible Metal Conduit - Lighting Fixtures and similar type equipment
    3. Liquidtight Flexible Metal Conduit - motor (and similar equipment involving close proximity to water and/or oil) connections
    4. Exposed outlets - Cast Type, FD capacity
    5. Recessed Outlets (where permitted) - one-piece galvanized steel (expandable metal outlets not permitted)
    6. Coverplates - companion type as specified and/or indicated on the Drawings

b. Administrative Buildings and Related Type Facilities or Areas

1) All areas within conditioned rooms (those spaces where heating and/or air conditioning/ventilation is provided to maintain a nominal ambient temperature of 68 degrees and higher)
2) General Installations
    1. Electrometallic Tubing (EMT) for concealed raceways with compression fittings (set-screw fittings are NOT permitted)
    2. Rigid Galvanized Steel (RGS) Conduit and fittings for exposed raceways
    3. PVC Conduit is NOT to be used for any application other than for approved in-floor (or other encased in concrete) applications as outlined by these Documents.
    4. Flexible Metal Conduit - Recessed Lighting Fixture connections and similar type equipment terminations
    5. Liquidtight Flexible Metal Conduit - motor (and similar equipment involving close proximity to water and/or oil) connections
    6. Exposed outlets - Cast Type, FD capacity
    7. Recessed Outlets - one-piece galvanized steel (expandable metal outlets not permitted)
    8. Coverplates - companion type as specified and/or indicated on the Drawings
3) In-floor (or other encased in concrete) Installations
    1. PVC Schedule 40 for 120 volt and greater general power / branch circuits; transition to metallic raceway system for continuation in or on wall as identified above. (Note - refer to VFD cabling installation requirements for special installation considerations)
    2. EMT for Data, Instrumentation and low voltage signal (less than 50 V) circuits; transition to metallic raceway system for continuation in or on wall as identified above.
    3. All transitions from "in-floor" to above floor in any area or room where water is also supplied in the room shall utilize PVC Coated RS Conduit sweeps to provide corrosion / physical protection; extend PVC Coated raceway minimum 6" AFF.

c. Underground and Similar Raceway Applications
1) Encased in Concrete Raceway Installations - (Ductbanks, Equipment Bases, etc) as identified on the Drawings
    1. Conduits 2" in diameter and smaller- PVC Schedule 40 Conduit with PVC Schedule 40 sweep radius horizontal bends and PVC Coated RS Conduit sweep radius bends for vertical transitions to above grade or concrete surface. FRP sweep radius bends may be used in place of PVC Coated RS Conduit for vertical transitions to above grade in this application only.
    2. Conduits greater than 2" in diameter - PVC Schedule 40 Conduit with RGS sweep radius horizontal bends and PVC Coated RS Conduit sweep radius bends for vertical transitions to above grade or concrete surface.
    3. Note - Refer to VFD cabling installation requirements for special installation considerations that may alter the criteria outlined above
    4. Conduit supports, spacing and concrete / reinforcement to be as specified
2) Direct Burial Raceway Installations - Ductbanks, Branch Circuits and Feeders as Identified on the Drawings
    1. Conduits 2" in diameter and smaller- PVC Schedule 40 Conduit with PVC Schedule 40 sweep radius horizontal bends and PVC Coated RS Conduit sweep radius bends for vertical transitions to above grade or concrete surface. FRP sweep radius bends may be used in place of PVC Coated RS Conduit for vertical transitions to above grade in this application only.
    2. Conduits greater than 2" in diameter - PVC Schedule 40 Conduit with RGS sweep radius horizontal bends and PVC Coated RS Conduit sweep radius bends for vertical transitions to above grade or concrete surface.
    3. Note - Refer to VFD cabling installation requirements for special installation considerations that may alter the criteria outlined above

4. Conduit spacing and protective concrete cover to be as specified or detailed on the Drawings. Note, Direct Burial installations do not use conduit "chairs" or separators; embedment is provided by screening material only.
5. Transitions from underground to building or other structure to be provided as Detailed on the Drawings

3. *Lighting Systems*: Fluorescent lighting systems shall be used in the design for the interior of the buildings; HID lighting (HPS) shall be acceptable for exterior use. Illumination levels to be as recommended by IES for the space and tasks being performed. Lighting fixtures types are to be suitable for the environments where installed and shall be located (serviceable and accessible) for routine maintenance. Provide calculations and fixture catalog data/specification sheets for review and acceptance by the Water Company.
   a. Night-lighting / means of egress lighting fixtures shall be incorporated in the normal lighting layout / scheme to ensure that all passages and exits remain illuminated in the event of a power failure. These fixtures may be switched providing they include the lighting transfer device integral with the fixture. Separate battery-powered emergency lighting units shall also be provided to augment this system and provide Code required egress lighting in the event of a power failure on the Stand-By Power System. These units are to be powered from the local areas night-lighting circuits and wired ahead of any switching. This pass-thru/night lighting should be un-switched; other lighting in the area or room to be controlled by means of suitable occupancy sensors.
   b. Where otherwise required by the authority having jurisdiction , provide means of egress and emergency lighting systems in conformance with NFPA 101 (the Life Safety Code)
   c. Illuminated Exit Signs: IF REQUIRED by CODE, provide LED type and placed inside the facility per the latest requirements of NFPA 101 (the Life Safety Code) as applicable.

4. *Cables:* Those rated for 480V and below shall be listed as XHHW, XHHW-2 for general underground, damp and wet locations and other similar areas. In addition, only XHHW-2 insulated conductor material is to be used with any variable frequency drive application. Dual-rated THHN/THWN type is for use ONLY in interior, *(Administrative Buildings and Related Type Facilities or Areas as previously defined)* dry locations. Insulation shall be UL listed for at least 90 degrees centigrade but applied at its 75 degree ampacity rating (maximum). Provide specific information in the Documents outlining where each type of conductor insulation material for review and acceptance by the Water Company.

5. Grounding: The electrical system and equipment will be grounded in compliance with the National Electrical Code. A buried grounding grid should be provided for the new switchgear and generators. Conductors shall be No. 3/0 AWG copper, minimum, for interconnecting ground rods and for connection to transformers and MCC's and other major electrical equipment. Electrical equipment, devices, panelboards, and metallic raceways will be connected to the ground conductors.

6. Medium Voltage Switchgear:

   a. Type of Equipment: Tin-plated copper buss (phase and ground), 5 KV, 3-phase, 3-wire plus ground operating at 60 Hz. Draw-out vacuum circuit breakers. All components are U.L. listed. Switchgear equipment shall consist of standardized, freestanding structures bolted together for form a single dead-front panel assembly containing circuit breakers, control devices, protective relay and metering units and all interlocking and miscellaneous control / interface devices.
   b. In general, Metal-Enclosed Switchgear is considered acceptable. Provide Metal-Clad Switchgear type design where required due to specific design and/or Utility considerations.

7. Medium Voltage Motor Controllers:

    a. Type of Equipment: Tin-plated copper bus (phase and ground), 5 KV, 3-phase, 3-wire plus ground operating at 60Hz. All components are U.L. listed. MCC equipment shall consist of standardized, freestanding structures bolted together for form a single dead-front panel assembly containing combination motor control units; feeder units; metering, relaying, and interlocking and miscellaneous control devices.
    b. Starters: Full-Voltage NEMA rated fusible switch / contactor type combination controllers as required. The use of IEC rated controller is prohibited. Solid-state reduced voltage motor starters shall be utilized where required due to power utility requirements, process control of hydraulic transients, and/or engine-generator sizing considerations. The Engineer shall coordinate starter types with the Water Company.

8. Low Voltage Motor Control Centers/Motor Controllers:

    a. Type of Equipment: Tin-plated copper bus (phase and ground), 600V, 3-phase, 3-wire plus ground operating at 60Hz; provide a neutral bus only in those MCC assemblies where required. All components are U.L. listed. MCC equipment shall consist of standardized, freestanding structures bolted together for form a single dead-front panel assembly containing combination motor control units; feeder units; metering, relaying, and interlocking and miscellaneous control devices and will be of the per definitions in the latest edition of NEMA ICS 3 and UL 845.
    b. Starters: Full-Voltage NEMA rated (Size 1 minimum) combination magnetic starters shall be utilized as required. The use of IEC rated starters is prohibited. Solid-state reduced voltage motor starters may be utilized where required due to power utility requirements, process control of hydraulic transients, and/or engine-generator sizing considerations. The Engineer shall coordinate starter types with the Water Company.
    c. Circuit Breaker Compartments and Circuit Breakers: Control center disconnects shall be three-pole, single-throw, 600-volt, molded-case circuit breakers. Circuit breakers of combination starters shall be magnetic motor circuit protector type where appropriate. Feeder circuit breakers shall be thermal-magnetic type and shall be manually operated with quick-make, quick-break, trip-free toggle mechanism.
    d. Enclosure Type: Match existing NEMA ratings in equivalent areas of the plant. Engineer shall also propose modifications to the NEMA rating if appropriate for intended service.

9. Power Monitoring: Provide microprocessor based SEL 735 metering unit on main incoming feeder circuit breaker. Unit shall compute voltage, amperes, power factor, kilowatt-hour, etc. Communications will be via fiber-optic cable back to a port on a plant remote terminal unit (RTU). Provide SEL 710 motor protective units motor loads larger than 100 horsepower wired to plant RTU for monitoring, trending and archiving. Other SEL protective relays to be provided as determined through the design; reviewed and accepted by the Owner.

10. Miscellaneous Power Distribution:

    a. Panelboards and Switchboards: Circuit breakers will be of the “Bolt-On” type;”Push-On” / “Plug-On” type circuit breakers are not allowed. Use plated copper type bus and ensure U.L. labeling of entire system.
    b. Provide a transient voltage surge suppresser on the main of each power distribution panel where applicable. For more specific requirements for the protection of sensitive electronic instrumentation, see Instrumentation section.
    c. Lighting and Power Transformers: Dry type to limit maintenance items. A minimum of (2) taps will be provided above rated voltage (in 2.5% increments) and a minimum of (2) taps will be provided below rated voltage (in 2.5% increments). Open type transformer cases are not

allowed. All units located in wet or chemical areas will be of sealed type construction. Provide open ventilated type enclosures for other general dry, environmentally ventilated/conditioned spaces. All transformers to utilize copper windings; 115 degree C rated. The Engineer shall examine the need to install transformers with a higher than average Basic Impulse Level (BIL) that is not normally required in the 480V class.

APPENDIX 2 ATTACHMENT 8

POWER SYSTEM STUDY REQUIREMENTS

SHORT-CIRCUIT, PROTECTIVE COORDINATION AND ARC FLASH ANALYSIS/EVALUATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Provide all items of labor, materials and equipment necessary for investigation, development, evaluation and report generation of the work described in this Section. The entire power distribution system, new and existing equipment which is to remain, is to be included in the Study being provided for this Project.

B. Visit the site to determine actual conditions, equipment and settings and related elements necessary to prepare a complete oneline diagram of the entire power distribution system. This oneline diagram shall include the equipment (loads/ratings), cable and raceway information and other data associated with the installations (new and existing) to allow evaluation and calculation of the various Studies to be provided in the Report outlined herein. Field work shall be coordinated with the Owner and shall follow all applicable safety standards for the activities required. The Contractor shall review / compare the Owner's operational and safety standards with his own and provide adequate PPE for those involved in any data gathering activities as outlined by applicable Regulatory Agencies. Failure to sufficiently determine existing conditions and equipment ratings / settings shall not be considered grounds for additional compensation.

C. Furnish a complete Short-Circuit, Protective Coordination and Arc Flash Hazard Analysis Study per the requirements set forth in the criteria established for the Project, the criteria outlined herein this document, and as identified in the current version of NFPA 70E -*Standard for Electrical Safety in the Workplace*. The arc flash hazard analysis shall be performed according to the IEEE Standard 1584, the IEEE *Guide for Performing Arc-Flash Calculations;* modified as hereinafter identified. Temporary Arc-Flash labeling of the electrical equipment shall be provided upon acceptance of the pre-final study/report for equipment being transferred to the Owner for operational acceptance during the construction effort. Final Arc-Flash Labeling shall be provided as indicated after all field start-up / acceptance testing and adjustments have been made to the over-current protective and solid-state devices; these revisions are to be included and incorporated to the oneline modeling based on final "as-built" conditions.

D. Studies shall be provided to the Owner in the Report submittals as indicated herein this Section. The Final (Record) Report shall address all final adjustments and modifications/changes provided during the construction and acceptance start-up of the equipment provided.

E. Drawings and Material Data Sheets / Product Information provided by the Owner is considered as generally indicative of Power System but is not to be considered as matching actual site conditions. Modifications/field changes may have occurred which were not recorded; therefore, provide field verification as necessary to validate the Power System as Work under this project in preparation of the Short-Circuit, Protective-Coordination and Arc-Flash Study and Analysis.

F. The approach to the evaluation and analysis work included in this assignment shall include, but not be limited to the following minimum level of effort;

1. Collect system and “as-installed” data associated with all electrical equipment, feeders, and devices associated with this Study/Report. This effort shall also include obtaining the necessary load-history and available fault current from the serving Power Utility Company.
2. Determine system modes of operation by conducting interviews with Owner’s Operational Staff
3. Determine bolted short-circuit and arc fault currents
4. Determine protective device characteristics and duration of arcs
5. Document system voltages and classes of equipment
6. Evaluate existing equipment short circuit ratings against computed available fault currents.
7. Arc Flash Hazard Analysis to select working distances as outlined herein, determine incident energy for all equipment and determine flash-protection boundary zones for all affected equipment

1.02 REFERENCES

A. ANSI - American National Standards Institute, Inc.
1. ANSI C57.12.00 – Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
2. ANSI C37.13 – Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures
3. ANSI C37.010 – Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis
4. ANSI C 37.41 – Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories.

B. ASTM - American Society for Testing and Materials

C. IEEE - Institute of Electrical and Electronic Engineers
1. IEEE 141 – Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems
2. IEEE 242 – Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
3. IEEE 399 – Recommended Practice for Industrial and Commercial Power System Analysis
4. IEEE 1584, Latest Edition -Guide for Performing Arc-Flash Hazard Calculations

D. IPCEA - Insulated Power Cable Engineers Association

E. NEMA - National Electrical Manufacturers Association

F. NESC - National Electrical Safety Code

G. NFPA - National Fire Protection Association
1. NFPA 70 -National Electrical Code, latest edition
2. NFPA 70E – Standard for Electrical Safety in the Workplace, latest edition

1.03 STUDY REQUIREMENTS

A. The Work associated with this assignment must comply with all Federal and State, municipal or other authority's laws, rules and/or regulations. The Contractor shall enlist the services of a qualified, licensed Professional Engineer (hereinafter referred to as Engineer and/or Engineer-of-Record) to conduct the actual analysis, evaluation and development of the Report and Arc Flash labeling.

B. As previously stated, the Power System Study / Analysis shall include All *(new and existing that is to remain)* Electrical Equipment; evaluations / analyses shall be conducted by a licensed Professional (Electrical) Engineer in the State where the Project is being provided; hereinafter referred to as the Engineer-of-Record or EOR during the detailed design phase of the Project to coordinate equipment selections, evaluate / select Over Current Protective (OCP) devices and settings for coordination and potential arc flash mitigation where appropriate and determined to provide a cost/benefit.

1. In general (not limited to) and starting at the Utility, all electrical equipment including the main service transformer, Utility OCP device and system ratings shall be evaluated and included in this Study.
2. All medium voltage equipment, motors, transformers (primary and secondary) shall be included as well as all 480 VAC low voltage equipment, motors nominally 25 HP and larger, safety disconnect switches 100 amps and above, panelboards, transformers (primary and secondary locations). 120/208-240 VAC equipment shall be included in the Study in accordance with IEEE / NFPA criteria. Where this equipment is served from transformers smaller than 125 KVA, the Study shall include the reporting data and labeling based on the acceptable criteria; labeling of this equipment is still required.
3. Refer to other criteria and reporting requirements are outlined elsewhere in this Document.

C. The Report(s) / calculations must be supplied to the Water Company before final equipment and specifications are considered accepted or approved. The EOR shall provide documentation for all assumptions related to machine impedances, cable impedances (both resistance and inductance), transformer impedances and other equipment values used to complete the computations where obtaining actual data is not available. The EOR shall develop fault conditions under minimum, maximum, and average power consumption scenarios based on the way the plant is to be operated. The Engineer shall also develop fault scenarios with standby power generators where included and used instead of the electric utility source. Where applicable, Load Flow calculations and Reports are to be provided as outlined in the Design Criteria for differing operational scenarios or otherwise required for the Project. Arc Flash Hazard analysis and equipment evaluations to be provided as hereinafter indicated.

D. All oneline diagrams included in the Study / Report shall utilize naming conventions and identifiers matching the Design Documents; generic identifiers are not considered appropriate. Coordinate equipment naming / identifiers with the Owner during the design development phase of the project taking into account the existing terminology used.

1. Provide annotated onelines for the Power Distribution System identifying all equipment and naming conventions as stated above.
2. Provide annotated onelines identifying the available short-circuit current at each piece of equipment; include this in the Section of the Report associated with this topic.
3. Provide annotated onelines identifying the Incident Energy and Arc Flash Hazard Level at each piece of equipment; include this in the Section of the Report associated with this topic.
4. All onelines shall be legible and readable with a minimum 10 point font size; coordinate drawing size (not to exceed 22" x 34") accordingly. Provide sleeved drawing holders where printed size is larger than 11" x 17".

E. Short Circuit, Protective Coordination and Arc Flash Hazard Analysis Study

1. A short circuit, protective coordination and arc flash hazard analysis study shall be made for the entire distribution system in accordance with ANSI/IEEE C37.10 & C37.13, IEEE Std. 141, 242 and 399 beginning at Utility connections and ending at the largest feeder from each motor control center or panel as applicable for the system and analysis being conducted. Actual Utility data including system and equipment impedances, X/R Ratios, OCP device(s) and other applicable ratings are to be obtained by the EOR; include this

data as provided by the Utility Company in the Report provided.

2. The protective coordination study shall consist of the following:
   a. All protective devices contained in the scope of work shall be evaluated to provide the best possible coordination and protection where possible. The coordination study shall include computer generated log-log plots of phase overcurrent and where applicable, ground overcurrent protection devices on log-log time-current characteristic paper. Complete plots of these devices will be accurately plotted through their operating range. A oneline sketch shall be included on each plot sheet showing the device identifications and ratings. Attempts are to be made by the Engineer to obtain complete coordination on every portion of the system where possible. Appropriate maximum fault levels, transformer inrush currents, conductor insulation withstand curves and transformer damage curves / withstand points shall be plotted on each coordination plot sheet to assure adequate component protection and maximum system reliability.
   b. Each current transformer shall be checked for saturation to insure that they accurately translate all fault currents which may be available on the system.
   c. A complete and thorough discussion of each coordination curve sheet shall be prepared. This discussion will describe the areas where coordination is effective, as well as any instances where a lack of coordination exists. All protective relay and solid-state device settings; fuse sizes; and low-voltage circuit breaker settings shall be tabulated. Recommendations for equipment and/or conductor changes which may be necessary to improve protection and/or coordination shall also be provided in a section of the completed coordination study. The recommendations should include discussion on additional devices/replacements and adjustments to existing equipment.
   d. A complete set of coordination curves (complete with device settings indicated on the TCC) are to be prepared starting with the Utility Company's OCP device(s) and the main distribution devices protecting the Owner's service down through and including all on-site services, feeders, sub-feeders, transformers and secondary main and branch circuit devices, shall be included in the Study. These shall be arranged to provide a uniform approach to the review and device coordination for the system and shall include a snap-shot/annotated oneline diagram on each TCC sheet outlining the devices included. Provide sufficient overlap on the TCC evaluations included to demonstrate "upstream / downstream" coordination.
   e. The final selection and setting of overcurrent devices shall be based on this protective coordination study; coordinate these settings with overcurrent relays or primary fuses associated with the Power Company's up-stream protective devices and relative devices provided by the switchgear manufacturer
   f. The EOR conducting the Study shall also coordinate ground fault protection provided in conjunction with the project where applied. Provide Time Current Characteristic (TCC) curves for all GFI equipment protection as outlined above.
   g. Motor starting voltage profiles for all large motors (over 25 HP or as otherwise determined and accepted by the Owner) shall be provided based on the starter type being provided; other motors to be configured as combined loads as applicable to the application
   h. Tabulations shall include a listing of the worst-case calculated short circuit duties as a percentage of the applied device rating (automatic transfer switches, circuit breakers, fuses, etc.); the short circuit duties shall be upward-adjusted for X/R ratios that are above the device design ratings. This tabulation shall also include indication of acceptability or, in the event of a noted deficiency, provide recommended solution for corrective action.
   i. Points of non-coordination shall be brought to the attention of the Owner, along with recommendations by the EOR based on the manufacturer's equipment involved.
   j. The Study shall include all existing and new equipment as included in the Scope of

Work for this assignment. The use of documentation and record information as may be provided by the Owner shall not be construed as providing all data necessary; the EOR shall be responsible to conduct or obtain field verification necessary to determine / obtain all required data in establishing the power distribution one-line diagram for the system being evaluated.

k. Submissions and approval of this study are required as outlined below in Article 1.06 of these specifications.

3. Arc Flash Hazard Analysis

a. The arc flash analysis shall include the incident energy and flash boundary calculations.

1) Unless otherwise specified or approved in writing by the Owner, the EOR shall utilize a Working Distance of 18 inches for ALL voltage levels (low & medium voltage values); not the 18" or 24" typical distances for low voltage systems and/or 36" for medium voltage systems as otherwise permitted under NFPA-70E / IEEE.

2) Calculations shall be provided for both line and load sides of all transformers and the overcurrent protective devices served from these transformers or other separately derived sources and labeling developed to identify both Incident Energy / PPE sets of values. Equipment Arc Flash Hazard labeling to be provided indicating both Incident Energy and PPE Levels associated with these analyses to properly identify and notify workers to the hazards present.

b. The EOR shall furnish an Arc Flash Hazard Analysis Study per the latest edition of NFPA 70E - *Standard for Electrical Safety in the Workplace*, reference Article 130.3 and as indicated in Annex D to these specifications.

c. The analysis shall utilize the appropriate short-circuit and clearing times associated with the over-current protective devices. Where this information is not available, alternative methods for similar devices shall be identified and submitted in the study for review and comment by the Owner.

d. The flash protection boundary and the incident energy shall be calculated at all significant locations in the electrical distribution system (I.E. transformers, switchboards, switchgear, motor-control centers, panelboards, busways and other associated power equipment) where work (including inspection activities) may be performed on energized parts. [i.e. infrared scanning / thermal-imaging of terminations]

e. The Arc-Flash Hazard Analysis shall include all medium voltage where applicable, 480/277 volt locations as well as those locations associated with the 240 volt and 208 volt systems fed from transformers greater than 112.5 KVA. Where the arc-flash energy is calculated to be a value below the PPE 0 level (or 1.2 cal/cm^2) of protection, the Analysis shall provide indication; however, electrical equipment shall still be labeled as part of the Work associated with this project.

f. Safe working distances shall be identified for calculated fault locations based upon a calculated arc flash boundary considering an Incident Energy level of 1.2 cal/cm^2; (the distance at which the incident heat energy density would be 1.2 cal/cm^2). Working distances shall be based on paragraph 3.a.1 above and in accordance with the general criteria as outlined in IEEE 1584. The calculated arc flash protection boundary shall be determined using those working distances.

g. The Arc Flash Hazard analysis shall include calculations for maximum and minimum contributions of fault current magnitude (based on the available fault-current values, not the AIC ratings of the equipment). The minimum calculation shall assume that the Utility contribution is at a minimum and shall assume a minimum motor load contribution from the Facility. Conversely, the maximum calculation shall assume a maximum contribution from the Utility and shall assume motors to be operating under full-load operating conditions. The calculations shall include all motor and other sources that can contribute to the available fault current. The Arc-

Flash Hazard Analysis shall be performed utilizing mutually agreed upon facility operational conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.

h. As previously noted, Arc flash computations shall include both line and load side of "main" breaker calculations. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. In general, AW does not consider the use of this IEEE Exception to be appropriate. However, where the EOR proposes using a maximum clearing time of 2 seconds (*based on IEEE 1584. Appendix B.1.2*), the Study Report shall include the EOR's supplemental evaluation & documentation regarding the physical conditions of the area, the type of equipment involved and the work tasks anticipated in making this recommendation for consideration and acceptance by the Owner. Where it is deemed not physically or readily possible to move outside of the flash protection boundary in less than 2 seconds during an arc flash event, the maximum clearing time based on the specific location shall be utilized unless otherwise proposed by the EOR through the evaluation of the area and tasks as outlined above.

i. Results of the Analysis shall be submitted in tabular form, include device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, personal-protective equipment classes and the arc flash incident energy levels determined. In addition, the Study shall include the EOR's recommendations for possible reduction in the arc flash energy as well as other possible provisions for improving operation, maintenance and safety of personnel.

j. The Report shall also include identification of the Personnel-Protective Equipment (PPE) Classes and identify minimum PPE required for each location.

k. Arc Flash Labeling of Electrical Equipment: Provide copies of the Arc Flash Labels (Article 3.03 below) in the Report for documentation of the information being identified on the equipment in a separately tabbed section of the report. Include in this section definitions of the terms and distances outlined along with information on the various PPE equipment classifications indicated.

1.04 SHORT CIRCUIT, PROTECTIVE COORDINATION AND ARC FLASH ANALYSIS STUDY QUALIFICATIONS

A. The short-circuit, protective device coordination and arc flash hazard analysis studies shall be conducted under the supervision and approval of a Registered Professional Electrical Engineer skilled (*minimum of 10 years of demonstrated experience in conducting power systems studies; provide qualifications upon request*) in performing and interpreting the power system studies. The final report, including copies of the Arc Flash Labels, shall be sealed and signed by the EOR.

1.05 ENGINEERING STUDY / REPORT SUBMISSIONS

A. Submit the following Reports for AW Engineering Review and Comment.

1. Preliminary – Report to contain field verified and annotated One-line Power Riser Distribution Diagram with OCP devices, device settings and cable feeders (conductor size/type and raceway size/type) identified.

a. As part of this Preliminary effort, consideration related to new equipment selections shall include type of device, and features needed to assure adequate withstand suitability and over-current protective features needed for protective coordination with other elements of the power distribution system and loads served. Provide initial discussion and/or indication related to proposed equipment for Owner consideration and comment.

b. Include the overall oneline diagram along with a oneline diagram indicating the initial short-circuit values anticipated based on Utility and simplified computer modeling approach. This information will provide basic evaluation for the equipment short-circuit / withstand ratings initially being considered / developed.

2. Pre-Final - Provide a written response to Owner comments provided regarding Preliminary Study Report. Advance the Preliminary Report, providing all calculations associated with Short-Circuit AIC values and Equipment suitability, initially identified Protective Coordination settings, and preliminary Arc-Flash Hazard Analysis Report with proposed / typical ANSI Z535.* label information (*current edition*) documentation. Where considered appropriate, this report is to be presented with a Recommendations Section (supplement to the Executive Summary) identifying any proposed modifications or other changes associated with reduction of fault current, improved protective coordination and mitigation of arc-flash energy being considered / recommended by the EOR. Preliminary PPE ratings will be clearly identified in the Report for each piece of equipment to assist in Owner's review. Recommendations for any modifications and/or changes shall include estimated costs related to the materials, installation/construction, and design/engineering.
   a. Included in this Report, Oneline Drawings for the overall Power Distribution Power Riser diagram, an annotated oneline outlining the Short-Circuit ampacity values calculated, and an annotated oneline showing the Arc Flash Incident Energy and PPE Levels calculated. Each of these oneline diagrams shall be included in their appropriate Sections of the Report.
   b. In addition, a copy of the oneline diagram with the OCP devices indicated shall be included with the Protective Coordination TCC's. Each TCC shall include the partial oneline drawing associated with the protective coordination elements being evaluated and included.
3. Final - Provide a written response to Owner comments provided regarding Pre-Final Study Report. Finalize the information associated with the Pre-Final Report; update data, settings and other appropriate information including any accepted Recommendations and/or Modifications.
   a. Provide three hard-copies of each submission Report as well as editable Word electronic formatted Report document with the Final submission. Power Distribution Riser Diagrams shall be provided for all analysis configurations conducted including, but not limited to, short-circuit models for minimum and maximum operational scenarios and arc flash hazard models. Include hardcopies of equipment reports and calculations performed.
   b. Submit an electronic copy of the final Arc Flash Hazard Analysis and One-line Power Riser Diagram, complete with all associated equipment databases formatted with the engineering software used and as outlined herein.
   c. The report shall include the following sections:
      1. Executive Summary including Introduction, Scope of Work and Results/Recommendations
      2. Short-Circuit Methodology Analysis Results and Recommendations
      3. Short-Circuit Device Evaluation Table
      4. Protective Device Coordination Methodology Analysis Results and Recommendations
      5. Annotated and revised oneline diagrams (all) as outlined in "2" above shall be provided with the Final Report.
      6. Protective Device Settings Table
      7. Time-Current Coordination Graphs and Recommendations
      8. Arc Flash Hazard Methodology Analysis Results and Recommendations including the details of the incident energy and flash protection boundary calculations, along with Arc Flash boundary distances, working distances, Incident Energy levels and Personal Protection Equipment levels.

9. Arc Flash Labeling section showing types of labels to be provided. Section will contain descriptive information as well as actual copies of the label images.
10. One-line system diagram that shall be computer generated and will clearly identify individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location, device numbers used in the time-current coordination analysis, and other information pertinent to the computer analysis.

4. Upon acceptance of the Final Report, provide labeling of the power distribution equipment in accordance with ANSI Z535.4– Product Safety Signs and Labels; label size to be 4” x 6”. Labels to be provided as outlined in Article 3.03 below. Label materials furnished to be suitable for either the interior or exterior locations where they are to be applied; provide samples for review and approval by the Owner along with data sheets from the Manufacturer outlining these applications.

1.07 COMPUTER ANALYSIS SOFTWARE

A. The studies shall be performed using ETAP power systems software as provided by OTI, or SKM Systems Analysis Power Tools for Windows (PTW) software program.

B. Provide a final electronic file copy of all data, reports and the oneline diagram in electronic engineering database (ETAP or SKM) format to the Owner prior to final acceptance of the Project. This information is to be validated by the EOR as representing “As-Built” conditions including all over-current protective devices and their settings, feeder conductors and raceway information and load data; including inductive, resistive and combination loads. The files shall contain all Reports (in Microsoft Word) conducted including Short-Circuit evaluations, Protective Coordination and Load Flow Studies as well as the Arc Flash analysis values determined as well as copies of the Arc Flash labels. The EOR for the Study shall attest to this validation in writing when submitting the final electronic copy of the project.

PART 2 – PRODUCTS - Not Applicable

PART 3 - EXECUTION

3.01 FIELD INVESTIGATION / DATA COLLECTION

A. Continuity of Service:
  1. If any service or system must be interrupted, the Contractor / Engineer shall request permission in writing stating the date, time, etc. the same will be interrupted and the areas affected. This request shall be made in sufficient time (approximately 1 week minimum in advance) for proper arrangements to be made. Written permission shall be obtained from the Owner before any interruption to electrical power is permitted.

B. Lock-Out / Tag-Out Procedures
  1. The Contractor shall provide his own lock-out / tag-out equipment in coordination with the Owner’s program; coordinate with the Owner’s field operational and maintenance staff.
  2. The Contractor shall have in effect a written safety program that includes a lock-out / tag-out safety program in accordance with OHSA under Part 1910, Subpart S.

C. Electrical Safety Program

1. The Contractor shall review the Owner's Electrical Safety Program and take the necessary precautions, in conjunction with his own safety program for employee protection.
2. The Contractor is to have in effect a written electrical safety program that includes all applicable provisions of the NFPA-70E which has been adopted by OHSA under Part 1910, Subpart S.

D. The Contractor shall provide written documentation indicating that his employees, those working on American Water projects, have been trained and certified on all provisions applicable to B and C above upon request from the Water Company.

E. The Contractor's employees shall follow all provisions of Band C above including, but not limited to, the use of personal protective equipment (PPE), establish protective barriers, approach boundaries and documentation for such activities. Provide a written statement attesting to the above requirements prior to the start of the Field Investigation / Data Collection activities.

3.02 FIELD ADJUSTMENT

A. The Contractor shall adjust protective devices settings based on the final accepted Study/Report provided by the Engineer; settings to be listed in a table format and submitted as part of the final O&M Manual for the equipment / system.

3.03 ARC FLASH WARNING LABELS

A. The electrical equipment supplier or independent study engineer shall provide an ANSI Z535.4 compliant (size 4 in. x 6 in.) thermal transfer type two color die-cut arc flash label as provided by DuraLabel or Brady for each work location analyzed and included in this project. Material type to be suitable for the locations; IE indoor, outdoor, chemical resistively, etc.

B. If the equipment will be energized prior to the application of the final labels, provide temporary labels until the final labels are applied. Temporary labels do not need to be of the materials specified above. Temporary labels shall be suitable for the environment (example 110 pound paper or 30 pound paper in a plastic "page protector"). [Note: label information to meet required criteria outlined herein for permanent labeling. Once final labels are available, remove temporary labeling and provide permanent labels as indicated.]

C. The label shall have either an orange header with the wording, "**WARNING, ARC FLASH HAZARD**", or a red header with the wording, **"DANGER, ARC FLASH HAZARD".** The Danger signal wording shall be provided for all incident energy values calculated greater than 40 cal/cm^2; Warning to be used for all values calculated below 40 cal/cm^2. These labels shall include the following information:

1. Location designation
2. Nominal voltage
3. Flash protection boundary
4. Hazard risk category including PPE Classification
5. Available Fault Current at this equipment location *(SS Value from study)*
6. Incident energy
7. Working distance
8. Engineer, report number, revision number and issue date

Refer to Appendix for Sample Label and Information to be included

D. Labels shall be machine printed, with no field markings

E. Arc flash labels shall be provided in the following manner and all labels shall be based on recommended over-current device settings. Coordinate the data provided with the Arc Flash Study results and the ANSI labeling requirements. Quantities outlined below are considered minimum quantities necessary; provide additional labeling as may be required by Regulatory or Inspection Agencies at no additional cost to the project.

1. For each transformer, 480 and applicable 240 and/or 208 volt panelboard, individually-mounted circuit breaker and safety disconnect device, one arc flash label shall be provided
2. For each motor control center, one arc flash label shall be provided *(see footnote below).*
3. For each low voltage switchboard, one arc flash label shall be provided *(see footnote below).*
4. For each low or medium voltage switchgear, one arc flash label shall be provided *(see footnote below).*
5. For medium voltage switches one arc flash label shall be provided *(see footnote below).*
6. For each motor power terminal box, 25 horsepower and larger, one arc flash label shall be provided
7. General Use Safety labels shall be installed on equipment in coordination with the Arc Flash labels. The General Use Safety labels shall warn of general electrical hazards associated with shock, arc flash, and explosions, and instruct workers to turn off power prior to work.

(Footnote – where control center, switchboard, or switchgear assemblies are dual-fed, provide on arc flash label at each main entrance device or section as well as at any "Tie" device location. For equipment that is front and rear accessible, provide the same labeling on the rear sections as outlined above.)

F. Refer to the Appendix to this Section for examples of required labels.

G. Labels shall be field installed by the (Contractor or Engineer) at the conclusion of the project after acceptance by the Owner.

H. Provide written maintenance procedures and guidelines in accordance with NFPA-70E; Latest Edition

APPENDIX 2 - ATTACHMENT 9

[RESERVED]

APPENDIX 2 ATTACHMENT 10

CHEMICAL STORAGE ANALYSIS

POST TREATMENT CHEMICAL STORAGE ANALYSIS

	Avg Pre MGD	Max Pre MGD	Avg 2nd Pass MGD	Max 2nd Pass MGD	Avg Post MGD	Max Post MGD
	24.0	**28.0**	**4.1**	**4.1**	**9.6**	**11.2**
	Sodium Hydrox Post 50%	**Sodium Hydrox 2nd Pass 50%**	**Zinc Ortho Phosphate 32.5%**	**Sodium Hypochlorite to Filters 0.8%**	**Sodium Hypochlorite to Post 0.8%**	**Sodium Hypochlorite Total 0.8%**
				On-Site Hypo Gener.	On-Site Hypo Gener.	On-Site Hypo Gener.
Active Ingredient Concentration	6.4	6.4	3.8	0.07	0.07	0.07
Units	lb/gal	lb/gal	lb/gal/	lb CE/gal	lb CE/gal	lb CE/gal
Form	Liquid	Liquid	Liquid/	Liquid	Liquid	Liquid
	Neat	Neat	Neat			
Density Deliv. (lb/gal)	12.76	12.76	11.68	8.34	8.34	8.34
Dose	**Dose, (mg/L) as Active Ingredient**					
Minimum	2.0	5.0	0.5	0.50	1.00	
Average	3.0	10.0	1.0	2.00	1.50	
Maximum	5.0	20.0	3.0	3.00	2.50	
Dose	**Average Flow - Pounds per Day of Active Ingredient**					
Minimum	160	171	40	100	80	180
Average	240	342	80	400	120	520
Maximum	400	684	240	600	200	801
Dose	**Maximum Flow - Pounds per day of active ingredient**					
Minimum	187	171	47	117	93	210
Average	280	342	93	467	140	607
Maximum	467	684	280	701	234	934
	Average Flow Feed Rate - Volumetric Basis					
Dose	gal/day	gal/day	gal/day	gpm	gpm	
Minimum	25	27	11	1.0	0.8	
Average	38	54	21	4.2	1.3	
Maximum	63	107	63	6.3	2.1	
	Maximum Flow Feed Rate - Volumetric Basis					
Dose	gal/day	gal/day	gal/day	gpm	gpm	
Minimum	29	27	12	1.2	1.0	
Average	44	54	25	4.9	1.5	
Maximum	73	107	74	7.3	2.4	
Storage						
Units	gals	gals	gals	*SALT: 3 lbs/Chlorine Equivalent*		
Max. Dose x Avg. Flow x 30 days	1,882	3,216	1,899	54,043	18,014	72,058
Avg. Dose x Max. Flow x 30 days	1,318	1,608	738	42,034	12,610	54,644
Avg. Dose x Avg. Flow x 30 days	1,129	1,608	633	36,029	10,809	46,837
Storage Volumes						
Delivery Size	Bulk Delivery 3,448 gal		Bulk Delivery 3,768 gal			Bulk Delivery 44,000 lbs SALT
Storage Number Min Volume Each, gal	**Bulk Tank** **1** 5,172		**Bulk Tank** **1** 5,653			**Bulk Tank** **2**
Notes						1

NOTES

Note (1) Bryneer Model 10-15 to receive 25 ton delivery

PRETREATMENT CHEMICAL STORAGE ANALYSIS

Average Flow, MGD: 24.0 **Filter Waste Flow, MGD** 1.2 **2nd Pass Inlet, MGD** 4.1
Max Flow:, MGD 28.0 **Filter Waste Flow, MGD** 1.4 **2nd Pass Inlet, MGD** 4.1

	Coagulant Ferric Chloride 40%	**Sodium Bisulfite 38%**	**Sulfuric Acid 50%**		**Polymer Non-Ionic to Waste 35.0%**	**Threshold Inhibitor Pre 100%**	**Threshold Inhibitor to 2nd Pass 100%**
Active Ingredient Concentration	4.7	4.2	5.83		3.1	10.4	10.4
Units	lb/gal	lb/gal	lb/gal		lbs/gal	lb/gal	lb/gal
Form	Liquid Neat	Liquid Neat	Liquid/ Neat		Liquid Emulsion Neat	Liquid Neat	Liquid Neat
Density Deliv. (lb/gal)	11.68	11.09	11.66		8.8	10.4	10.4
Dose		**Dose, (mg/L) as Active Ingredient**					
Minimum	2.0	1.5	5.0		0.2	2.0	2.0
Average	3.0	3.0	10.0		0.2	3.0	3.0
Maximum	5.0	6.0	30.0		0.8	6.0	6.0
Dose		**Average Flow - Pounds per Day of Active Ingredient**					
Minimum	400	300	1,001		2	400	68
Average	600	600	2,002		2	600	103
Maximum	1,001	1,201	6,005		8	1,201	205
Dose	**Maximum Flow - Pounds per day of active ingredient**						
Minimum	467	350	1,168		2	467	68
Average	701	701	2,335		2	701	103
Maximum	1,168	1,401	7,006		9	1,401	205
	Average Flow Feed Rate - Volumetric Basis						
Dose	gal/day	gal/day	gal/day		gal/day	gal/day	gal/day
Minimum	86	71	172		0.65	38.4	7
Average	129	142	343		0.65	57.6	10
Maximum	214	285	1,030		2.60	115.2	20
	Maximum Flow Feed Rate - Volumetric Basis						
Dose	gal/day	gal/day	gal/day		gal/day	gal/day	gal/day
Minimum	100	83	200		0.76	44.8	7
Average	150	166	401		0.76	67.2	10
Maximum	250	332	1,202		3.03	134.4	20
Storage							
Units	gals	gals	gals		gals	gals	gals
Max. Dose x Avg. Flow x 30 days	6,429	8,548	30,899		240	3,456	592
Avg. Dose x Max. Flow x 30 days	4,500	4,986	12,016		70	2,016	296
Avg. Dose x Avg. Flow x 30 days	3,857	4,274	10,300		19	1,728	296
Storage Volumes							
Delivery Size	Bulk Delivery 3,768 gal	Bulk Delivery 3,967 gal	Bulk Delivery 3,774 gal		Drum, 55 gal 55	Bulk Delivery 4,221 gal	
Storage	**Bulk Tank**	**Bulk Tank**	**Bulk Tank**		**Drum**	**Bulk Tank**	
Number	**1**	**1**	**1**		**1**	**1**	
Min Volume Each, gal	5,653	5,950	10,000		or 10 PAILS @ 5 GAL	6,331	
Notes		**Note 1**					

NOTES
1 - Excludes feed to Filter to Waste or Brine Discharge

APPENDIX 2 ATTACHMENT 11

CAD STANDARDS

CAPTIAL IMPROVEMENT PROJECTS

Table of Contents

Software

1. AutoCad software is the preferred drawing software. The most recent version of AutoCad should be used.

Drafting Procedures

EXTERNALLY REFERENCED DRAWING

1. Begin a new drawing with the Awwborder template file, **AWWBORDER.DWT.**

AutoCAD Template Files

FILENAME	DESCRIPTION
AWWMODEL. DWT	This template is to be used for all full-scale (real world) Model Space drafting.

2. Draw all items in real world measurements in model space. Ex: a pipe that is 100 feet long shall be drawn at 100 feet.

3. Save Drawing as per AWW file naming procedure (page 2) for externally referenced drawing using the normal save command icon.

Layering Convention

All layer names shall follow the AIA National CAD Standard layering standard. Absolutely **NO** numbers will be used as layer names.

Color Scheme

Colors shall determine the line weight of the object being drawn; the color scheme shall be as follows with the first color being the heaviest and the last being the lightest. CYAN (4), GREEN (3), RED (1), BLUE (5), WHITE (7), YELLOW (2). Color MAGENTA (6) shall be used for all existing objects. The appropriate color will correspond with the discipline of the dwg. Ex: A concrete foundation will be color (4) Cyan on the structural dwgs but will be color (7) white on the mechanical dwgs for new items. All non specific discipline items will be color (7) white. Text and dimensions shall always be color yellow (2). All bold text shall be color cyan (4). All new hatch patterns will be color 253 on all disciplines except if that item is being described or detailed then you would use a heavier color such as blue or red (new items). The color will be changed on the contract dwg (layout) to agree with the discipline of that dwg. All discipline driven items shall be color (4) cyan or color (3) green or color (1) red or color (5) blue depending on the complexity of the individual detail and its viewport scale. EX: If a detail shows information regarding a complex steel detail and if cyan was used, the detail bleeds into other items after it was plotted, then you would use color green or red to clearly show the information after it has been plotted. This will be at the user's desecration. Typically, cyan is used for the discipline driven item. All non-discipline items will always be color (7) white. All existing items on all disciplines will

always be color (6) magenta. The Standard .ctb file will be supplied by AW for plotting to follow the above color scheme.

<u>File Naming Procedure</u>

Externally Referenced (XREF) Drawings

Xref drawing files should conform to an eight.three (XXXXXXXX.DWG) naming structure and should identify the objects being drawn as clearly as possible. The following procedure shall be used to name and save Xref drawings:

First Character	=	X
Second & Third Characters	=	Location/Building Designation AV = Altitude Valve Vault BW = Backwash Tank CB = Chemical Building CW = Clearwell ET = Elevated Tank FB = Filter Building GE = Generator GS = General Site GST = Ground Storage Tank LM=Location Map OF = Office OFS = Outfall Structure PS = Pump Station RWI=Raw Water Intake SB = Sed Basin TP=Treatment Plant WW = Washwater Tank
Fourth Character	=	Dash (-)
Fifth Character	**=**	Discipline code A = Architectural C = Civil/Site work E = Electrical D = Process I = Instrumentation M = Mechanical (HVAC, Plumbing, Fire Protection) R = Removals S = Structural
Sixth & Seventh Characters	=	Drawing Type DT = Detail EL = Elevation FP = Floor Plan PR = Profile RP=Roof Plan SC = Section SH = Schematic

Externally Referenced (XREF) Drawings (cont'd)

Eighth Character	=	Floor Level or Revision (if necessary, otherwise don't use) Could also be the Section Number (1,2) or Elevation Direction (N, S, E or W)

For Example:

XCB-MFP1.DWG would be the Chemical Building, Mechanical first floor plan.

XAV-SSCA.DWG would be the Altitude Vault, Structural Section "A".

XFB-AE.DWG would be the Filter Building, Architectural Elevation.

Contract or Sheet Drawings

1. Begin a new drawing with the paper space template file, **AWWBORDER.DWT.** The **AWWBORDER.DWT** shall be used for all disciplines. **The AWWBORDER.dwt shall never be exploded, revised, renamed or scaled. Also, the AWWBORDER.dwt will not be xreferenced into a drawing, a new drawing shall be started each time using the AWWBORDER.dwt. Sheet sets will be acceptable.** The limits will remain at **0,0** & **36,24** and be plotted at 1:1. All attributes inside the AWWBORDER.DWT will be filled out according to AWW naming convention for new drawings. AWW uses a document management program and it is **VITAL** that the border template and block remain as is.

AutoCAD Template Files

TEMPLATE NAME	DESCRIPTION
AWWBORDER.DWT	This template is to be used for all layouts and annotation in the Paper Space environment. This template is to be used for all drawings slated to be xrefs once the title block information is deleted.

2. Enter necessary information into the AWW title block with DDATTE icon.

3. Save the drawing as per the AWW File Naming Procedure for Contract Drawings. See attached .pdf file.

4. Toggle to Model Space. Attach the required xref's.

5. Toggle back to Paper Space and create all necessary viewports with the MVIEW command while on the approaiate layer.

6. All dimensions and annotation shall be on the model space of the xref drawing following the Autocad normal standard procedure for dimensions and annotation. All text will be annotative and follow the AWW Text Style guide.

7. All contract Dwgs shall be plotted at a scale of 1:1. They will include a graphic scale and north arrow.

8. The title block shall contain all required pertinent information related to the project such as project title, location, engineer of record, date, WBS number, drawing number, sheet numbers and revision dates. In the case of CAD files the file path shall be placed on the drawing along with the plot date using AutoCAD's plot stamp.

9. Generally all drawings shall be aligned with project north to the top of the drawing sheet. A north arrow shall be placed on the drawing in a prominent location.

10. Each drawing shall display project notes in a tabular format when required. Notes shall be project specific as determined by the Project Manager or Designer. Drawing notes shall consist of, but not be limited to, items such as construction/restoration specification, reference map information, utility information etc.

If the drawing contains topographic information the drawing shall include a vertical datum note, which shall indicated the vertical datum utilized on the plan. It will also include surveyor information. Where a specific horizontal datum is utilized, a horizontal datum note shall be shown on the plan.

11. All drawing revisions made after official release of the drawing shall be dated and noted in the revision block. An Autocad generated plot stamp will be used on all plotted drawings.

12. All drawings that are issued outside of E&TS shall be updated in the title block as follows:

(a) "Preliminary" – used for issue of any drawing prior to approval of Final Design. Drawings issued for permitting purposes shall not be stamped.

(b) "Permit Set" – used for the issue of any drawing intended for permits.

(c) "Bid Set" – used for the issue of any drawing intended for bidding.

(d) "Issued for Construction" – used for issue of any drawing intended for construction.

(e) "Record Drawing" – used for as-built drawings.

13. Standard survey note shall be added to the topo graphic sheet and read as follows: "All survey information is taken from a survey information is taken from a survey prepared by (name), (city), (state), registered card surveyor, (number #), prepared (date) for (water company)".

14. All drawing sets shall include cover sheet with drawing index, logo, water co. name, project title, aww engineering name, and month/year.

IF the contractor uses their own title block/border due to their document management sytem, they shall insert the block named Awwblock.dwg and fill out all attributed information according to the AWW Standarads outside of the contractors border. This will allow the AWW document management tracking to take place.

File Naming Procedure

Contract Dwgs

- Design contract drawings are assigned numbers, which are based on a 3 to 4 digit company number, a 3 to 4 digit series number and a 2 to 4 digit discipline sheet number (A = Architectural, G = General, E = Electrical, H = HVAC, I = Instrumentation, M = Mechanical, P = Process, PL = Plumbing, R = Removal, S = Structural).
- For Example:

A drawing prepared for New Jersey American Water Company, Lakewood District, and is an Architectural Dwg would be 350-1234-A1, a Mechanical Dwg would be 350-1234-M1. The following sheets in the discipline would be consecutive, M2, M3, M4 etc.

- Drafting personnel in the AWW Corporate Engineering Office will assign drawing numbers. A detailed list is kept for all districts within a Water Company. Since all projects are unique, each drawing set must also have a unique number. To avoid any confusion or duplication of drawing numbers, please contact AWW Corporate Engineering for all drawing numbers. Please provide the following information when calling in: Project Name & Station (location), BP Number, Name of Consultant (if one is used), and approximate number of drawings in the set. System Engineering drafting personnel will then issue a drawing number for the contract drawings and the sequential number for manufacturer's information drawings.
- The project design engineer prior to the start of drafting should prepare a drawing development schedule. The development schedule will provide the title of the project (line 1) and the discipline, location and type of drawing information (lines 2, 3 and 4) required to complete the title block of each drawing. Drawings should be numbered in accordance with this list.
- The electronic drawing filename will conform to an eight or nine.three (XXXXXXXX.DWG) naming structure and **WILL EQUAL** the AWW drawing number but

without the dashes. Call AWW Corporate Engineering Cad Department for numbers (856)-727-6133

- For Example:

  A drawing prepared for New Jersey-American Water Company, Lakewood District whose assigned drawing number is 350-1234-A1, would be electronically filed and saved as 3501234A1.DWG.

IF the contractor uses their own numbering system, all files shall be renamed electronically to follow the AWW standard listed above for final acceptance. The AWW design group will receive a CD containing all electronic drawing files numbered according to the AWW numbering system, including any xrefs, image files and .ctb files.

The table below lists the standard AWW text styles that are to be used when annotating drawings.

AutoCAD Text Styles

TEXT STYLE NAME	FONT	HEIGHT	DESCRIPTION
ROMANS	Roman Simplex	.1	Leaders & Notes & Dimensions
ROMAND	Roman Duplex	.15	Room Names, General Notes Title
ROMANDLG	Roman Duplex	.2	Headings, Titles
STANDARD*	Txt	N/A	Not Used

*AutoCAD Default Style – not used on AWW drawings.

AutoCAD Dimension Styles

Dimensions shall conform to the normal practices as set forth by Autocad for dimensions in model space, xrefs and viewports. All settings within the dimension variables will produce the final size in the viewports, text = .1, text style = Romans, arrow size = .125. Dimension layers shall conform to the AIA Layering standard.

HATCH PATTERNS

Standard Hatch Patterns

PATTERN	SCALE	ANGLE	DESCRIPTION
Steel			Sections through Steel Members
ANSI-37			Plans & Sections of Block Walls
AR-B816C			Elevations of Block Walls
ANSI-31			Plans of Brick Walls
AR-BRSTD			Sections of Brick Walls
BRICK			Elevations of Brick Walls
AR-CONC			Sections through Concrete
EARTH		45	Grade - New or Existing
INSUL			Sections through Wall Insulation
INSUL			Sections through Roof Insulation (other than batt)
GRATE			Grating - FRP or Aluminum
HOUND			Select fill (under slabs)
AR-SAND			Sand (i.e. Filter Media, Sub-base Material)
Aggregate			Broken Stone (under footers)
Sqshngle			Roof Shingles (elevation view)
Chainlnk			Chain link Fence (elevation view)
Chkdl			Checkered Plate (double line)
Chkds			Checkered Plate (single line)

NOTE: Scale of the hatch pattern shall be left up to the cad operator.

Design Drawing Development Schedule

AMERICAN WATER
SYSTEM ENGINEERING DEPARTMENT
IN-HOUSE DESIGN DRAWING DEVELOPMENT SCHEDULE

1ST LINE: PROJECT TITLE AS INDICATED IN BP MEMORANDUM

	2ND LINE	3RD LINE	4TH LINE
GENERAL	COVER SHEET		
CIVIL	CIVIL	LOCATION & VICINITY	PLANS
	CIVIL	SITE WORK & GRADING	PLANS
	CIVIL	SOIL EROSION & SED. CONTROL	PLANS
	CIVIL	SITE WORK	MISCELLANEOUS DETAILS
	CIVIL	OUTSIDE PIPING	PLANS
	CIVIL	OUTSIDE PIPING	PROFILES
REMOVALS	REMOVALS	LIMITS OF CLEARING	PLAN
	REMOVALS	PARTICULAR STRUCTURE	PLANS (at several elevations)
	REMOVALS	PARTICULAR STRUCTURE	SECTIONS
ARCHITECTURAL	ARCHITECTURAL	PARTICULAR STRUCTURE	PLANS (at several elevations)
	ARCHITECTURAL	PARTICULAR STRUCTURE	ELEVATIONS
	ARCHITECTURAL	PARTICULAR STRUCTURE	WALL SECTIONS
	ARCHITECTURAL	PARTICULAR STRUCTURE	DETAILS & SCHEDULES
STRUCTURAL	STRUCTURAL	PARTICULAR STRUCTURE	PLANS (at several elevations)
	STRUCTURAL	PARTICULAR STRUCTURE	SECTIONS
	STRUCTURAL	PARTICULAR STRUCTURE	DETAILS
MECHANICAL	PROCESS	OVERALL PLANT	SCHEMATIC
	PROCESS	OVERALL PLANT	HYDRAULIC PROFILE
	MECHANICAL	INTAKE/PUMP STATION/	PLANS (at several elevations)
	MECHANICAL	INTAKE/PUMP STATION/	SECTIONS
	MECHANICAL	CLARIFIER/FILTER BLDG./	DETAILS
	CHEMICAL PIPING	CLEARWELL/PUMP STATION	SCHEMATICS
	CHEMICAL PIPING	ETC.	PLANS (at several elevations)
	CHEMICAL PIPING	ETC.	SECTIONS & DETAILS
	PLUMBING	ETC.	PLANS
	PLUMBING	ETC.	SECTIONS
	PLUMBING	ETC.	DETAILS
ELECTRICAL	INSTRUMENTATION	OVERALL PLANT	PROCESS & INST. DIAGRAM
	INSTRUMENTATION	OVERALL PLANT	MOUNTING DETAILS
	ELECTRICAL	OVERALL PLANT	LEGENDS
	ELECTRICAL	OVERALL PLANT	MISCELLANEOUS DETAILS
	ELECTRICAL	OVERALL PLANT	SITE PLAN
	ELECTRICAL	OVERALL PLANT	ONE LINE DIAGRAM
	ELECTRICAL	OVERALL PLANT	SCHEMATIC DIAGRAMS
	ELECTRICAL	PARTICULAR STRUCTURE	PLANS (at several elevations)
	ELECTRICAL	PARTICULAR STRUCTURE	SECTIONS & DETAILS
	ELECTRICAL	PARTICULAR STRUCTURE	CONDUIT SCHEMATIC
	ELECTRICAL	PARTICULAR STRUCTURE	CABLE & CONDUIT SCHEDULE

NOTES:

<u>Water Company No's.</u>

Contact AWWSC Engineering for Drawing Prefixes
(856)-727-6133

<u>Miscellaneous Procedures</u>

Addendum Sketches

Addendum Sketches are 8 1/2” x 11” (A-size) drawings that are prepared during the bid phase to inform all potential contractors of a change in design. The need for such sketches usually arises during the contractors’ review and bid preparation for a project. The Design Engineer for the specific project usually provides input for the Addendum Sketch.

An 8 1/2” x 11” attributed title block has been created and saved as 81-2X11A.DWG and should be inserted **<u>into</u>** a modified or newly prepared plan, section or detail. The size of the sketch has been selected for ease in faxing to the contractors. If a large area of an original drawing is affected by the change/clarification, the entire D-size sheet will be revised and reissued to the all bidding contractors. All clarifying plans, sections or details must also be added to the original bid set of documents for incorporation into the As-built or Record set. Each affected bid set drawing should be updated in a timely manner and the revision should be noted in the Revision block of the title block. Annotation should include: the Addendum number, the drafter’s initial, and the current date. Leave space for the approving engineer to initial the revision.

The Addendum Sketch title block contains the following information: Title of Sketch (4 lines), Drafter’s Initials, Project Engineer’s Initials, Date Sketch was prepared, Project BP Number, Scale of Sketch, Addendum Sketch Number, Sketch Revision Date, and Reference Drawing Number. The Reference Drawing Number is the drawing number of the original design drawing in the bid set where the plan, section or detail was drawn. The Addendum Sketches are assigned drawing numbers in the following format: ADD-001, ADD-002, ADD-003, etc. Senior Drafting Personnel will assign drawing numbers. The original sketch will be filed with the Senior Design Drafter and a copy will be sent to the Approving Engineer for further markup or development.

Working Sketches

Working Sketches are 8 1/2" x 11" (A-size) drawings that are prepared after the project has gone to bid and has been awarded to a contractor. The need for such sketches usually arises during construction and should provide answers to the contractor's questions regarding field changes to the original design. The Design Engineer and/or the Construction Engineer for the specific project usually provide input for the Working Sketch.

An 8 1/2" x 11" attributed titleblock has been created and saved as N:\ACADCOM\BORDERS\81-2X11W.DWG and should be inserted **into** a modified or newly prepared plan, section or detail. The size of the sketch has been selected for ease in faxing to the contractor. If a large area of an original drawing is affected by the change/clarification, the entire D-size sheet will be revised and reissued to the contractor. All clarifying plans, sections or details must also be added to the original bid set of documents for incorporation into the As-built or Record set. Each affected bid set drawing should be updated in a timely manner and the revision should be noted in the Revision block of the title block. Annotation should include: a description of the change, the drafter's initial, and the current date. Leave space for the approving engineer to initial the revision.

The Working Sketch title block contains the following information: Title of Sketch (4 lines), Drafter's Initials, Project Engineer's Initials, Date Sketch was prepared, Project BP Number, Scale of Sketch, Working Sketch Number, Sketch Revision Date, and Reference Drawing Number. The Reference Drawing Number is the drawing number of the original design drawing in the bid set where the plan, section or detail was drawn. The Working Sketches are assigned drawing numbers in the following format: WS-001, WS-002, WS-003, etc. Senior Drafting Personnel will assign drawing numbers. The original sketch will be filed with the Senior Design Drafter and a copy will be sent to the Approving Engineer for further markup or development.

Redlining Procedure For Contract Drawings

Check prints of design contract drawings should be reviewed by the drafting group as well as by the engineering group before they are sent to external agencies for their review, comments or action. The following should be used as a guideline for redlining these drawings in a concise and consistent manner.

- Red Ink - should be used to indicate all revisions and corrections to a drawing
- Green Ink - should be used to indicate any desired deletions to a drawing
- Yellow Ink - should be used to indicate that any new or revised work has been done correctly
- Blue Ink - should be used by drafting personnel to indicate that a redlined item has been incorporated into the drawing. This will also assist personnel when reviewing the updated check print.

- Pencil - should be used to indicate notes or directions to drafting (things that drafting should do, but not things that should appear on the final drawing - i.e. “Move this electrical cabinet over 3 feet to the right”).

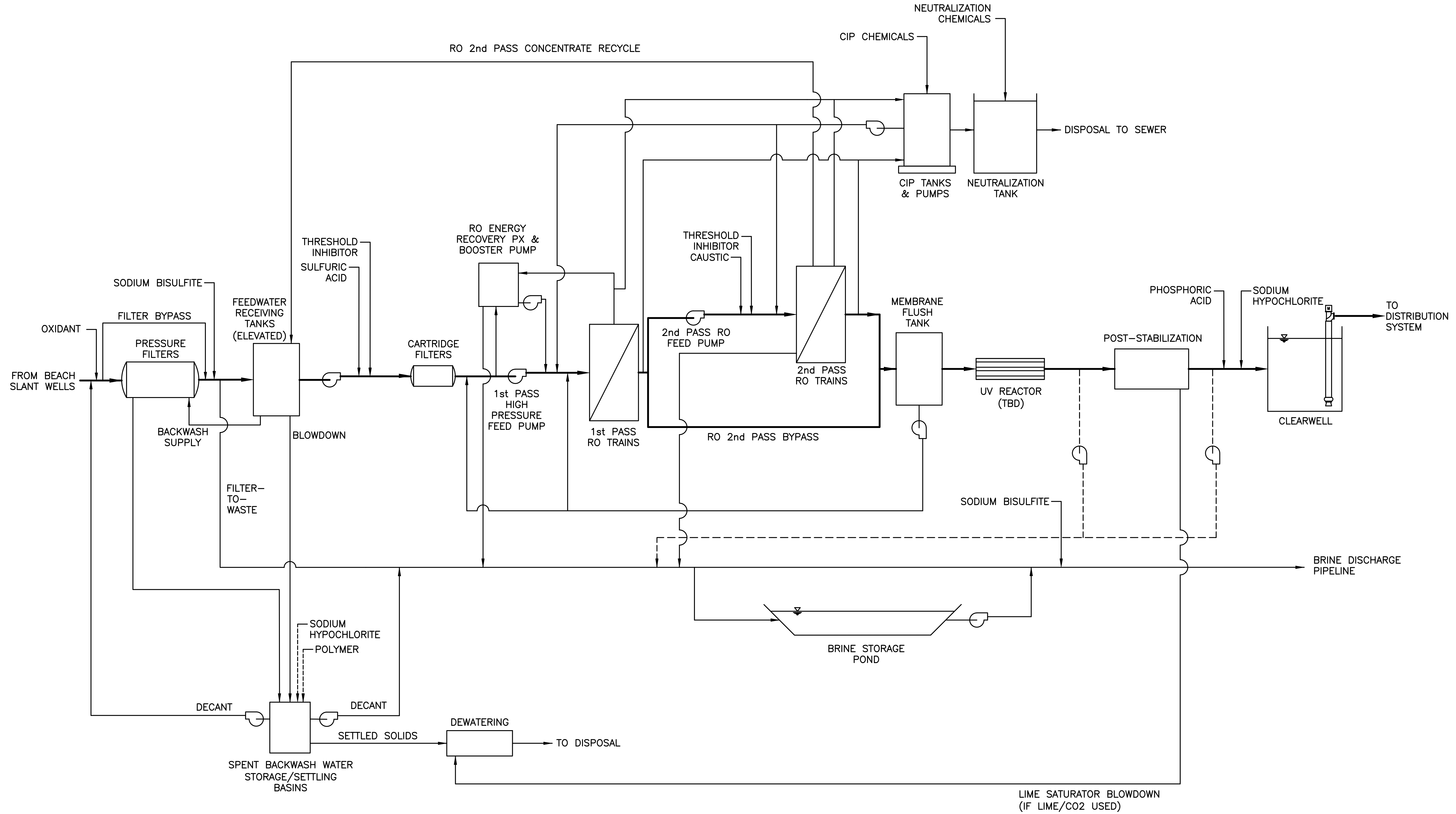
Appendix A
AWW Abbreviations

Abbreviation	Description
A.B.	Anchor Bolt
ADJ	Adjacent
ALUM.	Aluminum
ANSI	American National Standards Institute
APPROX.	Approximate
ARCH.	Architectural
AMP	Ampere
ASME	American Society of Mechanical Engineers
ASSY	Assembly
ASTM	American Society for Testing and Materials
UTO.	Automatic
AUX.	Auxiliary
AVG	Average
BLDG	Building
B.O.M.	Bill of Material
B.O.C.	Bottom of concrete
B.O.S.	Bottom of steel
BR	Bronze
BR	Brass
BTM	Bottom
C	Channel
°C	Centigrade, or Celsius
C to C	Center to Center
CFM	Cubic feet per minute
CHKD	Checked/Checkered (as in plate)
CI	Cast Iron pipe
CL.	Clearance
CM	Centimeter
COL.	Column
C.O.	Cleanout
CONC.	Concrete
CONSTR.	Construction
CONT.	Continued
CPLG	Coupling

CU.	Cubic
DEG(°)	Degrees
DIA.	Diameter
D.I.P.	Ductile Iron Pipe
DIM.	Dimension
DISCH.	Discharge
DN	Down
DPI	Differential Pressure Indicator
DWG	Drawing
E	East
EA.	Each
EA	Exhaust Air
E.F.	Each face
EL.	Elevation
ELL	Elbow
EQUIP.	Equipment
E.S.	Each Side
E.W.	Each way
EXIST.	Existing
EXPAN.	Expansion
F	Fan
°F	Fahrenheit
FD	Floor drain
FIG.	Figure
FL.	Floor
FLG	Flange
FLGD	Flanged
FPS	Feet per second
FS	Far side
FT(‘)	Foot or feet
FTG	Fitting
GAL.	Gallon(s)
GALV.	Galvanized
GPM	Gallons per minute
GND	Ground (as in electrical)
H	Height
HB	Hose Bibb
HEX	Hexagon(al)
HORIZ.	Horizontal
HP	Horsepower
HVAC	Heating, ventilation, and air conditioning
HZ	Hertz (frequency)
I.D.	Inside Diameter
IN.(“)	Inches
INV.	Invert (inside bottom of pipe)
JT.	Joint
KG	Kilogram

KVA	Kilovolt amperes
KW	Kilowatts
L	Length
LBS	Pounds
LR	Long Radius (of elbow)
M	Meter
MATL	Material
MAX.	Maximum
MCC	Motor Control Center
MECH.	Mechanical
MFR.	Manufacturer
MH	Manhole
MJ	Mechanical Joint (Pipe)
MIN.	Minimum
MISC.	Miscellaneous
MM	Millimeter
MVA	Megavolt amperes
N	North
N/A	Not applicable
NC.	Normally Closed
N.O.	Normally Open
NO.	Number
NOM.	Nominal
NPS	National pipe size
NPT	National pipe thread
NS	Near Side
NTS	Not to scale
OA	Outside air
O.D.	Outside Diameter
OH	Overhead
OPN’G.	Opening
ORIG.	Original
O.S.D.	Open Site Drain
P&ID	Process & Instrumentation Diagram
PE	Plain End (Pipe, etc.)
PERP.	Perpendicular
PL	Plate
PRESS.	Pressure
PRV	Pressure reducing/regulating valve
PSI	Pound per square inch
PSIA	Pound per square inch absolute
PSIG	Pound per square inch gauge
PVC	Polyvinyl chloride
QTY	Quantity
QUAD.	Quadrant
RED.	Reducing/Reducer
REINF.	Reinforcing/Reinforcement

REQ'D.	Required
REV.	Revision
RPM	Revolutions per minute
S	South
SCH or SCHED.	Schedule
SHT	Sheet
SLV	Sleeve
SQ.	Square
SR	Short Radius (of elbow)
S.S.	Stainless Steel
STD	Standard
STRUCT.	Structure/Structural
SUCT.	Suction
TEMP.	Temperature
THRU	Through
T.O.C.	Top of concrete
T.O.P.	Top of pipe
T.O.S.	Top of steel
TYP.	Typical
UG	Underground
UH	Unit heater
V	Volts
VERT.	Vertical
W	Watts
W	West
W	Width



THIS SCHEMATIC SHOWS OVERALL DESIRED PROCESSES, BUT IT NOT SUFFICIENTLY DETAILED TO SHOW ALL PIPING AND PROCESSES NECESSARY FOR A FULLY FUNCTIONING SYSTEM. THE DESIGN BUILDER IS ENCOURAGED TO INCLUDE FEATURES TO ENHANCE PLANT OPERABILITY.

EXHIBIT 1 Preliminary Process Flow Diagram	Monterey Peninsula WSP		CALIFORNIA AMERICAN WATER
	Drawn by E. Y. Idica, P.E.	Aug 2013	
	Design by C. C. Trussell, P.E.	Aug 2013	8/14/2013
	Design by S. Creel, P.E.	Aug 2013	
	Review by R. R. Trussell, P.E.	Aug 2013	

EXHIBIT 2

CONCEPTUAL DESIGN OF POWER DISTRIBUTION SYSTEM RISER DIAGRAM (SHEET 1 of 2)

** REVISED 8/16/2013
FOR ADDENDUM NO. 2

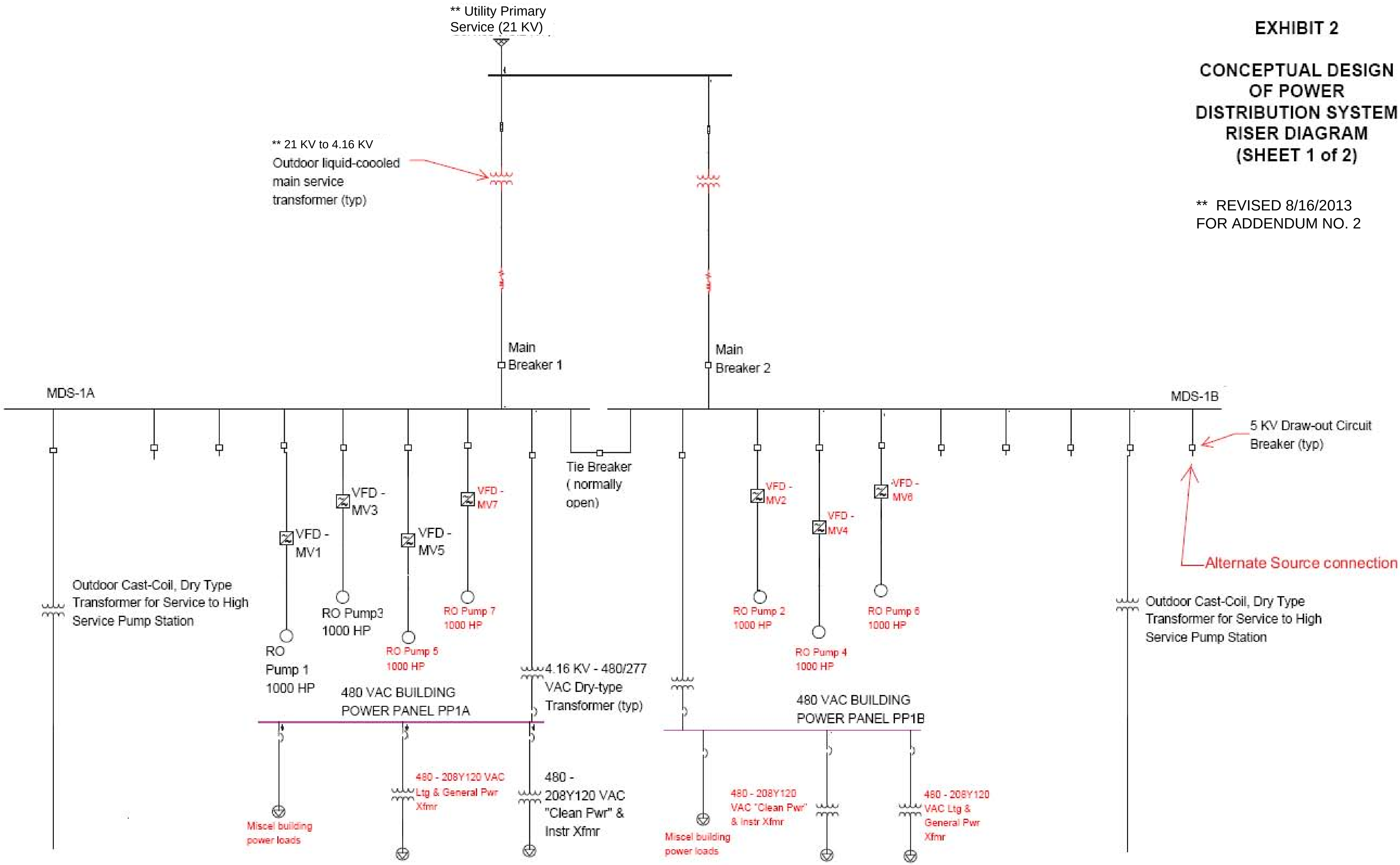
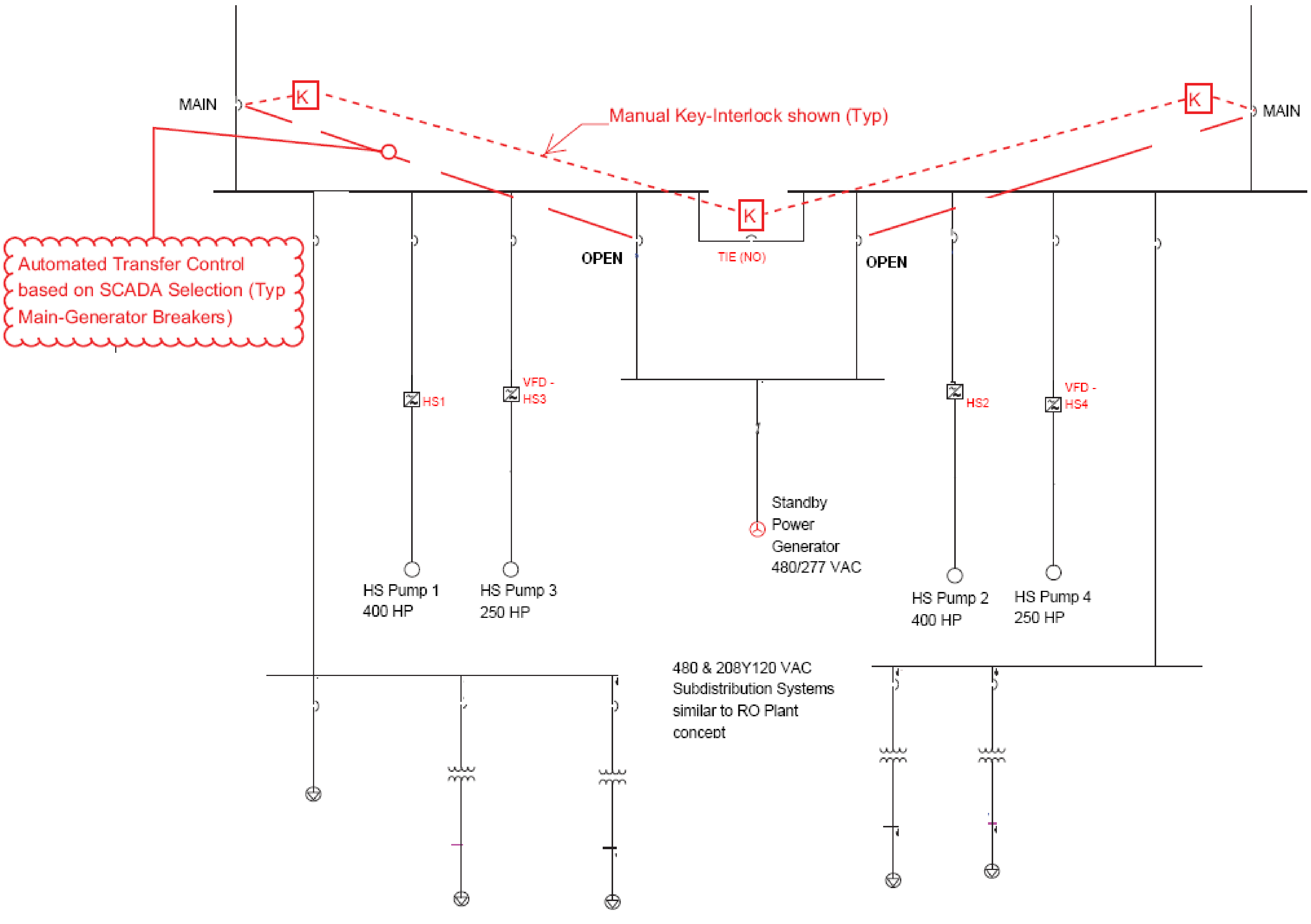


EXHIBIT 2

CONCEPTUAL DESIGN OF POWER DISTRIBUTION SYSTEM RISER DIAGRAM (SHEET 2 of 2)



Filtered Water Feedwater Pumps not shown; Other loads such as backwash pumps and UV disinfection not shown.

** Standby power supply to facilities on Sheet 1 is not shown.

HIGH SERVCE PUMP STATION - ONELINE DIAGRAM

APPENDIX 2 – ATTACHMENT 12

DRAWINGS

APPENDIX 2 – ATTACHMENT 13

VALVE SCHEDULE

Appendix 3

Governmental Approvals

Appendix 3

Governmental Approvals

3.1 Purpose and Objectives

The purpose of this Appendix is to provide a preliminary outline of the Governmental Approvals that are expected to be required for the design, construction and operation of the Project. Section 3.2 of this Appendix identifies Owner-designated Governmental Approvals. Section 3.3 identifies Governmental Approvals that are expected to be required to be obtained by the Design-Builder for the performance of the Design-Build Work. Notwithstanding the preliminary listing of Governmental Approvals in Section 3.3 of this Appendix, the Design-Builder shall be responsible for identifying and obtaining all Governmental Approvals (other than the Owner-designated Governmental Approvals) necessary for the performance of the Design-Build Work.

The Design-Builder shall be responsible for complying with the terms and conditions of all Governmental Approvals, including the Owner-designated Governmental Approvals.

3.2 Owner-Designated Governmental Approvals

Table 3-1 sets forth the Owner-designated Governmental Approvals that the Owner shall be responsible for obtaining in connection with the Project. The Design-Builder's obligations with respect to assisting the Owner in obtaining the Owner-designated Governmental Approvals are set forth in Section 3.6 of the Design-Build Agreement.

Table 3-1

CAW-Designated Governmental Approvals

Federal Agencies	
Regulatory Agency	**Regulatory Permit, Authorization or Approval**
U.S. Fish and Wildlife Service (USFWS), Ecological Services Branch	Biological Opinion or letter of concurrence and Incidental Take Statement as a result of coordination under Section 7 Endangered Species Act, (ESA)
	Fish and Wildlife Coordination Act (16 U.S.C. 661-667e; the Act of March 10, 1934; ch. 55; 48 stat. 401)
U.S. Army Corps of Engineers (USACE)	Individual or Nationwide Permit in accordance with Section 404 Clean Water Act (33 U.S.C. Section 1344)

State Agencies	
Regulatory Agency	**Regulatory Permit, Authorization or Approval**
California Public Utilities Commission (CPUC)	Certificate of Public Convenience and Necessity (PUC Article 1)
California Department of Fish and Wildlife (CDFW)	Streambed Alteration Agreement (Fish & Game Code Section 1600) Incidental Take Permit in accordance with the California Endangered Species Act (CESA) (Fish & Game Code Section 2081)
California Coastal Commission (CCC)	Coastal Development Permit in accordance with the California Coastal Act (Pub. Res. Code Section 30000 et seq.)
California Department of Parks and Recreation Office of Historic Preservation	Coordination under Section 106 of the National Historic Preservation Act (NHPA) (16 USC 470 et seq.)
Regional Water Quality Control Board for the Central Coast Region	National Pollutant Discharge Elimination System (NPDES) permit in accordance with Clean Water Act Secton 402 (33 U.S.C. Section 1342)
Local/Regional Agencies	
Regulatory Agency	**Regulatory Permit, Authorization or Approval**
Monterey Peninsula Water Management District (MPWMD)	Water System Expansion Permit in accordance with Ordinance 96 of the MPWMD Board of Directors
Monterey Regional Wastewater PCA	Brine Line Connection to PCA Outfall

3.3 All Other Governmental Approvals

Table 3-2 identified Governmental Approvals that are expected to be required to be obtained by the Design-Builder for the performance of the Design-Build Work. The Design-Builder shall prepare and make all filings, applications and reports and take all other action necessary to obtain and maintain, and shall obtain and maintain, all Governmental Approvals set forth in Table 3-2.

Table 3-2

Governmental Approvals

Federal Agencies	
State Agencies	
Regulatory Agency	**Regulatory Permit, Authorization or Approval**
Regional Water Quality Control Board (RWQCB)	National Pollutant Discharge Elimination System (NPDES) General Permit For Storm Water Discharges Associated With Construction Activity (WQO No. 2009-0009-DWQ)
	Waste Discharge Requirements (WDR) per Porter-Cologne Water Quality Control Act. (Water Code Section 13000 et seq.)
	Water Quality Certification in accordance with Section 401 Clean Water Act (33 U.S.C. Section 1341)
	General Construction Stormwater Permit
California Department of Public Health (CDPH)	Permit to Operate a Public Water System (Health & Safety Code Section 116525)
Local/Regional Agencies	
Regulatory Agency	**Regulatory Permit, Authorization or Approval**
Monterey County	Encroachment Permit (Monterey County Code Title 14 Chapter 14.040)
	Use Permit (Monterey County Code Chapter 21.74)
	Combined Development Permit Process (Monterey County Code Chapter 21.76)
	Grading Permit (Monterey County Code Chapter 16.08)
	Erosion Control Plan (Monterey County Code Chapter 16.12)
	Permit to Construct Desalination Treatment Facilities (Monterey County Code Chapter 10.72)
	Protected Tree Removal Permit (Monterey County Code Chapter 16.60)
Monterey Bay Unified Air Pollution Control District	Authority to Construct in accordance with Local Rule 3.1
	Permit to Operate in accordance with Local Rule 3.2

Appendix 4

General Design-Build Work Requirements

Appendix 4

General Design-Build Work Requirements

4.1. SCOPE OF DESIGN-BUILDER SERVICES

In addition to the work identified in the Design-Build Agreement, the following services shall be provided by the Design-Builder:

A. SCOPE OF SERVICES DURING DESIGN

1. Preparation and maintenance of a progress schedule throughout the design phase. The schedule can be in either Gantt chart or CPM form and must include all work items as defined in the Request for Proposal. The schedule shall compare actual to scheduled activities and be updated monthly once an award of the Design-Build Agreement is made. As a minimum, the schedule must include specific dates for the following milestones:

    a. Submission of information prior to review meetings. At least one week shall be allotted in the schedule for review of information by the Owner prior to any meeting.

    b. Each specific review meeting.

    c. Completion of permit applications for each specific permit.

    d. Design phase completion.

    e. Receipt of each specific permit. The Design-Builder shall ensure that the schedule reflects typical or legal review periods required by each respective regulatory agency to ensure receipt of permits by the required date.

2. Attendance at periodic meetings including all design phase and construction progress meetings with the Owner at their offices located in Pacific Grove, California, or at the Project Site. Information shall be provided to Owner at least seven (7) working days prior to any meeting. It is expected that, at a minimum, monthly design meetings will be required during the design phase including an initial Project meeting. The initial Project meeting will be coupled with a partnering meeting mentioned below. Other design phase meetings include progressive review of design documents (15%, 30%, 60%, and 90% complete) and preparation of permit applications.

3. Within thirty (30) days after the Contract Date, a one day partnering conference will be held in accordance with Appendix 6.

4. Performance of a constructability and value engineering review by the Design-Builder with participation of Owner. The value engineering review shall review each element of construction work with consideration given to feasible methods of construction, constraints to construction (materials, labor, specialty construction, weather, plant operations, other, etc.), design details, time required to complete each element of work,

and possible alternatives which would reduce costs. Pursuant to the Governance Committee Agreement, the value engineering process will be undertaken at the 30% design level.

5. All land survey work, including basic control as necessary to adequately complete the design and filter permit applications, and provide construction layouts. At a minimum, property lines, topographic information and location of existing above ground and underground features/structures are to be included.

6. All geotechnical investigations including soil borings, rock cores, and auger probing as necessary to provide a geotechnical report to adequately complete the design and to estimate and plan construction earthwork.

7. All environmental activities as necessary to adequately complete the design and to prepare permit applications.

8. Total interaction and coordination with all Utility companies to design and specify proper service for the proposed improvement and to coordinate the relocation of existing Utilities as required. The Design-Builder shall also determine if any additional capital or usage fees will be imposed by any specific Utility.

9. Determining which local, State, and federal permits are required for this Project, preparing necessary permit applications, and providing technical input as required in securing these permits. The Design-Builder shall also provide the Owner with information regarding the approximate length of review time for each permit, and any special requirements that could delay this process (e.g., public hearings). Except for extraordinary revisions required by regulatory agencies, the Design-Builder is expected to revise reports, plans, and specifications as necessary to secure permits as part of the basic lump sum proposal. The permit applications will be formally submitted and paid for by the Owner.

10. Preparation and maintenance of a “Basis of Design Report”. The Basis of Design Report is a summary of design data presented in outline format along with other pertinent Project information. The primary intent of the memorandum is to allow the Owner to review and comment on the design early in the design schedule. The Basis of Design Report shall be updated throughout the design, and resubmitted as necessary at each subsequent review meeting as well as being submitted with permit applications, where applicable. The Basis of Design Report is often used as the Engineer’s Report in permit applications. A summary of the information to be included in the memorandum is outlined in the Attachments.

11. Preparation of a narrative description of the operation of the proposed facilities to be used by plant operations personnel to familiarize themselves with the operation, capabilities, and limitations of the proposed improvements. The narrative shall be an extension of the process sections from the Basis of Design Report, but in text format. It shall explain the intent and function of each unit process in addition to the system as a whole, and it shall include the detailed written control strategies (functional descriptions) which were

prepared for the Basis of Design Report submission. Preparation of the narrative shall not begin until the Basis of Design Report is finalized and accepted. The narrative shall be submitted as a separate document for review at the 60% Design Meeting. It shall serve as the foundation of the O&M Manual discussed in the Construction Administration section of this Appendix.

12. Preparation of a complete and coordinated set of design drawings for all Engineering disciplines with an adequate level of detail to allow for construction by a general contractor. Drawings used for permit applications and bidding require the signature and seal of a licensed professional Engineer in the applicable State. The drawing sets require segregation by major discipline: site, architectural, structural, mechanical, electrical, instrumentation, etc. Drawings shall not contain extensive notes and written instructions to the general contractor which are more appropriate for the Design-Build Agreement and the Appendices. Standard detail drawings shall exclude items which are not applicable to the current Project. CAD Standards shall be followed. CAD standards are included in Appendix 2, Attachment 11.

13. Prepare technical specifications, Divisions 2 through 16 (or Divisions 2 through 50) in the CSI Spec-Text format, and preparation of a master list of required shop drawings/submittals. Specifications shall reflect only the scope of work for this Project. Standard specifications shall be modified to exclude items not applicable to this Project.

14. Specifications shall be prepared using the most current version of Microsoft Word. If your standard specifications are in a format other than Microsoft Word, they must first be converted to Microsoft Word format, thoroughly checked to ensure that a complete conversion was accomplished (including all tables, charts, headers, footers, etc.), then edited for this Project as appropriate within Microsoft Word. The text shall be 12 point Times New Roman font. An electronic file name for each specification section shall include a descriptive name preceding a 5-digit specification section number followed by the Microsoft Word file extension (e.g., PROJECT 11500.doc).

15. Provide a total of twelve (12) sets of drawings, Basis of Design Report, specifications, and reports in printed form and also in electronic form (PDF) for Owner review prior to review meetings.

16. Provide design notes and calculations at the end of the design phase in electronic (PDF) format.

17. Maintain electronic communication capabilities throughout the design, construction, commissioning, and acceptance phases of the Project. Maintain a web based Project management and file sharing service to allow the Owner to access Project data and documents including drawings, submittals, etc. Access shall be password protected and shall continue through the warranty period.

B. SCOPE OF SERVICES DURING CONSTRUCTION/TESTING & COMMISSIONING

1. Design professional shall attend construction progress meetings, shall participate in resolution of construction problems related to the design, and shall review and interpret the design.

2. Design professional shall perform Project Site inspections of the Design-Build Work in progress in order to certify that the Design-Build Work is proceeding in accordance with the Design-Build Agreement. Perform additional Project Site inspections as needed for startup/commissioning, Acceptance Testing, and troubleshooting. Provide the services of a California licensed Engineer as needed to complete construction certifications and satisfy other regulatory and local agencies closeout requirements.

3. Design professional shall perform shop drawing review and approvals including review and approval of resubmittals and maintenance of a shop drawing log indicating dates received, returned, status, date needed on-site, current responsible party, etc. A complete and comprehensive shop drawing log shall be prepared prior to procurement that shall be updated and distributed monthly. Long lead, critical and overdue items shall be highlighted.

4. Design professional shall be responsible for preparation of supplementary detailed working drawings, specifications, and written instructions as necessary through the construction period to interpret the documents and resolve changes that arise during construction and startup/commissioning.

5. The Design-Builder shall provide the services of an instrumentation and control (I&C) staff engineer or Subcontractor to witness the factory acceptance test (FAT) of the assembled I&C system pror to the systems shipment from the factory to the Project Site. The FAT is anticipated to extend for an approximate three (3) day period to accomplish two separate goals. The first goal is to ensure that the system has been assembled properly and is in proper working order. This will include testing of each individual I/O point and should be witnessed by the I&C staff Engineer. The second goal is to simulate and test the control logic, and this portion of the FAT should be attended by the design Project manager/Engineer (the "Design Project Manager/Engineer") or someone familiar with the details of the process design and operation of the facility.

6. The Design-Builder shall provide the services of an I&C staff engineer for at least four (4) site visits to review and inspect the instrumentation and wiring of field mounted instruments, resolution of problems, initial calibration and testing, and system startup. Trip reports shall be filed within 7 working days of each visit.

7. The Design-Builder shall provide services of the Design Project Manager/Engineer who will participate in and observe initial operation, startup/commissioning, and Acceptance Testing of each treatment process, equipment, system and review operation and performance tests required by the Design-Build Agreement and the Appendices. Written reports shall be authored by the Engineer after review of operation/performance

data/reports. Provide any additional Engineering services required for on-site startup and resolution of initial operating problems. Engineers from all disciplines shall be made available to resolve startup issues as required and to resolve problems which may arise during construction period. The Design Project Manager/Engineer will assist the Owner's Representative in the preparation of the punch list and recommend Acceptance of the Design-Build Improvements by the Owner.

8. The Design-Builder shall prepare and submit electronic record drawings within two (2) months of startup or Substantial Completion, whichever is earlier. Record drawings shall be furnished in both PDF and .dwg formats. The record .dwg files shall confirm to American Water's CAD standards. If it is found that the final drawings do not conform to American Water's CAD standards, the Design-Builder shall revise the files at the Design-Builder's cost. Data, information, sketches and working drawings to be incorporated with the record drawings shall be provided to the Owner by the Design-Builder upon completion. The record drawings shall include all above and below grade changes from the original design drawings for all Engineering disciplines. Changes made to reflect the as-installed conditions shall be made in the same level of detail and to the same degree of drafting quality as the original design drawings. The I&C Engineer must review record drawings prepared by the wiring contractors to verify their accuracy prior to substantial completion, and shall document his review in writing.

9. The Design-Builder shall prepare Operation and Maintenance Manual (O&M Manual). The hardcopy O&M Manual is described in Section V, Item D of this Appendix.

10. At Final Completion, the Design-Builder shall provide electronic Project file system using self running CD presentation menu software to provide rapid access to PDF files of submittals, operational narrative, control strategies, final Basis of Design Report, Governmental Approvals, specifications, record drawings, equipment O&M manuals, and Project photographs. Autorun files shall require no license fees and shall require no other software. American Water has used CD Front End PRO by VisualVision on previous Projects. Provide six (6) electronic copies of the electronic Project file system on individual CD, DVD, or flashdrives. Format shall be collaboratively developed prior to implementation.

11. Design-Builder shall prepare standard operating procedures that include the operational narrative, schematics, one line diagrams, P&ID drawings and complete step by step description of the start up and shutdown procedure for all systems and processes. Engineer shall review and provide quality control for this effort.

12. Design-Builder shall prepare lock out – tag out procedures for the control of hazardous energy in mechanical, electrical, hydraulic, pneumatic, thermal and other energy sources in accordance with OSHA regulations and policies. Engineer shall review and provide quality control for this effort.

13. Design-Builder shall prepare maintenance data sheets for every piece of equipment furnished in accordance with the Owner's computerized maintenance management system (CMMS). Engineer shall review and provide quality control for this effort.

14. Design-Builder shall prepare a comprehensive and detailed Utility account estimate in accordance with the Owner's Utility and property unit accounting system. A list of the Utility accounts is provided in Appendix 3.

15. Design-Builder shall provide the services of the Design Project Manager/Engineer for a one (1) day inspection of the facilities approximately ten (10) months after they are placed into operation. The Design Project Manager/Engineer shall provide a written report summarizing warranty repairs that are necessary, and any operational modifications that are recommended to optimize performance.

4.2. SAFETY

A. SAFETY AND PROTECTION

1. Design-Builder shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Design-Build Work. Design-Builder shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

    - All persons on the Project Site or who may be affected by the Design-Build Work;
    - All Design-Build Work and materials and equipment to be incorporated therein, whether in storage on or off the Project Site; and
    - Other property at the Project Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, Utilities and underground facilities not designated for removal, relocation, or replacement in the course of construction.

2. The Design-Builder shall comply with Applicable Law relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss and shall erect and maintain all necessary safeguards for such safety and protection. Design-Builder shall notify owners of adjacent property and of underground facilities and Utility owners when prosecution of the Design-Build Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

The Design-Builder shall comply with the applicable requirements of Owner's safety program. The following Owner safety programs are applicable to the Design-Build Work:

> **American Water – Focus on Safety, Safety Bulletin dated October 2012, "Pipe Cutting Requirements – Update", Application to Contractors and Subcontractors. (SEE ATTACHMENT 1)**

The Design-Builder shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Design-Build Work. If the Design-Builder notices any conflicts, errors, ambiguities, or discrepancies with Owner's safety program, the Design-Builder shall promptly give Owner written notice, and confirm written resolution thereof by Owner is acceptable to Design-Builder.

The Design-Builder shall inform the Owner of the specific requirements of Design-Builder's safety program with which Owner's employees and representatives must comply while at the Project Site.

3. All damage, injury, or loss to any property referred to in paragraph 1.a or 1.b caused, directly or indirectly, in whole or in part, by Design-Builder, any Subcontractor, supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Design-Build Work, or anyone for whose acts any of them may be liable, shall be remedied by Design-Builder.

4. Design-Builder's duties and responsibilities for safety and for protection of the construction shall continue until such time as all the Design-Build Work is completed and Owner has issued a notice to Design-Builder in accordance with Section 5.4 of the Design-Build Agreement that the Design-Build Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

B. SAFETY REPRESENTATIVE

Design-Builder shall designate a qualified and experienced safety representative at the Project Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

C. HAZARD COMMUNICATIONS PROGRAMS

Design-Builder shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Project Site in accordance with Applicable Law.

D. EMERGENCIES

In emergencies affecting the safety or protection of persons or the Design-Build Work or property at the Project Site or adjacent thereto, the Design-Builder is obligated to act to prevent threatened damage, injury or loss. The Design-Builder shall give Owner prompt written notice if Design-Builder believes that any significant changes in the Design-Build Work or variations from the Design-Build Agreement have been caused thereby or are required as a result thereof. If a change in the Design-Build Agreement is required because of the action taken by the Design-Builder in response to such an emergency, a Change Order will be issued.

4.3. TESTING AND COMMISSIONING

A. DESCRIPTION

1. The Design-Builder shall:

- Provide assistance in connection with the start-up, testing, refining and adjusting of any equipment or system;

- Assist the Owner in training staff to operate and maintain the Design-Build Work; and
- Assist the Owner in developing systems and procedures for control of the operation and maintenance of and record keeping for the Design-Build Work.

2. This Section covers testing in accordance with the Design-Build Agreement and the Appendices, as shown on the drawings, and as necessary for a complete and satisfactory installation. Testing shall include equipment checkout, equipment and systems testing and startup, and equipment, systems and plant commissioning. Equipment shall be considered for this specification as any separate and individual equipment, component, part or structure.

3. No equipment, system or subsystem shall be checked, started up or placed into service unless all components of that system or subsystem required to be available and in service, including instrumentation, safety and other ancillary and pre-requisite systems, are complete and operable as intended by the contract documents.

4. Unless specified elsewhere in the contract documents, provide all labor, special tools, special testing devices or equipment, chemicals, lubricants, operating fluids, fuel, electricity, water, filters, and other expendables required for checkout, startup and commissioning.

5. No equipment, system or subsystem shall be commissioned prior to the completion of training of the Owner's personnel, receipt by the Owner of applicable approved O&M Manuals, and receipt by Owner of applicable spare parts and special equipment required for the equipment, system or subsystem.

B. PIPELINES

All pipelines, valves, appurtenances, etc. installed per the Design-Build Agreement shall be tested in the manner described by the technical specifications. Unless otherwise stated, all pipelines shall be hydrostatically tested, with no leakage, at a pressure at least equal to the maximum operating pressure of the pipeline.

C. WATER CONTAINING VESSELS

Prior to backfilling around water containing vessels, the Design-Builder shall fill said vessels with water for a period of at least 7 days in order to insure vessels are watertight. If any vessel leaks, it shall be repaired to the satisfaction of the Owner and retested until no leakage occurs.

D. LIQUID CHEMICAL STORAGE TANKS

Prior to filling bulk storage tanks, batch, and day tanks with appropriate chemicals, each tank shall be filled with water for a period of at least 7 days in order to insure each tank is watertight. If any tank leaks, it shall be replaced or repaired by a factory-trained representative to the satisfaction of the Owner and retested until no leakage occurs.

E. DAMPPROOFING AND PAINTING

During the application of dampproofing and painting, the Design-Builder shall ensure that the manufacturer's representative check the dry mil thickness of each coating and certify to the Owner in writing that the thickness is in compliance with the Design-Build Agreement and the Appendices. If deficiencies in the dry mil thickness of any coat are found, the Design-Builder shall correct by the application of an additional coat(s) to the said deficient area. The certificate shall also state that all surfaces were properly cleaned prior to the application of dampproofing and paint, specified meetings and inspections were made, the quantity of dampproofing and paint were applied in accordance with their recommendations, and all other requirements stated in the Design-Build Agreement and the Appendices have been satisfactorily completed.

F. HVAC SYSTEMS

Checkout, startup, and commissioning of heating, ventilation, and air conditioning systems are dependent upon the time of year that the checkout, startup, and commissioning is initiated. The Design-Builder shall return to the Project Site with manufacturer’s representatives at the beginning of the next appropriate season (whichever is applicable) to checkout and commission the systems.

G. EQUIPMENT CHECKOUT

The Design-Builder shall develop and maintain a detailed equipment checkout schedule. The schedule shall become a part of the overall Commissioning Plan. The Design-Builder shall check and certify with equipment supplier and/or manufacturer’s representative that all equipment is in accordance with the applicable technical specifications. The intent of equipment checkout is to certify that equipment has been properly installed and is functioning such that it may be safely operated to facilitate further equipment testing, system testing or other performed checkout and testing. If no specific requirements are specified, the Design-Builder shall check out and certify that the installation is complete, correct and meets the equipment manufacturer’s installation requirements. Written certification shall be provided. The Design-Builder shall maintain all responsibilities for equipment until such equipment is commissioned and turned over to the Owner.

H. EQUIPMENT TESTING

The Design-Builder shall develop and maintain a detailed equipment testing schedule. The schedule shall become a part of the overall Commissioning Plan. The Design-Builder shall determine if equipment testing shall immediately follow checkout, or whether system testing or ancillary systems are required to be complete in order to properly complete equipment testing. The intent of equipment testing is to certify that equipment is operating and functioning within the performance requirements of the technical specifications. Equipment testing shall be completed and documented in accordance with the technical specifications and the manufacturer’s requirements. Written certification shall be provided. All testing verifications and data shall be documented and attached to the certification. The Design-Builder shall maintain all responsibilities for equipment until such equipment is commissioned within a system and turned over to the Owner.

I. INSTRUMENTATION AND CONTROL TESTING

1. Factory Acceptance Test (FAT): Prior to scheduling the FAT, the system integrator shall determine through their own internal quality assurance program that the system is ready for shipment and will pass the FAT. The Owner and Design-Builder shall witness a complete FAT of the instrumentation and control system prior to its shipment to the Project Site. The Design-Builder shall provide written approval for shipment following acceptance of the FAT.

   - The purpose of the FAT is to verify the functionality, performance, and stability of the hardware and software.
   - The FAT shall be conducted by the system integrator using simulated inputs to assure all I/O are provided and all inputs, outputs and application software are functioning according to the intent of the plans, specifications, and Basis of Design Report. The test procedure shall include simulates system faults and failures. The factor test shall be staged in two parts: the first to review all I/O and hardware the second to demonstrate the functionality of the system, including each control loop.
   - The FAT shall demonstrate all graphics, report generation and alarm functions of the system.
   - The Design-Builder shall provide at least three (3) weeks notification to the Owner prior to the FAT. The Design-Builder shall provide a written FAT test plan to the Owner at least 7 days prior to the FAT.

2. Operational Ready Test (ORT): Following installation of the process control system components and prior to startup, the entire system shall be certified (inspected, wired, calibrated, tested and documented) that it is installed and ready for the ORT.

   - Each loop shall be checked for proper installation and calibration using prepared forms. The system integrator shall maintain the loop status reports at the Project Site and make them available to the Owner at any time.
   - Upon successful completion of the ORT, the system integrator shall submit a record copy of the test results to the Owner.

3. Functional Demonstration Test (FDT)

   - The FDT shall be witnessed by the Owner and shall consist of a loop by loop demonstration of the functionality and operability of the control system. Live field data shall be used to the extent possible. The test shall be scheduled and coordinated with Owner's staff to minimize the impact on plant operations.
   - Upon successful completion of the FDT, the system integrator shall submit a record copy of the test results to the Owner.

4. Site Acceptance Test (SAT)

- After completion of the ORT and FDT, the system shall undergo a 30-day SAT under conditions of full plant performance without a single non-field repairable malfunction. The 30 day SAT is a separate test from the 16 day duration Acceptance Test, is not a condition of passing the Acceptance Test, and is not a pre-condition of Acceptance.
- Owner shall have full use of the system. Only Owner's staff shall be allowed to operate equipment associated with live plant processes. Plant operations remain the responsibility of the Owner.
- Any malfunction during the SAT shall be analyzed and corrections made. Any malfunction during the 30 day test which cannot be corrected within 24 hours of occurrence, or more than two similar failures of any duration, will be considered as a non-field repairable malfunction.
- All database, process controller logic, and graphical interface system data points must be fully functioning.
- All reports must be functioning and providing accurate results.
- No software or hardware modifications shall be made to the system without prior approval.
- Following successful completion of the 30 day SAT, and subsequent review and approval of test documentation, the instrumentation and control system shall be considered substantially complete and the Warranty Period shall commence.

J. SYSTEM TESTING

1. The Design-Builder shall develop and maintain a detailed system testing schedule. The schedule shall become a part of the Commissioning Plan. The intent of system testing is to certify that all equipment within a system has been properly integrated and operate and function in concert with other equipment to meet the performance requirements for the entire system. As a minimum, the Design-Builder shall verify and certify that all equipment and components within a system meet the technical specifications for materials of construction for the intended service, performance range and settings, and all equipment within a system has been checked out, tested and certified for further testing and startup. Where appropriate, water shall be used in lieu of the intended chemical or process fluid for the system. Equipment and devices shall be tested, calibrated and documented in accordance with the technical specifications and the manufacturer's requirements. Written certification shall be provided. All testing verifications, data and calibration results shall be documented and attached to the certification. The Design-Builder shall maintain all responsibilities for systems until such system is commissioned and turned over to the Owner.

2. Subsequent to individual system testing, the Design-Builder shall operate systems to facilitate other testing and training of Owner personnel. The Design-Builder shall

operate and maintain the equipment and systems, but said operation shall not constitute the acceptance of the systems or commencement of any warranty periods.

K. SYSTEMS START-UP

1. As part of the Commissioning Plan or in order to comply with a request by the Owner for partial utilization of any part of the Design-Build Work, the Design-Builder shall start-up systems utilizing the appropriate chemical or process fluid. Prior to start-up of any system, the Design-Builder shall confirm that all equipment and components within a system have been tested and certified and that all pre-requisite systems, analyzers and safety systems and devices are functioning and available for service.

2. During system start up, chemical or process fluid shall be introduced to the system. Equipment shall be retested as appropriate and calibration verified. As defined elsewhere, individual systems shall be operated until acceptable to the Owner.

L. COMMISSIONING OF THE WORK

1. General

- As a prerequisite to the Owner's issuance of the certificate of Substantial Completion, the Design-Builder shall start up equipment and systems in a sequence and manner to place into service all the Design-Build Work. Conduct performance testing as described hereafter. The Design-Builder shall perform all tests with own forces and such equipment representatives and other experts as may be required by the Design-Build Agreement and the Appendices or necessary for a successful test. The Design-Builder shall provide sufficient technical and/or supervisory personnel to be fully responsible for all operations and coordination of the tests from their beginning to their satisfactory.
- The Design-Builder shall include as a part of the Fixed Design-Build Price, all operating costs, until the Design-Build Improvements are put into operation by the Owner to deliver potable water. Operating costs shall be understood to include, but not be limited to, the costs of: labor, fuel, heating, electrical power and lubricants. Owner will be responsible for the costs of all purchased treatment chemicals. The Design-Builder will be responsible for maintenance during the testing period and for repair of any damage resulting from the testing procedure. At all times, the Design-Builder shall have sufficient personnel to handle an emergency. The Design-Builder shall provide reimbursement to the Owner should he have to make repairs with his own forces for damage caused by the Design-Builder’s actions or inactions.
- Wages and salaries as may be required by any and all tests specified herein shall be paid for by the Design-Builder and are included in the Fixed Design-Build Price. Such wages and salaries shall include any premium time costs incurred to complete the tests as scheduled or as required.

- The Design-Builder shall dispose of all water used during the tests, in addition to wastes resulting from the tests. The method of disposing the water and wastes shall be in accordance with all Applicable Law and shall be subject to approval by the Owner. Pumping water for testing into the distribution system is not allowed until its quality meets requirements for public water supplies. Costs for the disposal of water and wastes shall be included in the Fixed Design-Build Price.
- The Design-Builder shall include costs for the above and below mentioned tests in unit and Fixed Design-Build Price for the Project.

2. Commissioning Plan

The Design-Builder shall prepare a detailed commissioning plan (the "Commissioning Plan") and shall develop the general sequencing of the testing. In general the sequence shall focus on the testing of individual pieces of equipment prior to testing entire systems including automatic control systems.

3. Prior To Commissioning

At least 30 days prior to the proposed testing, Design-Builder shall conduct a meeting with the Owner to discuss the Commissioning Plan and to finalize roles, responsibilities, proposed schedules, and required documentation of the tests. Such discussions shall in no way relieve the Contractor of the responsible of conducting the test expeditiously and with an adequate number of personnel to handle all emergencies. Subsequent to the meeting and before testing begins, make changes to the Commissioning Plan as determined at the meeting, and issue the final Commissioning Plan. No testing shall begin until the final Commissioning Plan is issued to all parties.

4. Mechanical Performance Demonstration (MPD)

The Design-Builder shall provide the Owner at least 14 days written notice prior to the commencement of mechanical performance demonstration and training. The Design-Builder shall demonstrate to the Owner, that the manual and automatic controls, performance over full operative range, efficiency, safety items, alarms, etc., of each mechanical and electrical item of equipment will operate in accordance with the design intent as indicated by the Drawings and/or described in the Design-Build Agreement and the Appendices. At this time, the Design-Builder shall continue to provide instruction and continue to train the Owner's personnel in the operation of all equipment, controls, safety devices, etc.

5. Initial Plant Performance Tests (IPPT)

After the mechanical performance demonstration has been successfully completed, in the opinion of the Owner, the Design-Builder shall commence the initial plant performance test. The test shall consist of a preliminary 24-hour operation test of the facility or subsystem. The 24-hour test shall commence after all Design-Build Work has been started up and operating integrally with all systems. If, in the opinion of the Owner, the results of the operational test are satisfactory, the Owner will give written notice to proceed with the final mechanical performance tests. If, in the opinion of the Owner, the results of the operational test are unsatisfactory, the

Owner shall provide a written list of deficiencies requiring correction prior to retest. The Owner reserves the right to have any portion of or the entire operational test until, in the opinion of the Owner, the facilities are completely operational.

6. Run-In Plant Performance Tests (RIPPT)

Run-In Plant Performance Tests shall cover a continuous **14 day** period while the facility is in continuous normal operation and delivering potable water to the distribution system. Plant flows shall be at least 50% of design capacity for seven (7) days, and at least 90% of design capacity for seven (7) days.

During the RIPPT, demonstrate to the satisfaction of the Owner, that all equipment is coordinated and operating properly; that all controls, safety features, and alarms operate satisfactorily in coordination with the equipment installed; and that installed equipment complies in all respects mechanically and electrically with applicable Design Documents. Provide sufficient technical and/or supervisory personnel to be fully responsible for mechanical operation of the facilities.

The Owner's staff shall operate the Design-Build Improvements while water is being delivered to the distribution system. Upon completion of the test period, correct all items from the written list of operating problems, equipment malfunctions, or other deficiencies related to plant operations and retest the affected system. The retesting shall be performed for a time period sufficient to demonstrate the proper operation of the system. This time period will not exceed two-weeks.

7. Acceptance Testing (AT)

Acceptance Testing is to be performed immediately after successful completion of the Run-In Plant Performance Test (RIPPT). The Acceptance Testing Standards and Requirements are defined in Appendix 7.

4.4. TRAINING

A. DESCRIPTION

1. Design-Builder shall supervise and provide training on the operation and maintenance of the equipment and systems of the Project to Owner's staff such that staff is capable of operating the facilities safely and competently.

2. Training shall be provided for to up to 15 persons.

B. TRAINING LOCATION AND FACILITIES

Training shall be provided at the Owner's facilities located in Pacific Grove, California or on the Project Site. Owner shall provide access to Projectors, internet, and telephones at their facilities in Pacific Grove.

C. SUBMITTALS

1. The Design-Builder shall submit draft training plan by the 90% design submittal. The Design-Builder shall finalize the plan based on Owner review and comment and resubmit within 30 days. Plan shall include training schedule.

2. Generic lesson plans shall be developed and submitted for Owner review.

D. SCOPE OF TRAINING

1. Training shall be provided on individual pieces of equipment, systems, and plant operation as a whole.

2. Training sessions shall be managed by Design-Builder and individual sessions shall be limited to 2 hours or less per class except as identified below or otherwise approved by the Owner.

3. Training shall utilize best practices for adult learning.

4. Training plan shall address both operation and maintenance.

5. Duration of training shall be commensurate with the complexity of the equipment or system.

E. QUALIFICATIONS OF INSTRUCTORS

1. Instructors shall be experienced and qualified to provide training.

2. Design-Builder shall submit qualifications of training providers to Owner for approval. Provide at least three (3) references for design-build instructor(s).

3. Design-Builder shall manage vendors to ensure that vendor instructors are qualified to instruct on proper operation and maintenance.

F. TRAINING MATERIALS

1. Design-Builder shall provide suitable instructional materials including books, pamphlets, and videos as part of the scope of training.

2. Training materials shall include the Basis of Design Report, the Project drawings and specifications, and vendor submittals.

3. Training materials shall include the Operation and Maintenance Manual and standard operating procedures.

G. TRAINING SCHEDULE

1. Training shall be provided during design, construction, commissioning, and post-commissioning. Training shall be scheduled such that all necessary training can be provided prior to the Acceptance Test. The time available for training during Commissioning is limited and compressing training during the Commissioning phase is not acceptable.

2. Owner's staff availability for training is limited and training must be coordinated with Owner. Owner's staff typically have 8 hours per week available for training, but additional time may be approved at the Owner's discretion.

3. Scheduling of training shall follow the mutually agreed Plan. Training shall be finalized at least 14 days prior to presentation.

H. DOCUMENTATION OF TRAINING

Design-Builder shall manage and document the training provided to Owner's staff. Class attendance shall be taken. Training received by each person shall be recorded. Monthly training reports shall be submitted to Owner on progress of training provided and planned training for the next three months.

I. DESIGN PROFESSIONAL ROLE IN TRAINING

1. The design professional shall provide training to Owner's staff during design to familiarize them with the Project and the processes.

2. The design professional shall oversee the training program and ensure that training materials accurately reflect the Project scope.

J. TRAINING BY VENDORS MANAGED BY DESIGN-BUILDER

1. Vendor training must address, at a minimum, the fourteen items listed below. It is recommended that model or demonstration equipment be made available to train staff. Design-Builder staff, familiar with the equipment at the Project, are to co-present with the vendor trainer to identify site specific references such as instrumentation, alarms, and implications of equipment failure.

    1. Health and Safety Warnings
    2. Settings and Adjustments
    3. Start up steps and procedures
    4. Instrumentation and controls
    5. Normal operation procedures

6. Local control
7. Calibration
8. Disassembly
9. Reassembly
10. Alignment
11. Alarm settings
12. Lubrication (materials, schedule, points)
13. Preventive maintenance procedures
14. Maintenance schedule

K. REVERSE OSMOSIS TRAINING

1. The Design-Builder shall supervise and manage training provided to Owner's staff on reverse osmosis process. Each training session shall be 6 to 8 hours in length. Class size shall be limited to 10 persons and two sessions per class are required.

2. The following classes shall be provided:

- Introduction to Reverse Osmosis
- Interpretation of water quality analyses
- Seawater Reverse Osmosis Operation and Training.

L. INSTRUMENTATION AND CONTROL SYSTEM TRAINING

1. The Design-Builder shall provide training on the operation of the instrumentation and control system. Operating training has the following goals:

- Use workstations, touch screens and keyboards;
- Retrieve and interpret all standard displays including graphics, overview displays, group displays, trends, point summaries, and alarm summaries;
- Enter data manually;
- Change control parameters and setpoint values;
- Assume manual control of equipment and control it from the HMI;
- Print reports;
- Acknowledge alarms;
- Respond to hardware and software error;
- Historical data collection, retrieval, and archival;
- Capability and configurability of reports, alarm reporting, passwords, and system hardware configuration; and

- Database backup and recovery.

2. The Design-Builder shall provide maintenance training. This training equips Owner staff with the skills to diagnose, trouble shoot, and make repairs such as replacing fuses and circuit boards. As a minimum, maintenance training shall include:

   - Power up and shutdown of all hardware devices;
   - Perform schedule maintenance functions;
   - Setup and use off line diagnostics to determine hardware failures;
   - Use workstations, keypad, or keyboards to retrieve and interpret displays which provide online diagnostic information;
   - Remove and replace all removable boards/modules; and
   - Maintenance training shall be at least 75% hands-on training.

3. Administrative training: provide training to personnel who need to make access changes to the Control System. This training includes:

   - Log on and log out to the HMI and OIT;
   - Setting and clearing passwords; and
   - Configuring access levels for various parameters and set points.

M. VIDEOGRAPHING OF TRAINING

1. Video recording of training sessions shall be performed to the extent permitted. Video recording shall be organized and managed by Design-Builder.

2. Video recordings shall be transcribed to DVD for use by Owner.

3. Videographing shall be performed by someone with at least 5 years experience in making professional commercial/industrial video. Videos shall include editing. Design-Builder shall provide suitable lighting and control of sound to provide a useful and well made training tool. Microphones shall be used as needed to provide audio input to videos.

N. TRAINING ON STANDARD OPERATING PROCEDURES

1. Design-Builder has responsibility to prepare standard operating procedures (SOP) used to start, stop, and operate various processes and the facility as a whole.

2. Design-Builder must provide training on SOPs.

3. SOPs shall be prepared ahead of providing training on SOPs.

4.5. DISINFECTION OF WATER MAINS

A. SUMMARY

This section includes the requirements for disinfection of water mains, including chemical feed lines.

B. REFERENCES

1. American National Institute:

   - ANSI/NSF Standard 60, Listing of Certified Drinking Water Treatment Chemicals – Health Effects.

2. American Water Works Association:

   - AWWA B300, Standard for Hypochlorites.
   - AWWA B301, Standard for Liquid Chlorine.
   - AWWA C600, Standard for Installation of Ductile Iron Water Mains and their Appurtenances.
   - AWWA C651, Standard for Disinfecting Water Mains.
   - AWWA Manual M12, Simplified Procedure for Water Examination.

C. SUBMITTALS

1. Bacteriological Test Results: See bacteriological tests below.

2. Wastewater Disposal Plan:

   - The Design-Builder shall develop a plan for safe disposal of chlorinated wastewater from disinfection/testing of pipelines, structures, etc. The Design-Builder shall submit the plan to the Engineer for review and to the Owner or the California Department of Environmental Protection for review and approval at least two weeks in advance of disinfection/testing activities. The Design-Builder shall not perform disinfection/testing prior to receipt of approval from to the Owner or the California Department of Environmental Protection.
   - The disposal plan shall include provisions for neutralizing chlorine and any other contaminants to levels acceptable to the Owner or the California Department of Environmental Protection.
   - Specific methods and devices designed to prevent erosion and subsequent sedimentation at the point(s) of discharge shall also be included in the Design-Builder's plan.

D. QUALITY ASSURANCE

1. Bacteriological Tests:

   - Required Number of Samples:
     1) Raw Water Main: One sample
     2) Filter Influent: One sample each filter
     3) Filter Effluent: One sample each filter
     4) Filter Washwater: One each line
     5) Plant Water Service: One sample
     6) Well: One sample
     7) Well Discharge: One sample
     8) Backwash Water: One sample
     9) Finish Water Main: One sample

E. DELIVERY, STORAGE, AND HANDLING

1. The Design-Builder shall transport, handle, and store specified disinfection products in manner recommended by respective manufacturers to prevent contamination and deterioration of products.

2. When handling disinfection products, due caution is advisable. The Design-Builder shall wear gloves, apron, goggles, and suitable vapor mask.

F. PROJECT CONDITIONS

1. Environmental Requirements:

   - The Design-Builder shall not test or disinfect water mains if air temperature is expected to fall below 35 degrees F.
   - The Design-Builder shall keep pipe interior clean. The Design-Builder shall close the open end of pipe with water tight plug when pipe laying is not in progress.

2. Operational Requirements:

   - The Design-Builder shall notify Owner a minimum of 24 hours in advance of any flushing operation.
   - Owner's representative must be present for operating valves required to fill mains. Valves may only be operated by Owner's personnel.
   - Flushing will be monitored by the Owner.

G. MATERIALS

1. Hypochlorites: AWWA Standard B300.

2. Liquid Chlorine: AWWA Standard B301.

3. The Design-Builder shall provide NSF Standard 60 certified products per Listing of Certified Drinking Water Treatment Chemicals – Health Effects.

H. WATER MAIN DISINFECTION

1. The Design-Builder shall disinfect water main installed under the Design-Build Agreement before placing in service.

2. Form of chlorine for disinfection: With Owner's approval, the Design-Builder shall follow one of the following designated methods of procedure:

   - Liquid Chlorine: Apply chlorine gas-water mixture with solution feed chlorinating device in combination with booster pump for injecting chlorine gas-water mixture into main to be disinfected. Use only if Design-Builder can demonstrate to Owner that person supervising operation is thoroughly familiar and experienced in handling chlorine gas, suitable equipment is used, and proper safety equipment is available. Provide device with means to prevent backflow of water into chlorine cylinder. Design-Builder to comply with all local, State, and Federal regulatory requirements.
   - Calcium Hypochlorite Solution: Prepare chlorine-water solution of 1 percent available chlorine using granular calcium hypochlorite. Inject or pump solution into pipeline. Prepare chlorine-water solution of 1 percent available chlorine by mixing approximately 1 pound of calcium hypochlorite with 8 gallons of water.
   - Sodium Hypochlorite Solution: Sodium hypochlorite conforming to ANSI/AWWA B300 in liquid form containing approximately 5 to 15 percent available chlorine.

3. Preparation

   - Preliminary Flushing: Prior to disinfection, the Design-Builder shall thoroughly flush section of water main being disinfected with available water pressure and outlets.
   - The Design-Builder shall flush after pressure and leakage tests are complete.

4. Chlorination:

   - Chlorine Application: The Design-Builder shall apply hypochlorite solution to water main with gasoline or electrically-powered chemical feed pump. For smaller applications, the Design-Builder shall prepare solution in a barrel and pump into main with hand pump, such as a hydraulic test pump. The Design-Builder shall apply chlorine at a dosage rate resulting in chlorine concentration in water in pipe is a minimum of 25 mg/l free chlorine. The table below gives amount of calcium hypochlorite and quantity of 1 percent hypochlorite solution required to produce 25 mg/l chlorine concentrate in 100 feet of pipe:

CALCIUM HYPOCHLORITE AND CHLORINE SOLUTION REQUIRED TO PRODUCE 25 MG/L CONCENTRATION IN 100-FEET OF PIPE						
Pipe Size Inches	Contents in 100-ft.		Section Gals.	Quantity of Calcium Hypochlorite		1% Chlorine Solution Gallons
	Cu.Ft.	Lbs.		Ounces	Pounds	
3	4.90	306	37	1/5	0.012	0.09
4	8.73	545	66	1/3	0.021	0.16
6	19.65	1,227	147	3/4	0.046	0.36
8	34.90	2,178	261	1-3/8	0.083	0.65
10	54.28	3,388	406	2-1/8	0.131	1.02
12	78.48	4,899	587	3-0	0.185	1.44
16	139.98	8,738	1,047	5-3/8	0.334	2.60
20	218.06	13,611	1,631	7-3/4	0.486	4.08
24	314.16	19,603	2,350	11-5/32	0.698	5.88
30	490.87	30,630	3,672	16-3/32	1.090	9.19
36	706.86	44,108	5,287	25-1/8	1.570	13.23
42	962.11	60,036	7,197	34-5/16	2.144	17.99
48	1,256.64	78,414	9,400	44-13/16	2.801	23.50
54	1,590.43	99,243	11,896	56-23/32	3.544	29.74
66	2,375.83	148,252	17,771	84-23/32	5.295	44.43

Feet of Pipe in Which 1 Ounce of Calcium Hypochlorite Will Produce 25 mg/l Available Chlorine														
3"	4"	6"	8"	10"	12"	16"	20"	24"	30"	36"	42"	48"	54"	66"
576	324	144	79	51	36	20	13	9	6	4	3	2	1.8	1.2

- Point of Application: The Design-Builder shall apply chlorinating agent at high end of pipeline section being chlorinated and through a corporation stop inserted in top of new pipe. If water for preparation of chlorine solution is supplied from tap on existing pipeline, the Design-Builder shall provide a physical break between injector supply and injector or pump.

- Rate of Application: The Design-Builder shall pump chlorine solution slowly into new pipeline. The Design-Builder shall not cease chlorine application until the entire main is filled with chlorine solution. If required by Engineer, the Design-Builder shall measure chlorine residual at several points along section of main being disinfected to ensure that proper dosage and distribution of chlorine solution is obtained.

- Prevention of Reverse Flow: The Design-Builder shall exercise great care in manipulating valves, so strong chlorine solution in line being treated will not flow back into adjoining water distribution system.

- Retention Period and Chlorine Concentration: The Design-Builder shall retain chlorinated water in main for at least 24 hours. Operate all valves and hydrants in section in order to disinfect appurtenances. At end of this 24 hour period, the Design-Builder shall maintain 10 mg/l chlorine residual throughout length of main.

- Final Flushing: Following chlorination, the Design-Builder shall thoroughly flush heavily chlorinated water from main at its extremities until replacement water throughout its length is tested comparable to quality of water in existing distribution system.

- Flushing Water: Owner will provide water for flushing; however, the Design-Builder shall not operate valves on water distribution system without presence of duly qualified representative of Owner.

5. Bacteriological Tests:

    - After final flushing and before each treated water main is placed in service, the Design-Builder shall collect samples from end of line. Test samples for bacteriological quality in accordance with standard methods to show absence of coliform organisms. The Design-Builder shall take samples of water that has been standing in main for at least 16 hours after final flushing has been completed. All required tests will be made by Owner at no expense to the Design-Builder. The Design-Builder shall assist the Owner in collecting samples for Owner's tests.

6. Redisinfection:

    - If initial disinfection fails to produce satisfactory bacteriological samples, reflush and resample main. If check samples show presence of coliform organisms, rechlorinate main as specified previously. Design-Builder shall reimburse the Owner for costs associated with retesting the lines.

7. Design-Builder shall be responsible for furnishing all water required for disinfection and flushing of waterlines and any additional disinfecting or flushing, required.

8. The costs for disinfection of water main is included in the Fixed Design-Build Price. No separate payment will be made for disinfection.

I. WATER MAIN CONNECTION DISINFECTION

1. General: If not possible to disinfect piping, valves, and fittings installed at certain connections in manner specified in Article 3.1, Design-Builder shall proceed as follows:

2. Installation of Connections: During installation, the Design-Builder shall observe every precaution to prevent foreign material and trench water from entering piping connections, fittings, and valves.

3. Disinfection: The Design-Builder shall swab interior of piping connections, fittings, and valves with 5 percent hypochlorite solution. The Design-Builder shall obtain 5 percent hypochlorite solution by mixing approximately 3 pounds of granulated calcium hypochlorite with 5 gallons of water.

4. Flushing: After pipe, fittings, and valves have been swabbed, the Design-Builder shall thoroughly flush with water in a manner to be addressed in the wastewater disposal plan. During installation, The Design-Builder shall use extreme care to ensure foreign material is kept out of pipe.

4.6. DISINFECTION OF STRUCTURES AND EQUIPMENT

A. SUMMARY

This section includes the requirements for disinfection of plant structures and equipment.

B. REFERENCES

1. American National Standards Institute:

   - ANSI/NSF Standard 60, Listing of Certified Drinking Water Treatment Chemicals – Health Effects.

2. American Water Works Association:

   - AWWA B300, Standard for Hypochlorites.
   - AWWA B301, Standard for Liquid Chlorine.
   - AWWA C653, Disinfection of Water Treatment Plants.

C. SCHEDULE OF DISINFECTION

1. Coordination: Equipment is to be disinfected just prior to the Final Mechanical Performance Tests.

2. Items to be Disinfected:

   - Pretreatment Filters
   - Filtered Water (seawater) Storage Tanks

- Clearwells

D. SUBMITTALS

1. Bacteriological Test Results: In accordance with Section 4.6(E).

2. Wastewater Disposal Plan:

   - The Design-Builder shall develop a plan for safe disposal of chlorinated wastewater from disinfection/testing of pipelines, structures, etc. Submit the plan to the Engineer for review and to (Owner) or (State Department of Environmental Protection) for review and approval at least two weeks in advance of disinfection/testing activities. The Design-Builder shall not perform disinfection/testing prior to receipt of approval from Owner or State Department of Environmental Protection.
   - The disposal plan shall include provisions for neutralizing chlorine and any other contaminants to levels acceptable to Owner.
   - Specific methods and devices designed to prevent erosion and subsequent sedimentation at the point(s) of discharge shall also be included in the Design-Builder's plan.

E. QUALITY ASSURANCE

1. Bacteriological Tests:

2. Number of Samples Required:

   - Pre-treatment Filters -- one sample each
   - Filtered Water (seawater) storage tanks -two samples each
   - Clearwells -- two samples each clearwell

F. PRODUCT DELIVERY, STORAGE AND HANDLING

1. The Design-Builder shall transport, handle, and store disinfection products in a manner recommended by respective manufacturers to prevent contamination and deterioration of products.

2. When handling disinfection products, the Design-Builder shall use due caution, including wearing gloves, apron, goggles, and suitable vapor masks.

G. MATERIALS

1. Hypochlorites: Standard AWWA B300.

2. Liquid Chlorine: Standard AWWA B301.

3. Provide NSF Standard 60 certified products per Listing of Certified Drinking Water Treatment Chemicals – Health Effects.

H. FLUSHING AND DISINFECTING WATER

1. The Design-Builder shall obtain flushing and disinfecting water for disinfection of structure at water treatment plant from Owner.

2. The Design-Builder shall incur all costs in utilizing and disposing of flushing and disinfecting water.

3. Owner will not charge for water used to initially flush and disinfect a structure. If any structure has to be reflushed and/or redisinfected, the cost of obtaining this additional water from Owner will be at Design-Builder's expense.

4. The Design-Builder shall include costs for disinfection of structures and equipment in unit or lump sum prices bid for work as no separate payment will be made for disinfection.

5. Bacteriological Tests: All required tests will be made by Owner at no expense to the Design-Builder. The Design-Builder shall assist the Owner in collecting samples for Owner's tests.

I. CLEANING AND PRELIMINARY FLUSHING

The Design-Builder shall clean items to be disinfected of dirt, debris, residual formed on sides of items, and any other foreign material. The Design-Builder shall thoroughly flush with water prior to disinfection.

J. CHLORINATION

1. General: After being thoroughly flushed, the Design-Builder shall disinfect specified structure by chlorination.

2. Form of Chlorine: The Design-Builder shall apply chlorine in a chlorine gas-water mixture, sodium hypochlorite solution, calcium hypochlorite solution, or chlorine spray solution.

3. Methods of Application:

    - General: The Design-Builder shall submit methods of application to Engineer for approval.
    - Chlorine Gas-Water Mixture: The Design-Builder shall apply chlorine gas-water mixture by means of a solution feed chlorination device. The Design-Builder shall provide device with means to prevent backflow of water into chlorine cylinder.

- Sodium Hypochlorite Solution: The Design-Builder shall inject or pump a solution consistent of 5 to 15 percent available chlorine into the lines
- Calcium Hypochlorite Solution: The Design-Builder shall inject or pump a solution consisting of 5 percent calcium hypochlorite powder and 95 percent water by weight into the lines.
- Chlorine Spray Solution: The Design-Builder shall apply chlorine spray solution, having a concentration of at least 200 ppm. The Design-Builder shall apply uniformly to all interior surfaces, including equipment by fruit tree sprayers, fire hoses, or other approved equipment. After spraying, the Design-Builder shall fill holding basin to a depth of 6 inches with water containing at least 50 ppm chlorine.

K. POINTS OF APPLICATION

If chlorine spray solution is not going to be used for basins, the Design-Builder shall inject disinfecting solution into water as it enters each basin or inject into influent main.

L. RATE OF APPLICATION

The Design-Builder shall control water to be used in disinfection process to flow slowly into basins.

M. PREVENTION OF REVERSE FLOW

The Design-Builder shall exercise great care that strong chlorine solution in areas being treated will not flow back into water supply where water for disinfection is being obtained.

N. RETENTION PERIOD AND CHLORINE CONCENTRATION

The Design-Builder shall retain chlorinated water in above specified items at least twenty four (24) hours. After chlorine treated water has been retained for required time, the chlorine residual is to be at least 25.0 ppm. If the initial procedure fails to result in specified conditions, the Design-Builder shall repeat chlorination procedure at no additional expense until results are obtained.

O. FINAL FLUSHING

Following chlorination, the Design-Builder shall completely flush all treated water from above specified items until replacement water throughout each facility, upon test, is proven to have a combined chlorine residual of approximately 2.0 ppm.

P. CHLORINE CONCENTRATION AFTER DISINFECTION

After disinfection and during subsequent mechanical performance tests, the Design-Builder shall maintain chlorine residual in all units of plant at a concentration satisfactory to Engineer. If chlorine residual drops to zero (0), the Design-Builder has option to require redisinfection of any or all units of the Design-Build Improvements at no additional cost to Owner.

4.7. SUBMITTALS

A. PRELIMINARY PROGRESS SCHEDULE

The Design-Builder shall prepare and submit to the Owner for approval a preliminary schedule. This submittal is to be made within ten (10) days from the Contract Date which schedule shall be based upon the preliminary schedule attached to this Appendix. The method of schedule preparation required is generally referred to as the critical path method (CPM).

This CPM schedule will be a computer-generated construction schedule, using Primavera Project Planner (P3), a Project management and control software developed by Primavera Systems, Inc., or the latest version of Microsoft Project.

In developing the Project schedule, the Design-Builder shall utilize the precedence diagramming method (PDM) option of P3 or Microsoft Project. The work day to calendar date correlation of the construction schedule shall be based on a 40-hour work week with adequate allowance for holidays, adverse weather and all other special requirements of the work.

The Design-Builder shall submit with the preliminary progress schedule, and all subsequent updates, a software generated back-up file. This back-up file must contain all descriptions, durations, logic, constraints, coding, cost information, and any other information required for computer analysis and generation of schedule and cost reports and plots. If resource loading is utilized, all resource loading, minimum and maximum limits, and any other information required for computer analysis must be provided.

The schedule shall include, as a minimum, the following separate activities:

1. Preliminary design, final design.
2. Physical construction (includes mobilization, demobilization, setup time, lags, etc.).
3. Issuance by Design-Builder of purchase orders for material and equipment and submittal of shop drawings and samples to the Owner.
4. Review by Engineer for each submittal of samples and shop drawings.
5. Fabrication time for materials and equipment.
6 Delivery of materials and equipment.
7 Installation of materials and equipment.
8. Testing, start-up and training for individual pieces of equipment or entire systems as appropriate.
9. Winter affected activities.
10. Outages or interruptions of Owner's facilities required to perform work.
11. Demolition or removal work under this Contract.

Activity durations shall represent the best estimate of elapsed time considering the scope of the Design-Build Work involved in the activity and the resources planned for accomplishing the activity expressed in working days.

Activity descriptions shall clearly define the scope of work associated with each activity. If activity descriptions contained in the schedule are not sufficient to describe the work, a supplemental narrative description is to be provided.

The construction work shall be detailed to an extent that progress can be readily monitored on a daily basis. In general, the construction work shall be detailed such that no construction activity shall have a duration greater than fifteen (15) work days.

Each activity shall be coded by the Design-Builder as necessary for proper and efficient utilization of the schedule. As a minimum, each activity shall be coded by:

1. Activity type (i.e., submittal, Engineer's review, delivery, construction, etc.).
2. Responsibility (i.e., Design-Builder, Engineer, subcontractor A, subcontractor B, Owner, etc.).
3. Area (i.e., Building A, Building B, sitework, etc.).
4. Task Order (i.e., Owner assigned number required for monthly invoicing requirements).

The above schedule development requirements are a minimum, and the Design-Builder shall develop the schedule as necessary to properly control and manage the Project.

The preliminary progress schedule shall be submitted in a network analysis format and shall include, as a minimum, a graphic representation of all significant activities and events involved in the construction of the Project, and a written statement explanatory thereof for a complete understanding of the diagram. The Design-Builder may furnish a pure logic diagram with a detailed predecessor/successor analysis report.

The network graphic representation and statement must clearly depict and describe the sequence of activities planned by the Design-Builder, their interdependence and the times estimated to perform each activity. The network shall be submitted on sheets 24" x 36" or larger and may be divided into as many separate sheets as required.

Accompanying the network graphic representation of the construction schedule, the following computer generated schedule reports shall be submitted as part of the network analysis:

1. Detailed Activity Report - This report shall be sorted by activity number and shall include, as a minimum, the following information:

a. activity number
b. activity description
c. estimated duration
d. early start date (calendar dated)
e. early finish date (calendar dated)
f. latest allowable start date (calendar dated)
g. latest allowable finish date (calendar dated)
h. total float
i. activity codes

j. detailed predecessor(s) and successor(s)
k. free float

2. Early Start Report - This report shall be sorted by activity type in an early start order.

3. Critical Path Report - This report shall be sorted by total float in an early start order.

4. Activity Cost Values - This report shall list the activity number, description and cost value assigned to it. Once approved, the Design-Builder will be provided work order numbers to be assigned to each activity for input into the schedule codes.

B. OPERATING AND MAINTENANCE INSTRUCTION MANUALS

1. The Design-Builder shall prepare complete written O&M Manuals covering each item of equipment finished or modified under this Design-Build Agreement. The Design-Builder shall submit in duplicate, at least eight (8) weeks prior to initial start-up, a draft form of the manual for review by the Engineer. After the manual has been approved, **four (4)** hard copies and one (1) electronic copy of the O&M Manuals shall be furnished to the Engineer. The final copies shall be received by the Engineer prior to start-up operations.

2. The O&M Manual shall include, but not be limited to, the following information: detailed description of the process and operating procedures as applicable; instruction for all components of the equipment whether manufactured by the supplier or not, including valves, controllers and other miscellaneous components; recommended lubrication and maintenance procedures and schedules including a detailed schedule of the manufacturer's preventative maintenance requirements; appropriate parts lists; exploded and/or sectional views; internal and external wiring and piping diagrams numbered to correspond to the installation; and all other pertinent information of value to obtain peak performance.

3. Equipment manufacturer's O&M Manuals which Design-Builder shall procure from the manufacturer shall include the following:

    1. Plant Specific Operating Instructions
    2. Maintenance and Lubrication Schedules and Lubricant Recommendations including recommended preventive maintenance schedules listed as daily, weekly, monthly, quarterly, semi annually and annually.
    3. Recommended Spare Parts List
    4. Plant Specific Troubleshooting guides with solutions recommended.
    5. Start-up Procedures
    6. Shut-down Procedure including extended shut-down recommendations.
    7. Emergency Operations
    8. Overhaul Procedures
    9. Selected drawings and exploded views.

10. Internal wiring and piping diagrams.
11. Complete catalog of parts used in final assembly of equipment.
12. Service Centers List
13. Manufacturer's name, contract number, model number and serial number of the equipment on the cover of each manufacturer's manual.
14. Other pertinent information of value to obtain peak performance.

4. Equipment manufacturer's manuals shall be written for average journey men mechanics without prior knowledge of the specific equipment.

5. The O&M Manuals shall be assembled in **four (4)** sets and bound in 3 or 4 inch post type, first quality, hard cover, heavy duty three post binders and one (1) electronic copy of CD. One or more numbered volumes shall be provided as required. Each item of equipment shall be placed in a logical sequential order, as listed or ordered in the Design-Build Agreement and Appendices.

6. The Design-Builder shall provide a table of contents at the front of each volume showing the equipment items in the order in which they appear in the volume. Each equipment item shall include the functional name, applicable specification section(s) and the plant sheet listing, if any.

7. The preventive maintenance schedule shall be bound in the front of each section immediately following the index tab sheet. The schedule shall be identified with respect to the piece of equipment it is referring to.

Sheet size shall be 8½ x 11-inches.
Imprint on the front cover and spine of each binder the following:

Owner
Project Title
Operations and Maintenance Manual
Volume No. -----

8. Prior to release of final payments, the Design-Builder shall revise and resubmit copies of the instructions to accord with any changes in procedures or equipment made during start-up or initial operation. Resubmittals are also required for changes made during the guarantee period.

4.8. TEMPORARY CONSTRUCTION FACILITIES

A. WATER SUPPLY & DISPOSAL

If reasonably available, water for the purpose of this Design-Build Agreement will be supplied to the Design-Builder by the Owner. The Design-Builder shall furnish and install all necessary meters, temporary piping and valves in connection with such water supply.

The Owner reserves the right to impose limitations upon the Design-Builder's use of water as the Owner, in its sole discretion, determines may be necessary to assure it of its continued ability to meet the demands of its customers and the volumes and pressures required for fire protection. Any water required by the Design-Builder in excess of the quantities the Owner provides to the Design-Builder must be furnished by the Design-Builder at his own cost.

Design-Builder will be responsible for disposal of all wastewater (including dechlorinating highly concentrated wastes that are the result of disinfection) from the sites. Although the brine discharge line has not been finalized, the Design-Builder may assume that disposal of 13 MGD of RO concentrate may be sent to the brine discharge line and that disposal of potable water during testing may be sent to the MRWPCA CSIP system and/or the distribution system (see Appendix 7).

B. TEMPORARY HEAT/AIR CONDITIONING

The Design-Builder shall provide approved type heating or air conditioning apparatus with the necessary power in order to protect the work. The stored materials and finished work shall be protected at all times from damage by the weather elements.

C. ELECTRICAL SUPPLY

The Design-Builder shall pay all fees, obtain necessary permits and have meter installed for power and light as may be required for the prosecution of his work. Owner shall pay for all fees and costs to have permanent power provided to the site. Design-Builder shall be responsible for all temporary electrical power (furnishing and installing) that is needed to perform construction, but not permanent power and not power for use for startup and testing.

D. TEMPORARY LIGHTING

The Design-Builder shall provide and maintain incandescent lighting for construction operations and lighting to exterior staging and storage areas after dark for security purposes as may be necessary.

E. BARRIERS

The Design-Builder shall provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing buildings. Provide protection for plant life designated to remain. Replace damaged plant life.

F. FENCING AND SECURITY

Design-Builder shall be responsible for protection of the Project Site, and all Design-Build Work, materials, equipment, and existing facilities thereon, against vandals and other unauthorized persons.

No claim shall be made against Owner by reason of any act of an employee or trespasser, and Design-Builder shall make good all damage to Owner's property resulting from Design-Builder's failure to provide security measures as specified.

Security measures shall be at least equal to those usually provided by Owner to protect Owner's existing facilities during normal operation but shall also include such additional security fencing, barricades, lighting, watchman services, and other measures as required to protect the Site.

All existing fences affected by the Design-Build Work shall be maintained by Design-Builder until completion of the Design-Build Work. Fences which interfere with construction operations shall not be relocated or dismantled until written permission is obtained from the owner of the fence, and the period the fence may be left relocated or dismantled has been agreed upon. Where fences must be maintained across the construction easement, adequate gates shall be installed. Gates shall be kept closed and locked at all times when not in use.

On completion of the Design-Build Work across any tract of land, Design-Builder shall restore all fences to their original or to a better condition and to their original locations.

G. PARKING

The Design-Builder shall arrange for temporary gravel parking areas to accommodate construction personnel. When site space is not adequate, the Design-Builder shall provide additional off-site parking. The Design-Builder shall designate two parking spaces each for the Owner, and Resident Project Representative.

H. PROGRESS CLEANING

Design-Builder shall keep the premises free at all times from accumulations of waste materials and rubbish. Design-Builder shall provide adequate trash receptacles about the Site and shall promptly empty the containers when filled.

Construction materials, such as concrete forms and scaffolding, shall be neatly stacked when not in use. Design-Builder shall promptly remove splattered concrete, asphalt, oil, paint, corrosive liquids, and cleaning solutions from surfaces to prevent marring or other damage.

Volatile wastes shall be properly stored in covered metal containers and removed daily.

Wastes shall not be buried or burned on the Site or disposed of into storm drains, sanitary sewers, streams, or waterways. All wastes shall be removed from the Site and disposed of in a manner complying with local ordinances and antipollution laws.

Adequate cleanup will be a condition for recommendation of progress payment applications. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

Prior to Substantial Completion, Design-Builder shall clean the Site and make it ready for utilization by Owner. At completion of Construction, Design-Builder shall remove all tools, appliances, construction equipment, temporary construction and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Design-Build Agreement and Appendices.

I. SANITARY FACILITIES

The Design-Builder shall provide suitable temporary facilities and enclosures for the use of workmen and shall maintain same in a sanitary condition.

The Design-Builder is advised that the Owner is in the business of providing potable water and the Design-Builder's sanitary arrangements shall not endanger the Owner’s facilities.

J. FIELD OFFICES

The Design-Builder shall provide, at a location designated or otherwise approved by the Owner, field offices for the Design-Builder and the Resident Project Representative (RPR). Unless otherwise approved, the Design-Builder's field office shall be large enough, and furnished, to conduct progress meetings. The Design-Builder's field office is to be an official place of business for the Design-Builder at which an authorized agent of the Design-Builder will be present while work is in progress. The record documents required to be maintained by the Design-Builder shall be kept at the Design-Builder's field office.

The Design-Builder shall provide a separate field office for the RPR and visiting Owner’s personnel. The office shall be not less than 256 square feet (8' x 32') and be provided with an outside entrance door with a substantial lock; glazed windows suitable for light and ventilation; and adequate heating, air conditioning, and lighting facilities. Design-Builder shall pay all electricity and heating bills. At a minimum this shall include the following:

- (2) desks (built-in type, one at each end of trailer),
- (2) free standing desks(30”x60”), (2) office chairs & (4) padded folding chairs
- (3) 4-drawer file cabinets
- drawing table, drafting stool, plan rack and plan hangers
- (1) small (2’x4’) and (1) large (4’x6’) white boards, with markers and erasers
- wall shelves - minimum 16 lineal feet of 12" wide wood shelving
- (2) wastebaskets
- telephone service: 2 services, one for voice telephone, one for facsimile machine. Telephone with speakers attachment for conference calls, speed dial capabilities and answering machine (integral or separate). (NOTE: Design-Builder to arrange and pay for hook-up, Owner to pay subsequent monthly phone bills.)
- copying machine – desktop unit is acceptable, Design-Builder to service and maintain throughout the Project.
- High Speed internet connection: 1 service (DSL , cable, or equivalent), for internet connectivity and electronic communications to the RPR. Design-Builder to arrange and pay for hook-up and monthly charges.
- water, hot and cold at sink. Water service and drains to be frostproof.
- sanitary facilities: flush type water closet with accessories including a wall mirror, paper towel holder and paper holder. Facilities shall be connected to the local

sanitary sewer system or a holding tank provided. Facilities shall be stocked and maintained by the Design-Builder.

- weekly janitorial service. Design-Builder shall employ a professional cleaning service.
- fire extinguisher, and first-aid kit
- electric water cooler with hot and cold water faucets and an accessory refrigerator
- digital video camera (from cash allowance)
- one (1) new Windows laptop computer, including docking station, with a Universal Serial Bus (USB) with Internet access and the following features (from cash allowance):
    - CD ROM Drive
    - DVD Drive
    - Wi-Fi
    - 24” monitor (minimum)
    - Color ink jet printer/scanner/fax
    - Licensed copies of:
        - Lotus Notes
        - Microsoft Office
        - Microsoft Project

The computer and digital video camera shall be maintained by the Design-Builder during the Design-Build Period and provided to the Owner at the completion of the Project.

The Design-Builder shall be responsible for cleaning and upkeep of the RPR’s space or field office.

The field offices shall be maintained until final acceptance of the Project unless otherwise approved by the Owner.

A 24-inch by 35-inch plywood sign shall be erected on the outside wall of the field office in a location determined by the Owner. The sign shall be painted white with blue, 3-inch high lettering, neatly arranged as follows:

Field Offices
CALIFORNIA AMERICAN WATER COMPANY
AND
DESIGN-BUILDER

K. DUST CONTROL

1. Design-Builder shall take all necessary measure to control dust from his operations, and to prevent spillage of excavated materials on public roads.

2. Design-Builder shall remove all spillage of excavated materials, debris or dust from public roads by methods approved by the Owner.

3. Design-Builder shall sprinkle water at locations and in such quantities and at such frequencies as may be required by the Owner to control dust and prevent it from becoming a nuisance to the surrounding area.

4. Dust control and cleaning measures shall be provided at no additional cost to the Owner.

L. USE OF PROJECT SITE

Design-Builder shall construct and maintain suitable and safe crossings over trenches or provide detours as necessary to care for public and private traffic. Provide flagmen at junctions of public traffic and Design-Builder vehicles and equipment.

M. PROJECT SIGN

1. The Design-Builder shall erect a sign at the Project Site identifying the Project. The sign shall be erected prior to mobilization and shall be in accordance with the Design-Build Agreement and the Appendices and details included in this Section. The Project sign and sign panel shall be furnished, erected and maintained by the Design-Builder at the location designated by the Owner. Wording and colors shall be identified by the Owner.

2. The Project sign shall be fabricated, erected and maintained by the Design-Builder in accordance with the following specifications:

   - Sign Panel: The sign panel shall be constructed of ¾ inch minimum thickness marine plywood rebated into a 2 inch by 4 inch wood frame. All fasteners used in the construction of the sign shall be of a rustproof nature.
   - Painting: All supports, trim and back of the sign panel shall be painted with at least two (2) coats of the same paint used for the sign face. All paint used shall be exterior grade paint, suitable for use on wood signs.
   - Sign Supports: The supports for the Project sign shall be at least two 4 inch by 4 inch treated wood posts. The sign panel shall be securely fastened to the sign supports with at least six (6) 3/8” galvanized bolts, nuts and washers. The positioning and alignment of the sign shall be as determined by the Owner.

4.9. PRODUCTS

A. PROTECTION OF MATERIAL AND EQUIPMENT

All electrical and mechanical equipment shall be stored in a warm, dry shelter with proper ventilation. Under no circumstances shall motors, electrical control equipment or any other electrical or mechanical equipment be stored under polyethylene plastic covers or tarpaulins. When space is available inside existing structures, and the Owner approves, the Design-Builder will be allowed to store equipment inside them. Should such space not be available, the Design-Builder shall construct a shelter with a source of heat and proper ventilation as approved by the Owner for the storage of equipment.

The interior of all pipe and accessories shall be kept free from dirt and foreign matter at all times.

After valves and hydrants have been inspected, the Design-Builder shall properly store them prior to use. In order to prevent entry of foreign material that could cause damage to the seating surfaces, the valves and hydrants shall be stored in a fully closed position unless recommended otherwise by the manufacturer. Resilient seated valves shall be stored in accordance with the manufacturer's recommendations. This may include storage with protective covers for rubber seats and in marginally open condition. Valves and hydrants should be stored indoors.

If valves must be stored outdoors, the Design-Builder shall protect the operating mechanism, such as gears, motor, actuators and cylinders, from weather elements. Valve ports and flanges must be protected from the weather and foreign materials. If valves are subject to freezing temperatures, all water must be removed from the valve interior and the valve closed tightly before storage, unless specifically recommended otherwise by the manufacturer. Valves shall be stored on pallets with the discs in a vertical position to prevent rainwater from accumulating on top of the disc, seeping into the valve body cavity and freezing and cracking the casting.

B. SERVICING EQUIPMENT

The Design-Builder shall check all equipment upon acceptance to determine if oil reservoirs are full and areas to be greased are properly packed with grease. The Design-Builder will provide the proper grease or oil for use in lubricating the required areas in the equipment. Any service to equipment while in storage, or installed pending acceptance, is the responsibility of the Design-Builder and shall be performed per manufacturer's requirements, industry standards or as stated specifically in the technical specifications.

C. GENERAL

Unless otherwise specifically provided for in the Design-Build Agreement and the Appendices, all equipment, materials and articles incorporated in the work shall be new, in current production and the best grade obtainable consistent with general construction usage.

D. COORDINATION OF DIMENSIONS

The Design-Builder shall verify and make necessary corrections to construction dimensions so that all specified and/or alternative equipment, can be installed and will function within the intent of the Design-Build Agreement and the Appendices.

E. SAFETY AND HEALTH REQUIREMENTS

All materials, equipment, fixtures and devices furnished shall comply with Applicable Law.

All equipment furnished and installed under this Contract shall be equipped with suitable and approved safety guards and devices required for the safety of the public and operating personnel. Such guards and safety devices shall be in accord with the latest requirements of safety codes approved by the American National Standards Institute as well as the safety requirements of

Applicable Law. Where said safety codes of the ANSI are incompatible with Applicable Law, Applicable Law shall prevail.

F. INSTALLATION

Material and equipment shall be installed in accordance with the appropriate Sections of the Design-Build Agreement and the Appendices.

G. SERVICES OF MANUFACTURER'S REPRESENTATIVE

The Design-Builder shall arrange for a qualified service representative from each company, manufacturing or supplying certain equipment as required by the individual Specification Sections to perform the duties herein described.

After installation of the applicable equipment has been completed and the equipment is presumably ready for operation, but before it is operated by others, the representative shall inspect, operate, test, and adjust the equipment. The inspection shall include, but shall not be limited to, the following points as applicable:

- soundness (without cracked or otherwise damaged parts)
- completeness in all details, as specified
- correctness of setting, alignment, and relative arrangement of various parts
- adequacy and correctness of packing, sealing and lubricants

The operation, testing, and adjustment shall be as required to prove that the equipment is left in proper condition for satisfactory operation under the conditions specified.

On completion of his Work, the manufacturer's or supplier's representative shall submit to the Owner a complete signed report of the result of his inspection, operation, adjustments, and tests. The report shall include detailed descriptions of the points inspected, tests and adjustments made, quantitative results obtained if such are specified, and suggestions for precautions to be taken to ensure proper maintenance. The report also shall include a certificate that the equipment conforms to the requirements of the Design-Build Agreement and Appendices and is ready for permanent operation and that nothing in the installation will render the manufacturer's warranty null and void.

4.10. PROJECT CLOSEOUT

A. CLOSEOUT PROCEDURES

The Design-Builder shall submit written certification that Design-Build Agreement and Appendices have been reviewed, Work has been inspected, and that Work is complete in accordance with Design-Build Agreement and Appendices and ready for Owner's inspection. Provide submittals to Owner that are required by governing or other authorities. Submit

Application for final payment identifying total adjusted Contract sum, previous payments, and sum remaining due.

B. FINAL CLEANING

The Design-Builder shall execute final cleaning prior to final inspection. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces. Clean equipment and fixtures to a sanitary condition. Clean debris from roofs, gutters, downspouts, and drainage systems. Clean site; sweep paved areas, rake clean landscape surfaces. Remove waste and surplus materials, rubbish, and construction facilities from the site.

C. PROJECT RECORD DOCUMENTS

The Design-Builder shall maintain on site, one set of the following record documents:

- contract drawings
- specifications
- addenda
- change orders and other modifications to the Design-Build Agreement
- reviewed shop drawings, product data, and samples

The Design-Builder shall store record documents separate from documents used for construction. The Design-Builder shall record information concurrently with construction progress.

Specifications: The Design-Builder shall legibly mark and record at each product section description of actual products installed, including the following:

- manufacturer's name and product model and number
- product substitutions or alternates utilized
- changes made by addenda and modifications.

Record Documents and Shop Drawings: The Design-Builder shall legibly mark each item to record actual construction including:

- Measured depths of foundations in relation to finish floor datum.
- Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
- Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Design-Build Work.
- Field changes of dimension and detail.

- Details not on original drawings.

The Design-Builder shall submit the final Requisition to the Owner in accordance with Section 5.4 of the Design-Build Agreement.

Record Drawings shall be submitted as follows:

- 2 sets of electronic files in AutoCAD format on CD
- 2 sets of paper copies (24 x 36)
- 2 sets of paper copies (11 x 17)

D. SPARE PARTS AND MAINTENANCE MATERIALS

The Design-Builder shall provide products, spare parts, maintenance and extra materials in quantities specified in individual specification sections. The Design-Builder shall confirm with Owner during the design phase the requirements for spare parts.

The Design-Builder shall deliver to the Project Site and place in location as directed by Owner, prior to final payment.

Appendix 4 - Attachment 1

Appendix 4 - Attachment 2

Preliminary Schedule

Activity ID	Activity Name	Original Duration	Start	Finish
	MPWSP DESALINATION INFRASTRUCTURE PROJECT	1067d	20-Dec-13	29-Mar-18
	Major Milestones	1561d	20-Dec-13	29-Mar-18
	Governmental Approvals	965d	20-Dec-13	29-Oct-17
	CAW-Designated Governmental Approvals	285d	20-Dec-13	11-Feb-15
	California Public Utilities Commission	239d	20-Dec-13	15-Aug-14
	U.S. Fish and Wildlife Service	178d	20-Dec-13	04-Sep-14
	U.S. Army Corps of Engineers	132d	20-Dec-13	30-Jun-14
	California Coastal Commission	419d	20-Dec-13	11-Feb-15
	California State Historic Preservation Office	266d	20-Dec-13	11-Sep-14
	Regional Water Quality Control Board	266d	20-Dec-13	11-Sep-14
	California Department of Fish and Wildlife	173d	20-Dec-13	27-Aug-14
	Monterey Peninsula Water Management District	271d	20-Dec-13	16-Sep-14
	Monterey Regional Wastewater PCA	271d	20-Dec-13	16-Sep-14
	Contractor Designated Governmental Approvals	685d	05-Feb-15	29-Oct-17
	Regional Water Quality Control Board	186d	05-Feb-15	29-Oct-15
	California Department of Public Health	437d	18-Aug-16	29-Oct-17
	Monterey County	130d	05-Feb-15	14-Jun-15
	Monterey Bay Unified Air Pollution Control District	478d	24-Sep-15	13-Jan-17
	Design	479d	20-Dec-13	18-Nov-15
	Pre-Design Activities	33d	14-Jan-14	03-Mar-14
	Basis of Design Report	53d	20-Dec-13	10-Mar-14
	30% Design Submittal	60d	24-Feb-14	16-May-14
	60% Design Submittal	189d	19-May-14	20-Feb-15
	90% Design Submittal	165d	23-Feb-15	15-Oct-15
	Approved for Construction Design Submittal	23d	16-Oct-15	18-Nov-15
	Project Plans	293d	23-Feb-15	21-Apr-16
	Construction	60d	23-Feb-15	15-May-15
	Start-Up/Commissioning	193d	15-Jul-15	21-Apr-16
	Procurement	316d	19-Nov-15	27-Feb-17
	Pre Treatment System	198d	30-Nov-15	09-Sep-16
	Pressure Filters	198d	30-Nov-15	09-Sep-16
	Equipment	137d	29-Dec-15	13-Jul-16
	Filtered Feedwater System	228d	07-Dec-15	31-Oct-16
	Filtered Feedwater Storage Tanks	154d	29-Dec-15	05-Aug-16

Critical Forcast Work
Forcasted Work
Milestone

MPWSP DESALINATION INFRASTRUCTURE PROJECT

Summary Schedule

CDM Smith

Activity ID	Activity Name	Original Duration	Start	Finish
	Filtered Feedwater Pumps	213d	07-Dec-15	07-Oct-16
	Cartridge Filters	198d	21-Jan-16	31-Oct-16
	Backwash Reclamation System	198d	14-Dec-15	23-Sep-16
	Backwash Water Recycle Pumps	198d	14-Dec-15	23-Sep-16
	Backwash Water Storage Basins	110d	21-Dec-15	26-May-16
	RO System	316d	19-Nov-15	27-Feb-17
	RO Feed Pumps	306d	07-Dec-15	27-Feb-17
	RO Membrane Skids	300d	19-Nov-15	02-Feb-17
	RO Energy Recovery Equipment	294d	19-Nov-15	25-Jan-17
	RO Clean/Flush Systems	154d	06-Jan-16	12-Aug-16
	Post Treatment System	246d	21-Dec-15	13-Dec-16
	Hydrated Lime/Calcite Contactors	246d	21-Dec-15	13-Dec-16
	UV System	198d	04-Feb-16	15-Nov-16
	Chemical Systems	198d	06-Jan-16	17-Oct-16
	Chemical Pump Systems	198d	06-Jan-16	17-Oct-16
	Sodium Hypochlorite Generation System	198d	06-Jan-16	17-Oct-16
	Chemical Bulk Storage Tanks	132d	19-Feb-16	24-Aug-16
	Finished Water System	198d	29-Dec-15	07-Oct-16
	Finished Water Storage Tanks	154d	21-Jan-16	26-Aug-16
	Finished Water Pumps	198d	29-Dec-15	07-Oct-16
	Brine Discharge System	258d	14-Dec-15	22-Dec-16
	Brine Discharge Pumps	198d	11-Mar-16	22-Dec-16
	Brine Storage Basin	110d	14-Dec-15	19-May-16
	Electrical Equipment	284d	19-Nov-15	10-Jan-17
	Shop Drawings/Submittals	96d	19-Nov-15	08-Apr-16
	Fabricate and Deliver	284d	19-Nov-15	10-Jan-17
	Instrumentation and Control	238d	19-Feb-16	31-Jan-17
	Shop Drawings/Submittals	106d	19-Feb-16	19-Jul-16
	Fabricate and Deliver	172d	23-May-16	31-Jan-17
	Yard Piping & Valves	60d	19-Nov-15	18-Feb-16
	Pre-Treatment Building	132d	07-Dec-15	14-Jun-16
	SWRO Building	189d	07-Dec-15	02-Sep-16
	Administration Building	132d	07-Dec-15	14-Jun-16
	Construction	409d	24-Nov-15	13-Jul-17

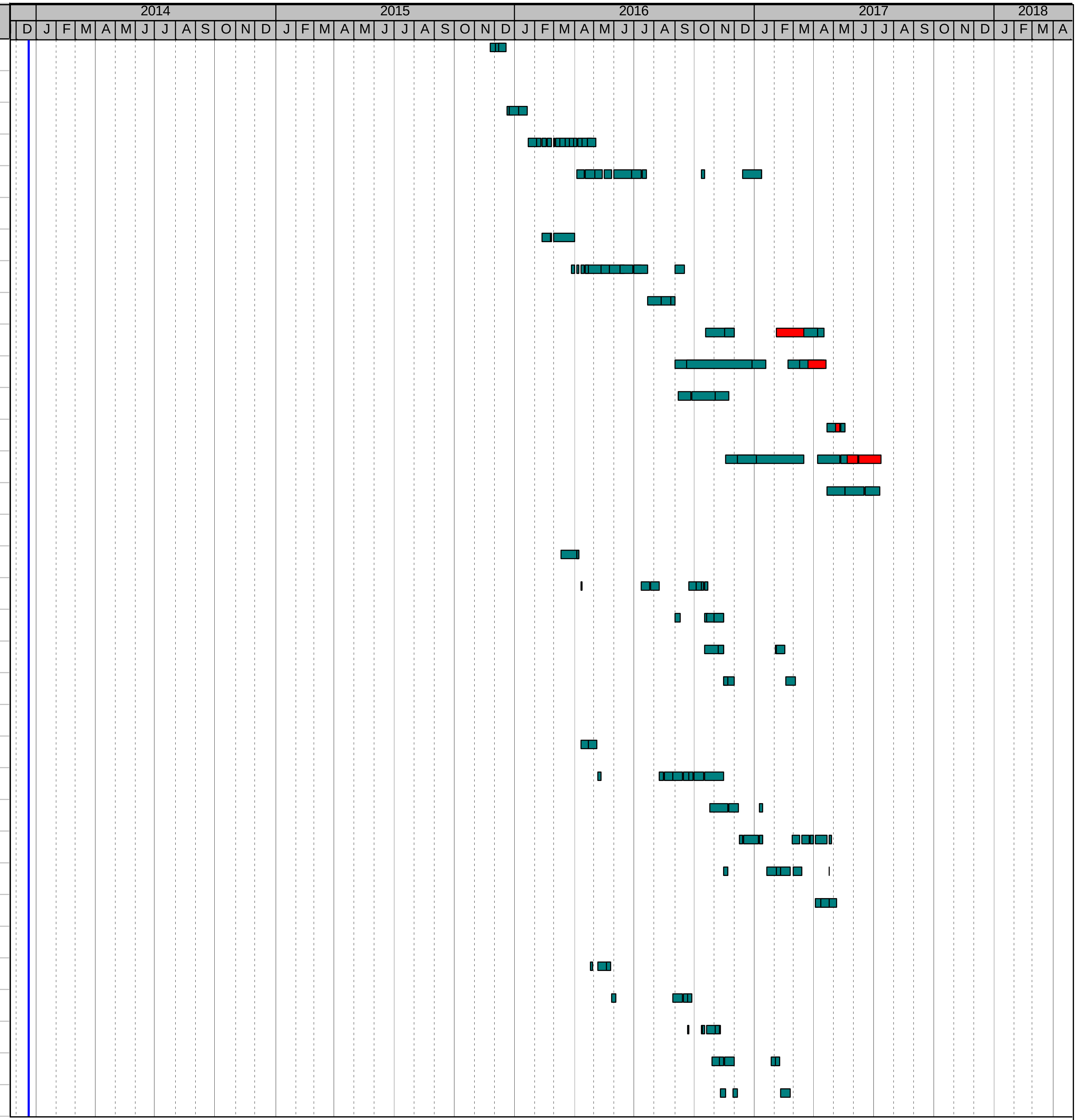
Critical Forcast Work
Forcasted Work
Milestone

MPWSP DESALINATION INFRASTRUCTURE PROJECT

Summary Schedule

CDM Smith

Activity ID	Activity Name	Original Duration	Start	Finish
	Mobilization	17d	24-Nov-15	18-Dec-15
	Site/Civil	266d	21-Dec-15	12-Jan-17
	Site Preparation	19d	21-Dec-15	19-Jan-16
	Yard Piping	74d	21-Jan-16	04-May-16
	Site Electrical	195d	04-Apr-16	12-Jan-17
	SWRO Building	357d	11-Feb-16	13-Jul-17
	Underslab Utilities	36d	11-Feb-16	01-Apr-16
	Structural Concrete	122d	28-Mar-16	16-Sep-16
	Structural Steel	30d	22-Jul-16	01-Sep-16
	Process Equipment	123d	18-Oct-16	17-Apr-17
	Process Piping	156d	02-Sep-16	20-Apr-17
	HVAC and Plumbing	55d	06-Sep-16	23-Nov-16
	Architectural	20d	21-Apr-17	18-May-17
	Electrical and I&C	163d	17-Nov-16	13-Jul-17
	Finishes	55d	21-Apr-17	10-Jul-17
	Pre Treatment	245d	11-Mar-16	03-Mar-17
	Underslab Utilities	21d	11-Mar-16	08-Apr-16
	Structural	136d	11-Apr-16	21-Oct-16
	Mechanical and Equipment	49d	02-Sep-16	14-Nov-16
	Electrical and I&C	83d	17-Oct-16	16-Feb-17
	Finishes	73d	15-Nov-16	03-Mar-17
	Administration Building	269d	11-Apr-16	05-May-17
	Underslab Utilities	19d	11-Apr-16	05-May-16
	Structural	132d	06-May-16	14-Nov-16
	HVAC and Plumbing	55d	24-Oct-16	13-Jan-17
	Architectural	98d	08-Dec-16	28-Apr-17
	Electrical and Communications	110d	15-Nov-16	25-Apr-17
	Building Finishes	25d	03-Apr-17	05-May-17
	Cartridge Filters and Pump Stations	208d	25-Apr-16	23-Feb-17
	Underslab Utilities	24d	25-Apr-16	26-May-16
	Structural	85d	27-May-16	27-Sep-16
	Mechanical and Equipment	35d	21-Sep-16	09-Nov-16
	Electrical and I&C	68d	28-Oct-16	08-Feb-17
	Finishes	69d	10-Nov-16	23-Feb-17



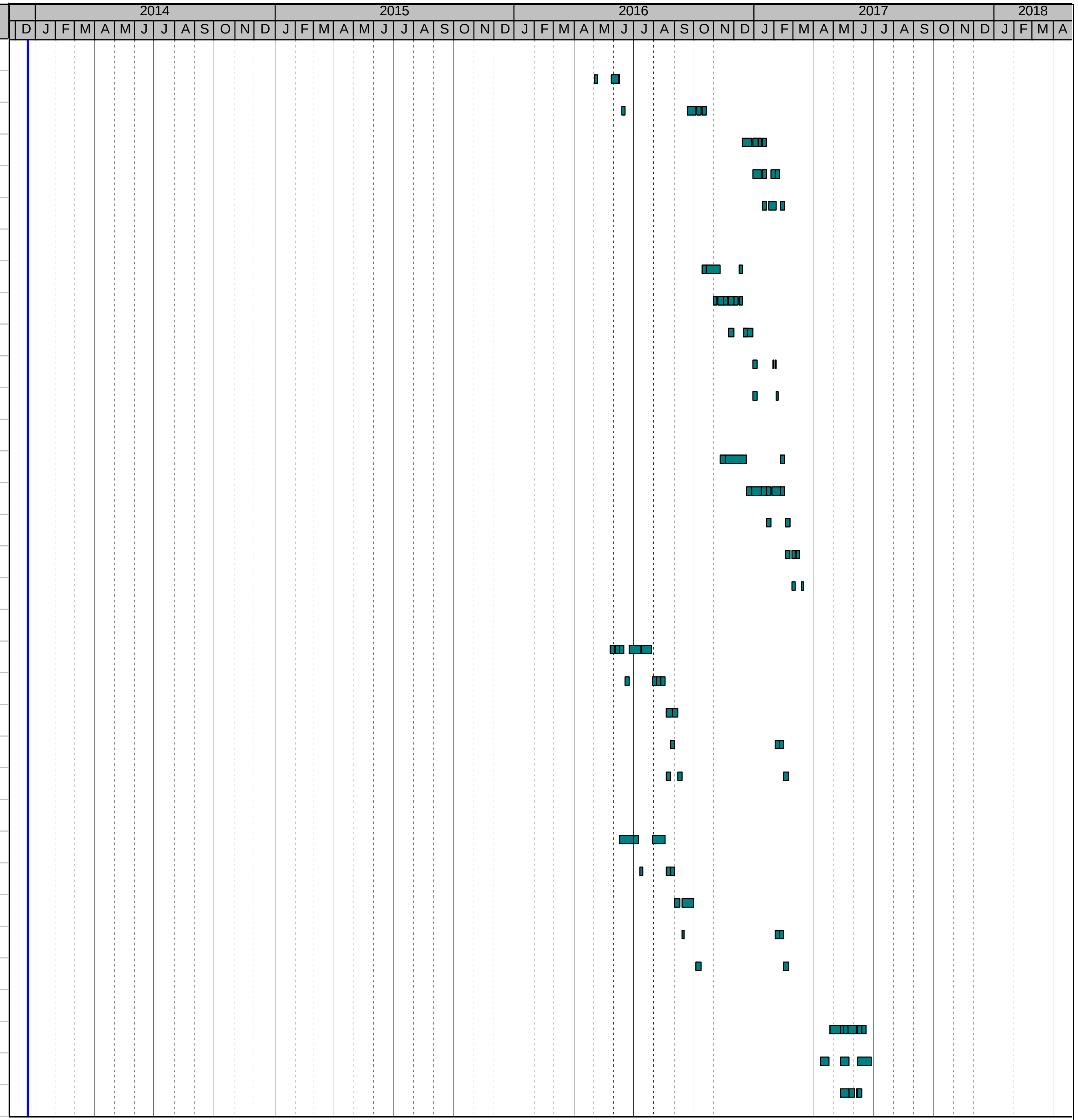
Critical Forcast Work
Forcasted Work
Milestone

MPWSP DESALINATION INFRASTRUCTURE PROJECT

Summary Schedule

CDM Smith

Activity ID	Activity Name	Original Duration	Start	Finish
	Post Treatment	198d	02-May-16	15-Feb-17
	Underslab Utilities	29d	02-May-16	10-Jun-16
	Structural	90d	13-Jun-16	19-Oct-16
	Mechanical and Equipment	25d	14-Dec-16	20-Jan-17
	Electrical and I&C	28d	29-Dec-16	08-Feb-17
	Finishes	23d	13-Jan-17	15-Feb-17
	Filtered Water Storage Tanks	77d	13-Oct-16	06-Feb-17
	Structural	42d	13-Oct-16	14-Dec-16
	Storage Tanks	30d	31-Oct-16	14-Dec-16
	Mechanical	25d	22-Nov-16	29-Dec-16
	Electrical and I&C	23d	30-Dec-16	02-Feb-17
	Finishes	25d	30-Dec-16	06-Feb-17
	Treated Water Tanks	85d	10-Nov-16	17-Mar-17
	Structural	65d	10-Nov-16	16-Feb-17
	Storage Tanks	40d	20-Dec-16	16-Feb-17
	Mechanical	25d	20-Jan-17	24-Feb-17
	Electrical and I&C	15d	17-Feb-17	10-Mar-17
	Finishes	15d	27-Feb-17	17-Mar-17
	Backwash Reclamation System	184d	26-May-16	22-Feb-17
	Site Civil	44d	26-May-16	28-Jul-16
	Structural	44d	17-Jun-16	18-Aug-16
	Mechanical and Equipment	12d	19-Aug-16	06-Sep-16
	Electrical and I&C	115d	26-Aug-16	14-Feb-17
	Finishes	125d	19-Aug-16	22-Feb-17
	Brine Discharge System	174d	10-Jun-16	22-Feb-17
	Site Civil	49d	10-Jun-16	18-Aug-16
	Structural	39d	11-Jul-16	01-Sep-16
	Mechanical and Equipment	20d	02-Sep-16	30-Sep-16
	Electrical and I&C	105d	12-Sep-16	14-Feb-17
	Finishes	95d	03-Oct-16	22-Feb-17
	Site Improvements	54d	12-Apr-17	27-Jun-17
	Paving/Fencing	39d	26-Apr-17	20-Jun-17
	Landscaping	54d	12-Apr-17	27-Jun-17
	Garden / Trellis	22d	12-May-17	13-Jun-17



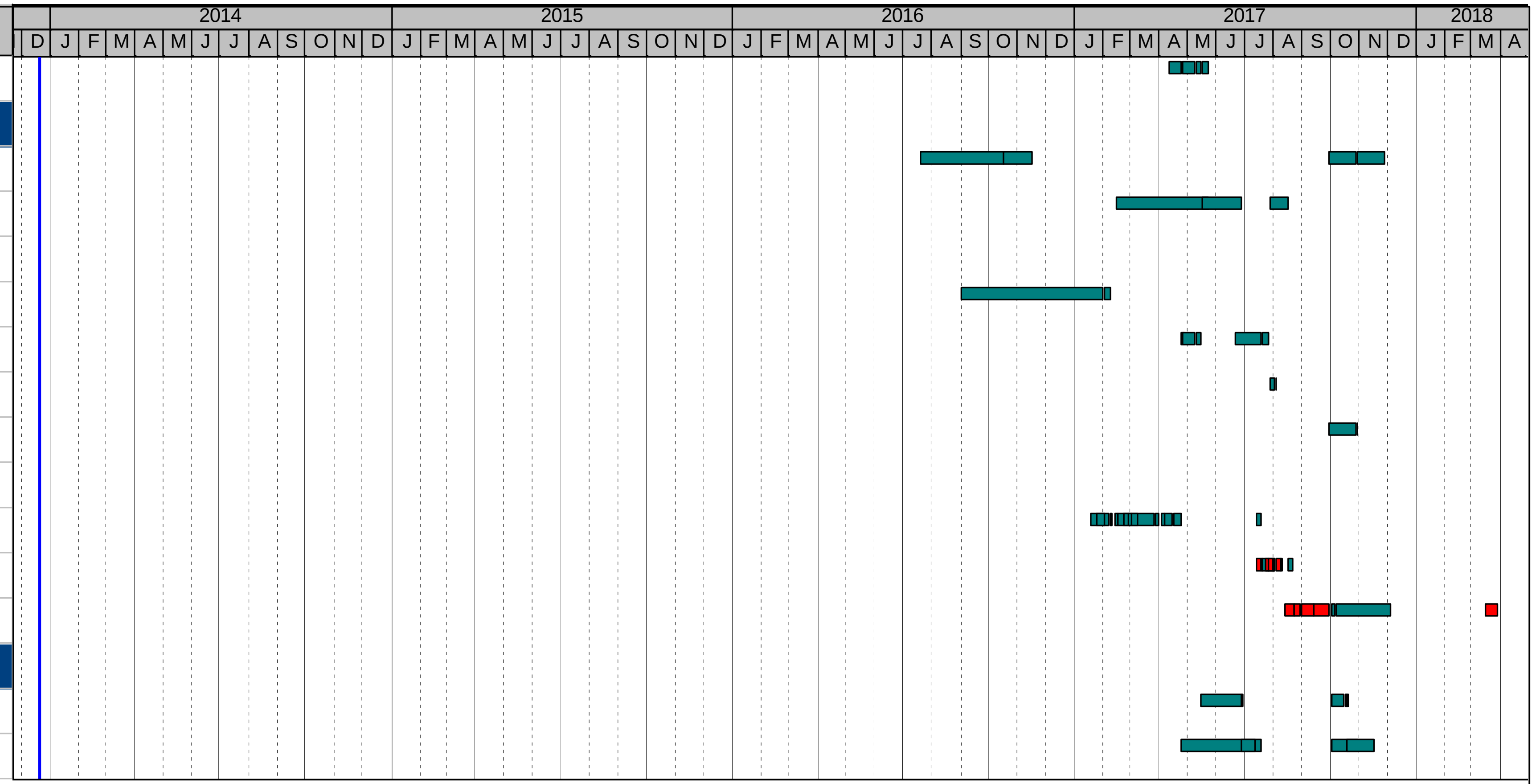
Critical Forcast Work
Forcasted Work
Milestone

MPWSP DESALINATION INFRASTRUCTURE PROJECT

Summary Schedule

CDM Smith

Activity ID	Activity Name	Original Duration	Start	Finish
	Site Lighting/Safety	30d	12-Apr-17	23-May-17
Startup & Commissioning		422d	19-Jul-16	29-Mar-18
	Operation and Maintenance Manual	497d	19-Jul-16	28-Nov-17
	Training	130d	14-Feb-17	17-Aug-17
	Instrumentation and Controls	289d	02-Sep-16	30-Oct-17
	Factory Acceptance Test (FAT)	105d	02-Sep-16	07-Feb-17
	Operational Ready Test (ORT)	67d	24-Apr-17	27-Jul-17
	Functional Demonstration Test (FDT)	6d	28-Jul-17	04-Aug-17
	Site Acceptance Test (SAT)	20d	30-Sep-17	30-Oct-17
	Plant Process	300d	18-Jan-17	29-Mar-18
	Equipment Checkout/Testing	128d	18-Jan-17	19-Jul-17
	Systems Testing/Start-Up	27d	14-Jul-17	22-Aug-17
	Performance Testing	155d	14-Aug-17	29-Mar-18
Project Closeout		144d	24-Apr-17	16-Nov-17
	Punch List / Inspections	110d	16-May-17	20-Oct-17
	Demobilization Record Documents	144d	24-Apr-17	16-Nov-17



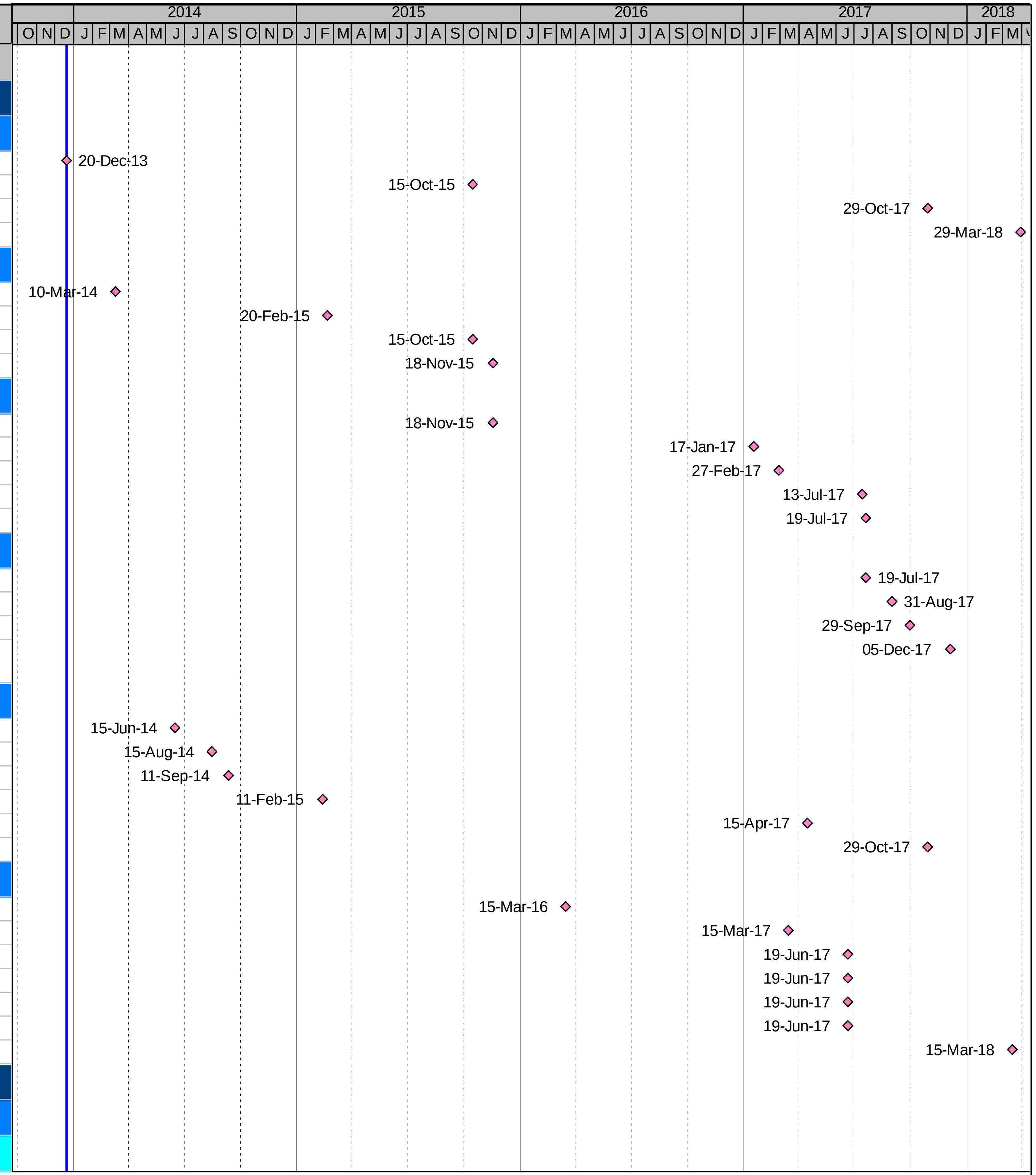
Critical Forcast Work
Forcasted Work
Milestone

MPWSP DESALINATION INFRASTRUCTURE PROJECT

Summary Schedule

CDM Smith

Activity ID	Activity Name	Duration	Start	Finish
MPWSP DESALINATION INFRASTRUCTURE PROJECT		1067d	20-Dec-13	29-Mar-18
Major Milestones		1561d	20-Dec-13	29-Mar-18
Contract		1561d	20-Dec-13	29-Mar-18
MS100	Contract Award	0d	20-Dec-13	
MS150	Final Plant Sizing Decision (9.6MGD / 6.2MGD - GWR Project)	0d		15-Oct-15
MS340	100% Governmental Approvals Received	0d		29-Oct-17
MS360	Final Completion	0d		29-Mar-18
Design		618d	10-Mar-14	18-Nov-15
MS110	Basis of Design Report Complete	0d		10-Mar-14
MS130	40-50% Specifications & Drawings Complete	0d		20-Feb-15
MS160	80-90% Specifications & Drawings Complete	0d		15-Oct-15
MS200	Approved for Construction Specifications & Drawings Complete	0d		18-Nov-15
Construction		608d	18-Nov-15	19-Jul-17
MS190	Guaranteed Scheduled Construction Date	0d		18-Nov-15
MS230	Permanent Power	0d		17-Jan-17
MS220	On-site Delivery of All Major Equipment	0d		27-Feb-17
MS240	Completion of Major Structures	0d		13-Jul-17
MS310	Substantial Completion Date (including CDPH approval)	0d		19-Jul-17
Start-Up Commissioning		140d	19-Jul-17	05-Dec-17
MS250	Commissioning and Functional Testing Commencement	0d	19-Jul-17	
MS320	Run-in Period Commencement	0d	31-Aug-17	
MS330	Acceptance Test Complete	0d		29-Sep-17
MS370	Guaranteed Scheduled Acceptance Date (Includes 60 day review period of AT Report)	0d		05-Dec-17
Regulatory Approvals		1232d	15-Jun-14	29-Oct-17
MS120	Final Environmental Impact Report (EIR)	0d		15-Jun-14
MS140	CPUC - Certificate of Public Convenience and Necessity	0d		15-Aug-14
MS180	SHPO - Natural Historical Preservation Act Permit	0d		11-Sep-14
MS170	CCC - Coastal Development Permit	0d		11-Feb-15
MS210	CDPH - Interim Authority to Operate a Public Water System Permit	0d		15-Apr-17
MS350	CDPH - Authority to Operate a Public Water System Permit	0d		29-Oct-17
MPWSP Non-Desalination Projects		730d	15-Mar-16	15-Mar-18
MS260	Raw Water Well (1/3 Well Capacity)	0d		15-Mar-16
MS380	Raw Water Well (2/3 Well Capacity)	0d		15-Mar-17
MS270	Raw Water Pipeline	0d		19-Jun-17
MS280	Brine Conveyance Pipeline	0d		19-Jun-17
MS290	Desalinated Water Pipeline	0d		19-Jun-17
MS300	Salinas Valley Water Return Pipeline	0d		19-Jun-17
MS390	Raw Water Well (Full Capacity)	0d		15-Mar-18
Governmental Approvals		965d	20-Dec-13	29-Oct-17
CAW-Designated Governmental Approvals		285d	20-Dec-13	11-Feb-15
California Public Utilities Commission		239d	20-Dec-13	15-Aug-14



Forcasted Work
Critical Forcast Work
Milestone

MPWSP DESALINATION INFRASTRUCTURE PROJECT

Proposed Schedule

CDM Smith

Activity ID	Activity Name	Duration	Start	Finish
PR140	Prepare/Submit Application - Certificate of Public Convenience and Necessity (already in progress)	1d	20-Dec-13	20-Dec-13
PR190	Review / Issue - Certificate of Public Convenience and Necessity	238d	21-Dec-13	15-Aug-14
U.S. Fish and Wildlife Service		178d	20-Dec-13	04-Sep-14
PR160	Prepare/Submit Application - Biological Opinion	1d	20-Dec-13	20-Dec-13
PR260	Review / Issue - Biological Opinion	177d	23-Dec-13	04-Sep-14
U.S. Army Corps of Engineers		132d	20-Dec-13	30-Jun-14
PR180	Prepare/Submit Application - 404 Clean Water Act	1d	20-Dec-13	20-Dec-13
PR270	Review / Issue - 404 Clean Water Act	131d	23-Dec-13	30-Jun-14
California Coastal Commission		419d	20-Dec-13	11-Feb-15
PR100	Prepare/Submit Application - Coastal Development Permit (CCC) (already in progress)	1d	20-Dec-13	20-Dec-13
PR200	Review / Issue - Coastal Development Permit (CCC)	418d	21-Dec-13	11-Feb-15
California State Historic Preservation Office		266d	20-Dec-13	11-Sep-14
PR150	Prepare/Submit Application - Natural Historic Preservation Act	1d	20-Dec-13	20-Dec-13
PR240	Review / Issue - Natural Historic Preservation Act Permit	265d	21-Dec-13	11-Sep-14
Regional Water Quality Control Board		266d	20-Dec-13	11-Sep-14
PR110	Prepare and Submit NPDES Permit (RWQCB)	1d	20-Dec-13	20-Dec-13
PR210	Review / Issue - NPDES Permit (RWQCB)	265d	21-Dec-13	11-Sep-14
California Department of Fish and Wildlife		173d	20-Dec-13	27-Aug-14
PR170	Prepare/Submit Application - Incidental Take Permit	46d	20-Dec-13	27-Feb-14
PR250	Review / Issue - Incidental Take Permit	127d	28-Feb-14	27-Aug-14
Monterey Peninsula Water Management District		271d	20-Dec-13	16-Sep-14
PR120	Prepare/Submit Application - Water System Expansion Permit (MPWMD)	1d	20-Dec-13	20-Dec-13
PR220	Review/ Issue - Water System Expansion Permit (MPWMD)	270d	21-Dec-13	16-Sep-14
Monterey Regional Wastewater PCA		271d	20-Dec-13	16-Sep-14
PR130	Prepare/Submit Application - Brine Line Connection Permit (Monterey Regional Wastewater)	1d	20-Dec-13	20-Dec-13
PR230	Review / Issue - Brine Line Connection Permit (Monterey Regional Wastewater)	270d	21-Dec-13	16-Sep-14
Contractor Designated Governmental Approvals		685d	05-Feb-15	29-Oct-17
Regional Water Quality Control Board		186d	05-Feb-15	29-Oct-15
PR280	Prepare/Submit Application - General Construction Storm Water Permit (RWQCB)	10d	05-Feb-15	14-Feb-15
PR350	Prepare/Submit Application - Waste Discharge Permit	10d	05-Feb-15	14-Feb-15
PR360	Prepare/Submit Application - National Pollutant Elimination System Permit	10d	05-Feb-15	14-Feb-15
PR290	Prepare/Submit Application - Title 27 Permit (RWQCB)	66d	05-Feb-15	08-May-15
PR310	Review / Issue - General Construction Storm Water Permit (RWQCB)	30d	15-Feb-15	16-Mar-15
PR420	Review / Issue - Waste Discharge Permit	30d	15-Feb-15	16-Mar-15
PR430	Review / Issue - National Pollutant Elimination System Permit	30d	15-Feb-15	16-Mar-15
PR300	Review / Issue - Title 27 Permit (RWQCB)	120d	11-May-15	29-Oct-15

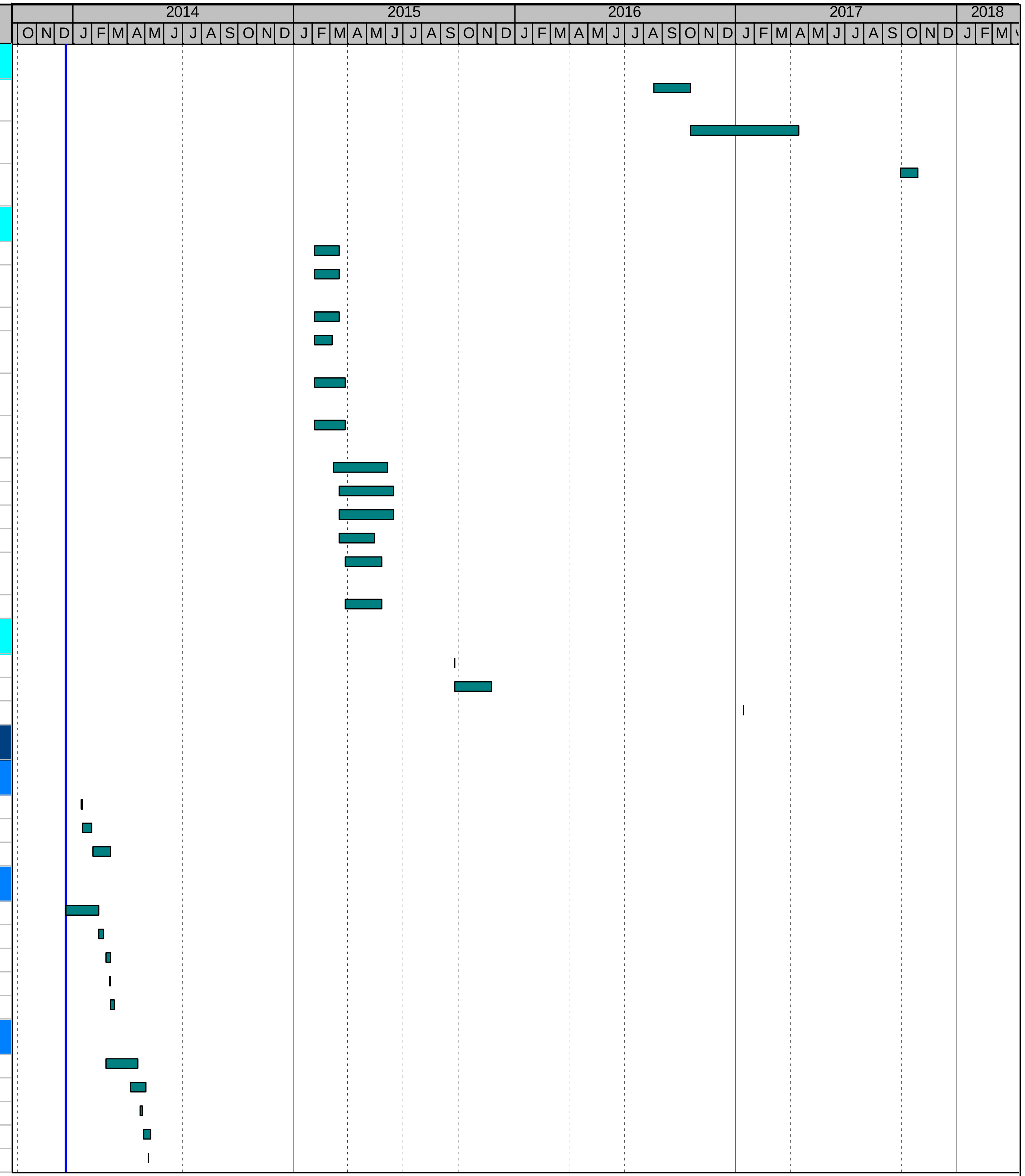
Forcasted Work
Critical Forcast Work
Milestone

MPWSP DESALINATION INFRASTRUCTURE PROJECT

Proposed Schedule

CDM Smith

Activity ID	Activity Name	Duration	Start	Finish
California Department of Public Health		437d	18-Aug-16	29-Oct-17
PR500	Prepare/Submit Application - Permit to Operate a Public Water System (CDPH)	60d	18-Aug-16	17-Oct-16
PR510	Review/Issue - Interim Authority to Operate a Public Water System (CDPH)	180d	17-Oct-16	15-Apr-17
PR530	Review / Issue - Final Permit to Operate a Public Water System (CDPH)	30d	30-Sep-17	29-Oct-17
Monterey County		130d	05-Feb-15	14-Jun-15
PR320	Prepare/Submit Application - Use Permit (Monterey County)	40d	05-Feb-15	16-Mar-15
PR330	Prepare/Submit Application - Combined Development Permit (Monterey County)	40d	05-Feb-15	16-Mar-15
PR380	Prepare/Submit Application - Grading Permit (Monterey County)	40d	05-Feb-15	16-Mar-15
PR390	Prepare/Submit Application - Erosion Control Permit (Monterey County)	30d	05-Feb-15	06-Mar-15
PR440	Prepare/Submit Application - Building Permit to Construct Desalination Facilities (Monterey County)	50d	05-Feb-15	26-Mar-15
PR450	Prepare/Submit Application - Protected Tree Removal Permit (Monterey Country)	50d	05-Feb-15	26-Mar-15
PR470	Review / Issue - Erosion Control Permit (Monterey County)	90d	07-Mar-15	04-Jun-15
PR400	Review / Issue - Use Permit (Monterey County)	90d	17-Mar-15	14-Jun-15
PR410	Review / Issue - Combined Development Permit (Monterey County)	90d	17-Mar-15	14-Jun-15
PR460	Review / Issue - Grading Permit (Monterey County)	60d	17-Mar-15	15-May-15
PR480	Review / Issue - Building Permit to Construct Desalination Facilities (Monterey County)	60d	27-Mar-15	25-May-15
PR490	Review / Issue - Protected Tree Removal Permit (Monterey Country)	60d	27-Mar-15	25-May-15
Monterey Bay Unified Air Pollution Control District		478d	24-Sep-15	13-Jan-17
PR340	Prepare/Submit Application - Authority to Construct (MBUAPCD)	1d	24-Sep-15	24-Sep-15
PR370	Review / Issue - Authority to Construct (MBUAPCD)	60d	25-Sep-15	23-Nov-15
PR520	Inspect/Issue - Permit to Operate (MBUAPCD)	1d	13-Jan-17	13-Jan-17
Design		479d	20-Dec-13	18-Nov-15
Pre-Design Activities		33d	14-Jan-14	03-Mar-14
DS110	Partnering/Project Kickoff Meeting	3d	14-Jan-14	16-Jan-14
DS130	Conduct Site Survey	10d	17-Jan-14	31-Jan-14
DS180	Conduct Geotechnical Investigation and Issue Report	20d	03-Feb-14	03-Mar-14
Basis of Design Report		53d	20-Dec-13	10-Mar-14
DS100	Develop - Basis of Design Report	36d	20-Dec-13	12-Feb-14
DS120	QA-QC/Submit - Basis of Design Report	6d	13-Feb-14	21-Feb-14
DS160	CAW Review/Comment - Basis of Design Report	5d	25-Feb-14	03-Mar-14
DS170	Conduct Design Progress Meeting - Basis of Design Report	1d	03-Mar-14	03-Mar-14
DS190	Respond to CAW Comments - Basis of Design Report	5d	04-Mar-14	10-Mar-14
30% Design Submittal		60d	24-Feb-14	16-May-14
DS140	Develop - 30% Design Submittal	40d	24-Feb-14	18-Apr-14
DS150	Develop/Submit Value Engineering Concepts	20d	07-Apr-14	02-May-14
DS210	QA-QC/Submit - 30% Design Submittal	5d	21-Apr-14	25-Apr-14
DS220	CAW Review/Comment - 30% Design Submittal	10d	28-Apr-14	09-May-14
DS200	Conduct Value Engineering Review Meeting	1d	05-May-14	05-May-14



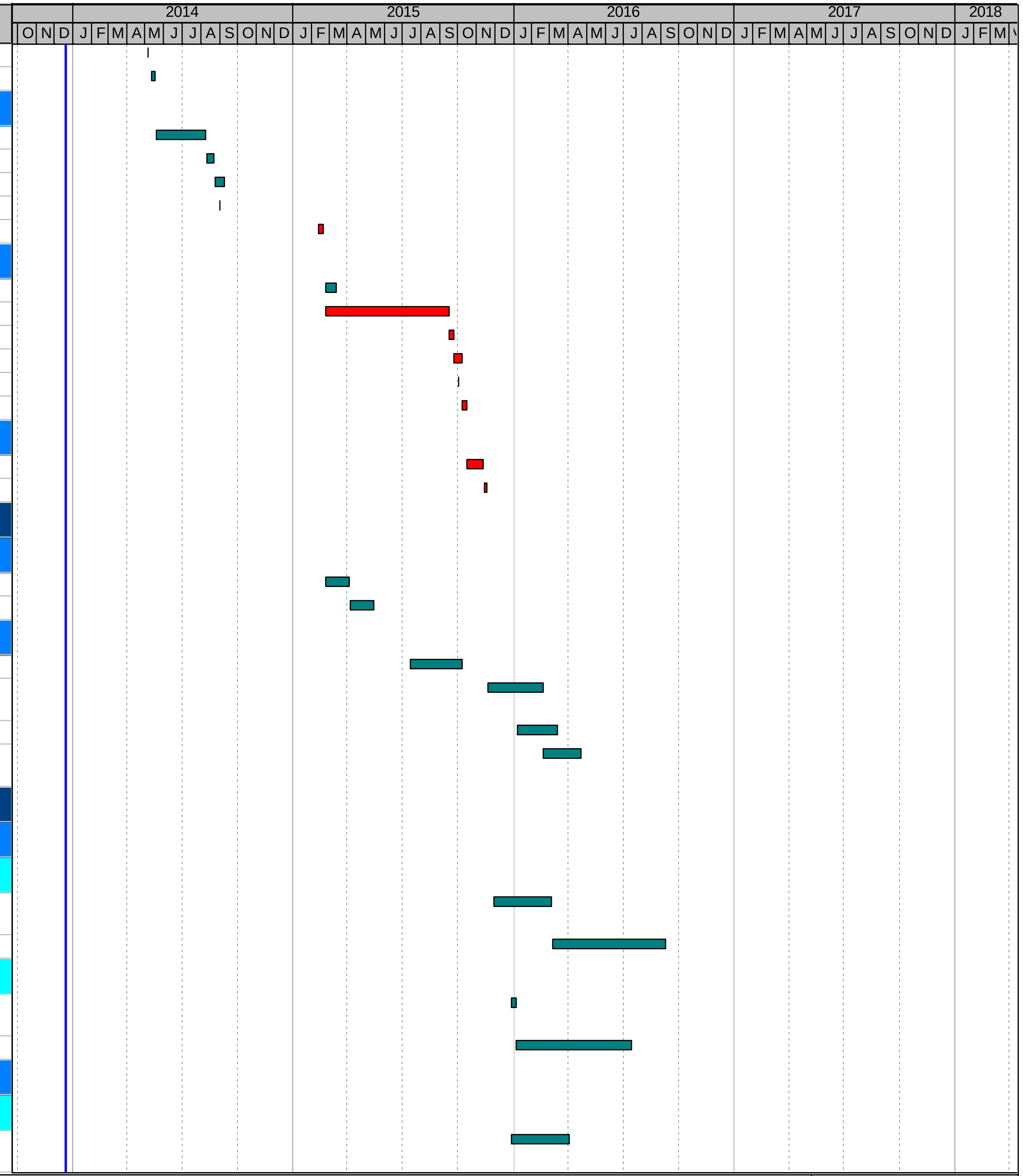
Forcasted Work
Critical Forcast Work
Milestone

MPWSP DESALINATION INFRASTRUCTURE PROJECT

Proposed Schedule

CDM Smith

Activity ID	Activity Name	Duration	Start	Finish
DS230	Conduct Design Progress Meeting - 30% Design Submittal	1d	05-May-14	05-May-14
DS240	Respond to CAW Comments - 30% Design Submittal	5d	12-May-14	16-May-14
60% Design Submittal		189d	19-May-14	20-Feb-15
DS250	Develop - 60% Design Submittal	58d	19-May-14	08-Aug-14
DS260	QA-QC/Submit - 60% Design Submittal	10d	11-Aug-14	22-Aug-14
DS270	CAW Review/Comment - 60% Design Submittal	10d	25-Aug-14	08-Sep-14
DS280	Conduct Design Progress Meeting - 60% Design Submittal	1d	02-Sep-14	02-Sep-14
DS290	Respond to CAW Comments - 60% Design Submittal	6d	12-Feb-15	20-Feb-15
90% Design Submittal		165d	23-Feb-15	15-Oct-15
DS300	Incorporate Final EIR into 90% Design Submittal	15d	23-Feb-15	13-Mar-15
DS310	Develop - 90% Design Submittal	145d	23-Feb-15	16-Sep-15
DS320	QA-QC/Submit - 90% Design Submittal	5d	17-Sep-15	23-Sep-15
DS330	CAW Review/Comment - 90% Design Submittal	10d	24-Sep-15	07-Oct-15
DS340	Conduct Design Progress Meeting - 90% Design Submittal	1d	01-Oct-15	01-Oct-15
DS350	Respond to CAW Comments -90% Design Submittal	5d	08-Oct-15	15-Oct-15
Approved for Construction Design Submittal		23d	16-Oct-15	18-Nov-15
DS360	Develop - Approved for Construction Design Submittal	19d	16-Oct-15	12-Nov-15
DS370	QA-QC/Submit - Approved for Construction Design Submittal	4d	13-Nov-15	18-Nov-15
Project Plans		293d	23-Feb-15	21-Apr-16
Construction		60d	23-Feb-15	15-May-15
PP100	Develop/Submit/Review Quality Management/Quality Control Plans	30d	23-Feb-15	03-Apr-15
PP110	Develop/Submit/Review Project Health and Safety Plan	30d	06-Apr-15	15-May-15
Start-Up/Commissioning		193d	15-Jul-15	21-Apr-16
PP140	Develop/Submit/Review Draft Training Plan	60d	15-Jul-15	07-Oct-15
PP120	Develop/Submit/Review Draft Start-Up/Commissioning/Acceptance Testing Plan (process only, no I&C)	60d	19-Nov-15	18-Feb-16
PP150	Develop/Submit/Review Final Training Plan	45d	08-Jan-16	14-Mar-16
PP130	Develop/Submit/Review Final Start-Up/Commissioning/Acceptance Testing Plan (process only, no I&C)	45d	19-Feb-16	21-Apr-16
Procurement		316d	19-Nov-15	27-Feb-17
Pre Treatment System		198d	30-Nov-15	09-Sep-16
Pressure Filters		198d	30-Nov-15	09-Sep-16
PT150	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - Media Pressure Filter	66d	30-Nov-15	04-Mar-16
PT460	Fabricate/Deliver - Media Pressure Filter	189d	05-Mar-16	09-Sep-16
Equipment		137d	29-Dec-15	13-Jul-16
PT280	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - Backwash Supply Pumps	5d	29-Dec-15	05-Jan-16
PT340	Fabricate/Deliver - Backwash Supply Pumps	132d	06-Jan-16	13-Jul-16
Filtered Feedwater System		228d	07-Dec-15	31-Oct-16
Filtered Feedwater Storage Tanks		154d	29-Dec-15	05-Aug-16
PT270	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - Filtered Feedwater Tanks	66d	29-Dec-15	01-Apr-16



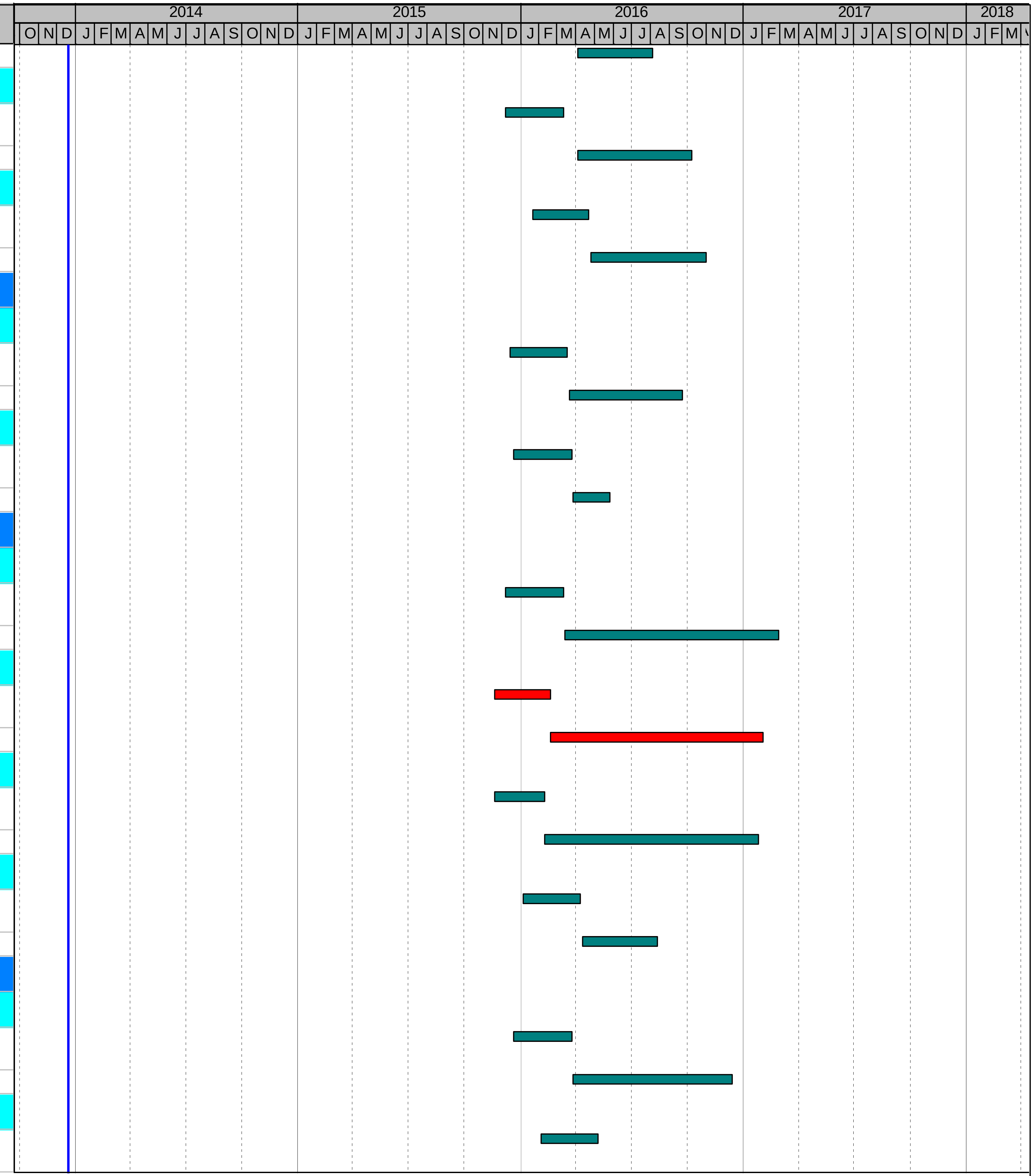
Forcasted Work
Critical Forcast Work
Milestone

MPWSP DESALINATION INFRASTRUCTURE PROJECT

Proposed Schedule

CDM Smith

Activity ID	Activity Name	Duration	Start	Finish
PT580	Fabricate/ Deliver - Filtered Feedwater Tanks	88d	04-Apr-16	05-Aug-16
Filtered Feedwater Pumps		213d	07-Dec-15	07-Oct-16
PT190	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - Filtered Feedwater Pumps	66d	07-Dec-15	11-Mar-16
PT590	Fabricate/ Deliver - Filtered Feedwater Pumps	132d	04-Apr-16	07-Oct-16
Cartridge Filters		198d	21-Jan-16	31-Oct-16
PT370	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - Cartridge Filters	66d	21-Jan-16	22-Apr-16
PT670	Fabricate/ Deliver - Cartridge Filters	132d	25-Apr-16	31-Oct-16
Backwash Reclamation System		198d	14-Dec-15	23-Sep-16
Backwash Water Recycle Pumps		198d	14-Dec-15	23-Sep-16
PT230	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - Backwash Water Recycle Pumps	66d	14-Dec-15	18-Mar-16
PT540	Fabricate/ Deliver - Backwash Water Recyde Pumps	132d	21-Mar-16	23-Sep-16
Backwash Water Storage Basins		110d	21-Dec-15	26-May-16
PT260	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - Backwash Water Basin Liner	66d	21-Dec-15	25-Mar-16
PT570	Fabricate/ Deliver - Backwash Water Basin Liner	44d	28-Mar-16	26-May-16
RO System		316d	19-Nov-15	27-Feb-17
RO Feed Pumps		306d	07-Dec-15	27-Feb-17
PT160	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - RO Feed Pumps	66d	07-Dec-15	11-Mar-16
PT480	Fabricate/ Deliver - RO Feed Pumps	240d	14-Mar-16	27-Feb-17
RO Membrane Skids		300d	19-Nov-15	02-Feb-17
PT120	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - RO Equipment	60d	19-Nov-15	18-Feb-16
PT440	Fabricate/ Deliver - RO Equipment	240d	19-Feb-16	02-Feb-17
RO Energy Recovery Equipment		294d	19-Nov-15	25-Jan-17
PT130	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - Energy Recovery Equipment	54d	19-Nov-15	09-Feb-16
PT410	Fabricate/ Deliver - Energy Recovery Equipment	240d	10-Feb-16	25-Jan-17
RO Clean/Flush Systems		154d	06-Jan-16	12-Aug-16
PT300	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - RO CIP/ Flush Water Tank	66d	06-Jan-16	08-Apr-16
PT610	Fabricate/ Deliver - RO CIP/ Flush Water Tank	88d	11-Apr-16	12-Aug-16
Post Treatment System		246d	21-Dec-15	13-Dec-16
Hydrated Lime/Calcite Contactors		246d	21-Dec-15	13-Dec-16
PT240	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - Hydrated Lime/Calcite Contactor System	66d	21-Dec-15	25-Mar-16
PT550	Fabricate/ Deliver - Hydrated Lime/Calcite Contactor System	180d	28-Mar-16	13-Dec-16
UV System		198d	04-Feb-16	15-Nov-16
PT400	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - UV System	66d	04-Feb-16	06-May-16



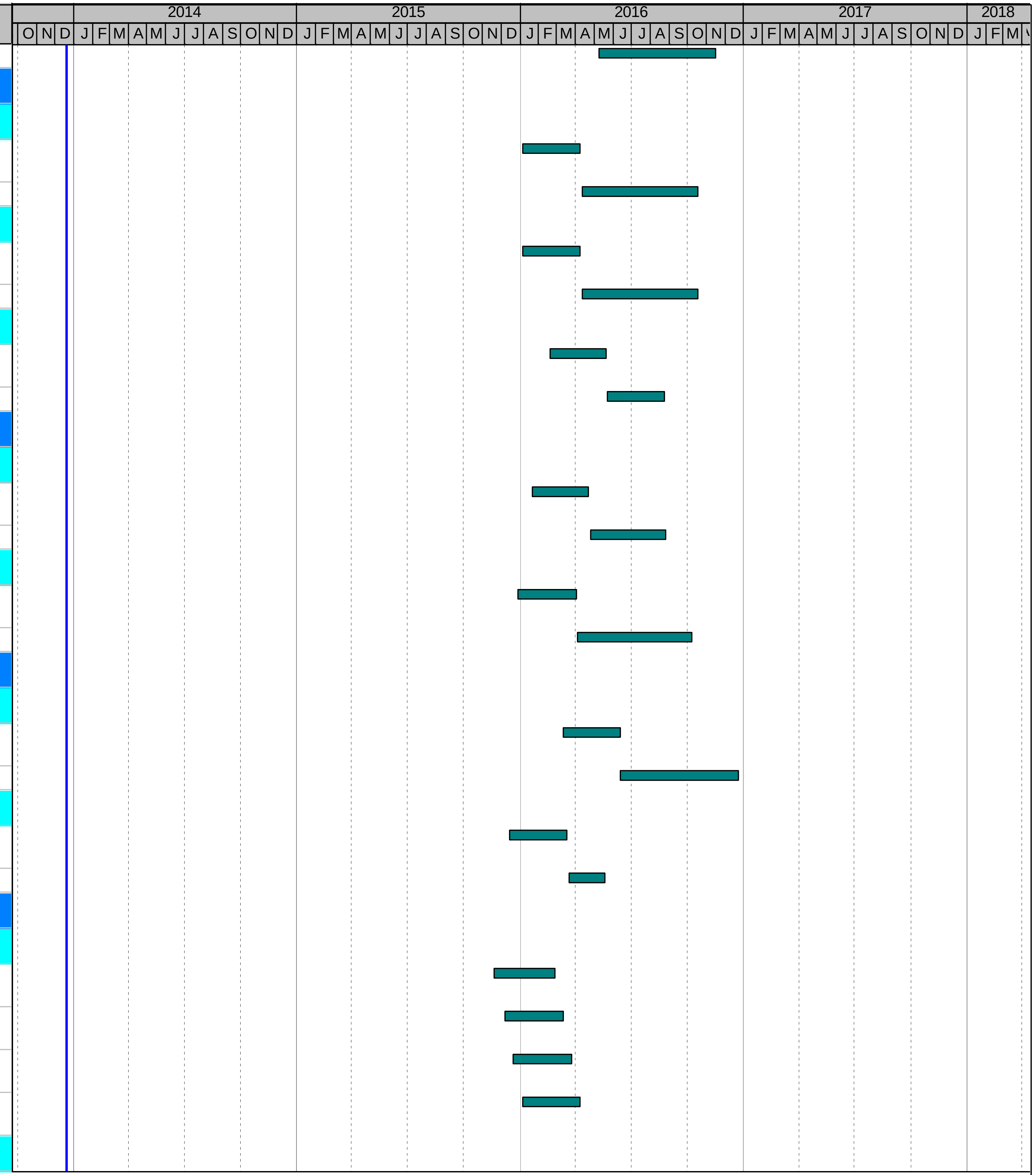
Forcasted Work
Critical Forcast Work
Milestone

MPWSP DESALINATION INFRASTRUCTURE PROJECT

Proposed Schedule

CDM Smith

Activity ID	Activity Name	Duration	Start	Finish
PT710	Fabricate/ Deliver - UV System	132d	09-May-16	15-Nov-16
Chemical Systems		198d	06-Jan-16	17-Oct-16
Chemical Pump Systems		198d	06-Jan-16	17-Oct-16
PT310	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - Chemical Metering Pumps	66d	06-Jan-16	08-Apr-16
PT620	Fabricate/ Deliver - Chemical Metering Pumps	132d	11-Apr-16	17-Oct-16
Sodium Hypochlorite Generation System		198d	06-Jan-16	17-Oct-16
PT320	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - NaOCL Generation System	66d	06-Jan-16	08-Apr-16
PT630	Fabricate/ Deliver -NaOCL Generation System	132d	11-Apr-16	17-Oct-16
Chemical Bulk Storage Tanks		132d	19-Feb-16	24-Aug-16
PT420	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - Chemical Bulk Storage Tanks	66d	19-Feb-16	20-May-16
PT720	Fabricate/ Deliver -Chemical Bulk Storage Tanks	66d	23-May-16	24-Aug-16
Finished Water System		198d	29-Dec-15	07-Oct-16
Finished Water Storage Tanks		154d	21-Jan-16	26-Aug-16
PT360	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - Finished Water Tanks	66d	21-Jan-16	22-Apr-16
PT680	Fabricate/ Deliver - Finished Water Tanks	88d	25-Apr-16	26-Aug-16
Finished Water Pumps		198d	29-Dec-15	07-Oct-16
PT290	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - Finished Water Pumps	66d	29-Dec-15	01-Apr-16
PT600	Fabricate/ Deliver - Finished Water Pumps	132d	04-Apr-16	07-Oct-16
Brine Discharge System		258d	14-Dec-15	22-Dec-16
Brine Discharge Pumps		198d	11-Mar-16	22-Dec-16
PT470	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - Brine Discharge Pumps	66d	11-Mar-16	13-Jun-16
PT740	Fabricate/ Deliver - Brine Discharge Pumps	132d	14-Jun-16	22-Dec-16
Brine Storage Basin		110d	14-Dec-15	19-May-16
PT220	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - Brine Storage Basin Liner	66d	14-Dec-15	18-Mar-16
PT530	Fabricate/ Deliver - Brine Storage Basin Liner	44d	21-Mar-16	19-May-16
Electrical Equipment		284d	19-Nov-15	10-Jan-17
Shop Drawings/Submittals		96d	19-Nov-15	08-Apr-16
PT110	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - Switch Gear and MCC's Submittal	66d	19-Nov-15	26-Feb-16
PT210	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - VFD's Submittal	66d	07-Dec-15	11-Mar-16
PT250	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - Emergency Generator Submittal	66d	21-Dec-15	25-Mar-16
PT330	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - Transformers Submittal	66d	06-Jan-16	08-Apr-16
Fabricate and Deliver		284d	19-Nov-15	10-Jan-17



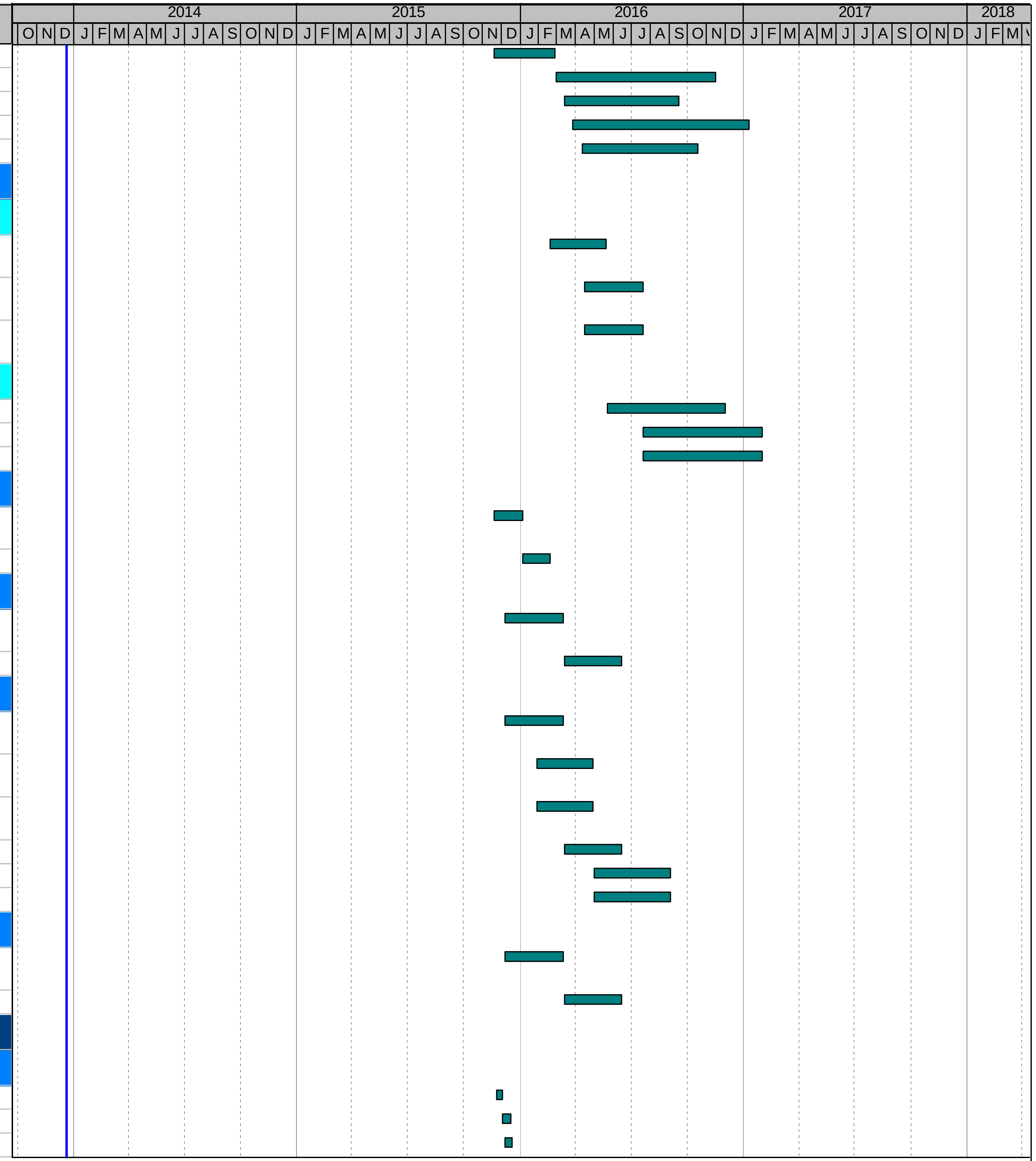
Forcasted Work
Critical Forcast Work
Milestone

MPWSP DESALINATION INFRASTRUCTURE PROJECT

Proposed Schedule

CDM Smith

Activity ID	Activity Name	Duration	Start	Finish
PT140	Electrical Ductbank Detailing and Switch Gear/MCC Footprints	66d	19-Nov-15	26-Feb-16
PT450	Fabricate/ Deliver - Switch Gear and MCC's	182d	29-Feb-16	15-Nov-16
PT520	Fabricate/ Deliver - VFD's	132d	14-Mar-16	16-Sep-16
PT560	Fabricate/ Deliver - Emergency Generator	198d	28-Mar-16	10-Jan-17
PT640	Fabricate/ Deliver - Transformers	132d	11-Apr-16	17-Oct-16
Instrumentation and Control		238d	19-Feb-16	31-Jan-17
Shop Drawings/Submittals		106d	19-Feb-16	19-Jul-16
PT430	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - PLC's	66d	19-Feb-16	20-May-16
PT650	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - SCADA/Controls	66d	15-Apr-16	19-Jul-16
PT660	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - Instrumentation Package	66d	15-Apr-16	19-Jul-16
Fabricate and Deliver		172d	23-May-16	31-Jan-17
PT730	Fabricate/ Deliver - PLC's	132d	23-May-16	01-Dec-16
PT750	Fabricate/ Deliver - SCADA/Control System	132d	20-Jul-16	31-Jan-17
PT760	Fabricate/ Deliver - Instrumentation Package	132d	20-Jul-16	31-Jan-17
Yard Piping & Valves		60d	19-Nov-15	18-Feb-16
PT100	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - Initial Yard Pipe	30d	19-Nov-15	05-Jan-16
PT350	Fabricate/ Deliver - Initial Yard Pipe	30d	06-Jan-16	18-Feb-16
Pre-Treatment Building		132d	07-Dec-15	14-Jun-16
PT180	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - Pre-Treatment Building	66d	07-Dec-15	11-Mar-16
PT500	Fabricate/ Deliver - Pre-Treatment Building	66d	14-Mar-16	14-Jun-16
SWRO Building		189d	07-Dec-15	02-Sep-16
PT200	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - Main Building	66d	07-Dec-15	11-Mar-16
PT380	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - HVAC System	66d	28-Jan-16	29-Apr-16
PT390	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - Fire Protection System	66d	28-Jan-16	29-Apr-16
PT510	Fabricate/ Deliver - Main Building	66d	14-Mar-16	14-Jun-16
PT690	Fabricate/ Deliver - HVAC System	88d	02-May-16	02-Sep-16
PT700	Fabricate/ Deliver - Fire Protection System	88d	02-May-16	02-Sep-16
Administration Building		132d	07-Dec-15	14-Jun-16
PT170	Issue PO/ Generate Submittal/ Engineer Review/Approve Submittal - Administration Building	66d	07-Dec-15	11-Mar-16
PT490	Fabricate/ Deliver - Administration Building	66d	14-Mar-16	14-Jun-16
Construction		409d	24-Nov-15	13-Jul-17
Mobilization		17d	24-Nov-15	18-Dec-15
CN100	Install SWPPP BMP's, Environmental Provisions	5d	24-Nov-15	02-Dec-15
CN110	Install Temporary Utilities	10d	03-Dec-15	16-Dec-15
CN120	Set-Up Field Office Trailers	10d	07-Dec-15	18-Dec-15



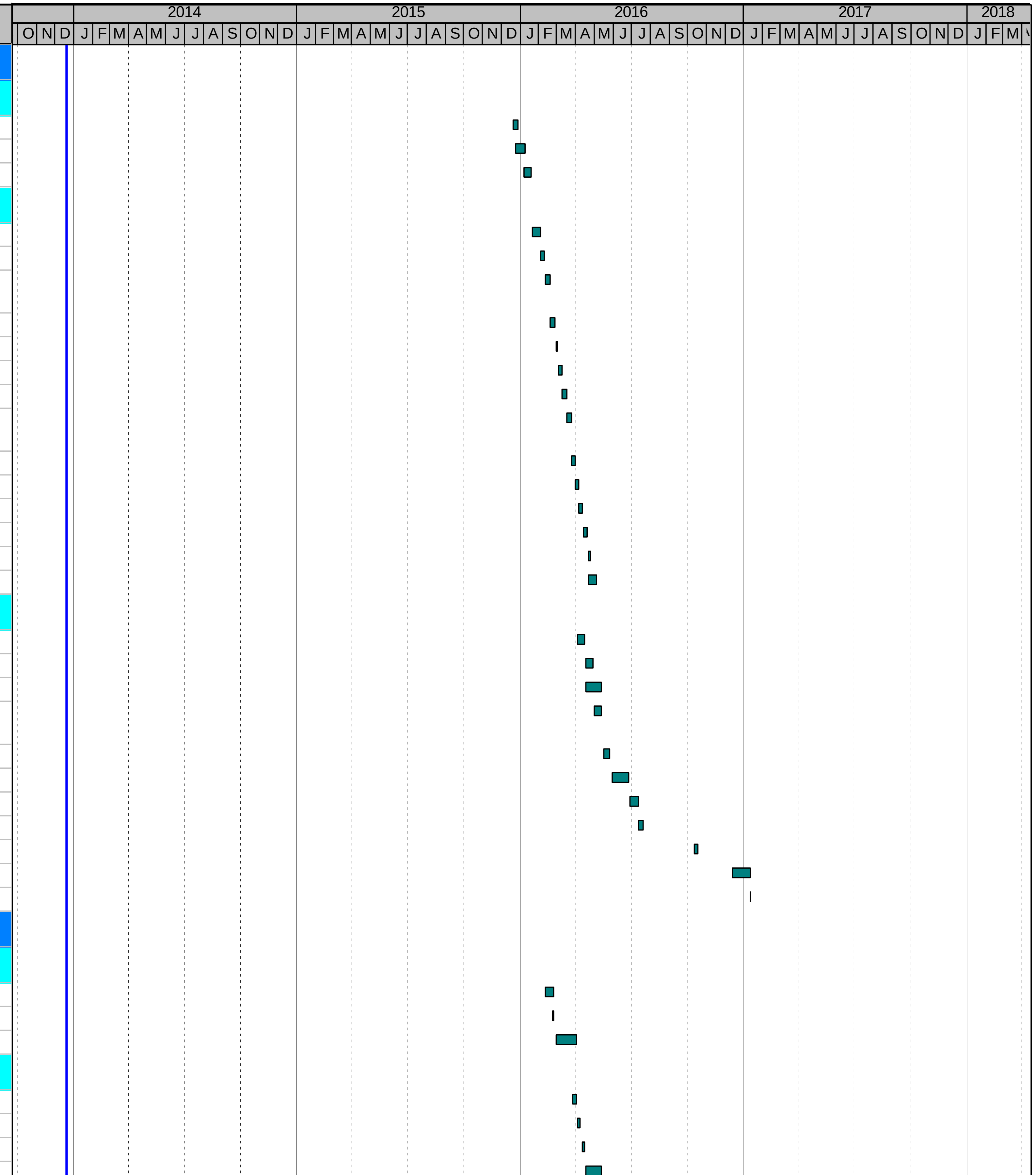
Forcasted Work
Critical Forcast Work
Milestone

MPWSP DESALINATION INFRASTRUCTURE PROJECT

Proposed Schedule

CDM Smith

Activity ID	Activity Name	Duration	Start	Finish
Site/Civil		266d	21-Dec-15	12-Jan-17
Site Preparation		19d	21-Dec-15	19-Jan-16
CN130	Clear and Grub, Boundary Staking	5d	21-Dec-15	28-Dec-15
CN140	Initial Site Grading	10d	24-Dec-15	08-Jan-16
CN150	Mass Excavation	8d	07-Jan-16	19-Jan-16
Yard Piping		74d	21-Jan-16	04-May-16
CN160	Install Yard Piping - Storm Drains	10d	21-Jan-16	03-Feb-16
CN170	Install Yard Piping - Project Boundary ->Pre-Treatment Filters	5d	04-Feb-16	10-Feb-16
CN180	Install Yard Piping - Pre-Treatment Filters -> Backwash Reclamation Pump Station	5d	11-Feb-16	18-Feb-16
CN200	Install Yard Piping - Pre-Treatment Filters -> Filtered Water Tank	6d	19-Feb-16	26-Feb-16
CN220	Install Yard Piping - Cartridge Filters -> Main Building	3d	29-Feb-16	02-Mar-16
CN240	Install Yard Piping - Main Building -> Post Treatment Area	5d	03-Mar-16	09-Mar-16
CN250	Install Yard Piping - Main Building -> Brine Pump Station	6d	10-Mar-16	17-Mar-16
CN270	Install Yard Piping - Post Treatment Area -> Finished Water Storage Tanks	5d	18-Mar-16	24-Mar-16
CN280	Install Yard Piping - Project Boundary -> Finished Water PS	4d	25-Mar-16	30-Mar-16
CN300	Install Yard Piping - Project Boundary -> Brine Pump Station	4d	31-Mar-16	05-Apr-16
CN350	Install Yard Piping - Pre-Treatment Area -> Brine EQ Basin	5d	06-Apr-16	12-Apr-16
CN390	Install Yard Piping - Potable Water Loop	6d	13-Apr-16	20-Apr-16
CN440	Install Yard Piping - Sanitary Sewer	4d	21-Apr-16	26-Apr-16
CN450	Install Yard Piping - Septic Tank/Leach Field	10d	21-Apr-16	04-May-16
Site Electrical		195d	04-Apr-16	12-Jan-17
CN310	Install Ductbanks - Main Building -> Pre-Treatment Filters	10d	04-Apr-16	15-Apr-16
CN400	Install Ductbanks - Main Building -> MCC2A/B	10d	18-Apr-16	29-Apr-16
CN410	Pull and Term Wire Phase 1	20d	18-Apr-16	13-May-16
CN480	Install Ductbanks - MCC2A/B -> Tanks and Reclamation Pump Station	10d	02-May-16	13-May-16
CN530	Install Ductbanks - Main Building -> Admin and Brine Pump Station	10d	16-May-16	27-May-16
CN590	Install Misc Yard Ductbanks	20d	31-May-16	27-Jun-16
CN690	Install Ductbank to PG&E Service Connection	10d	28-Jun-16	12-Jul-16
CN750	PG&E Install Service Drop	5d	13-Jul-16	19-Jul-16
CN1180	Install Padmount Transformers	5d	11-Oct-16	17-Oct-16
CN1610	Pull and Term Wire Phase 2	20d	14-Dec-16	12-Jan-17
CN1790	Install and Setup Generator	2d	11-Jan-17	12-Jan-17
SWRO Building		357d	11-Feb-16	13-Jul-17
Underslab Utilities		36d	11-Feb-16	01-Apr-16
CN190	SWRO Bldg - Install Underslab Process Piping	10d	11-Feb-16	25-Feb-16
CN210	SWRO Bldg - Install Underslab Drains	2d	24-Feb-16	25-Feb-16
CN230	SWRO Bldg - Install Underslab Conduit (Electric Room)	25d	29-Feb-16	01-Apr-16
Structural Concrete		122d	28-Mar-16	16-Sep-16
CN290	Prepare Subgrade	5d	28-Mar-16	01-Apr-16
CN330	SWRO Bldg - Excavate Footings/Foundations	5d	04-Apr-16	08-Apr-16
CN370	SWRO Bldg - Form/Rebar/Pour/Strip/ - Foundations	5d	11-Apr-16	15-Apr-16
CN420	SWRO Bldg - Form/Rebar/Pour/Strip/ - Pipe Trench	20d	18-Apr-16	13-May-16



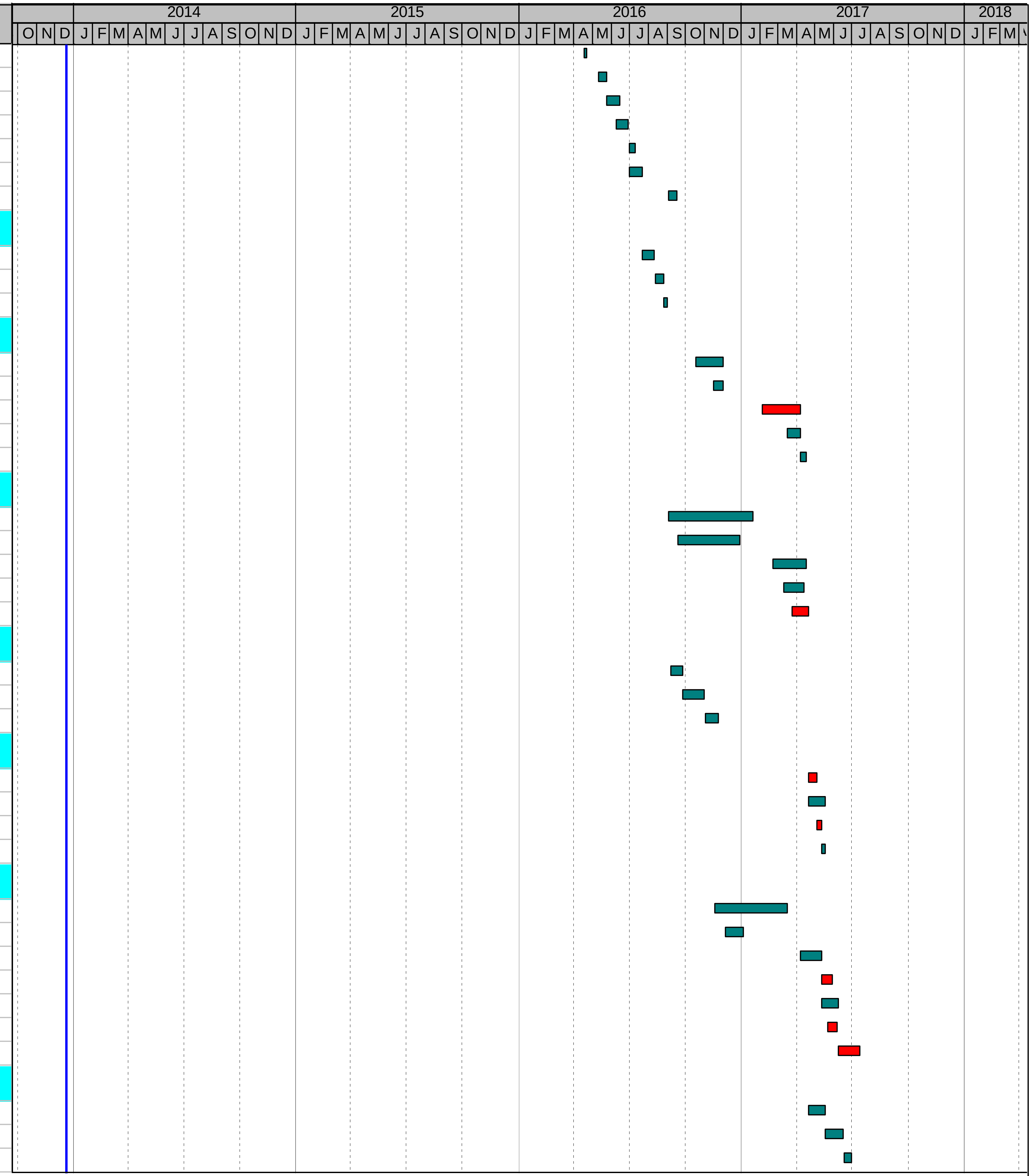
Forcasted Work
Critical Forcast Work
Milestone

MPWSP DESALINATION INFRASTRUCTURE PROJECT

Proposed Schedule

CDM Smith

Activity ID	Activity Name	Duration	Start	Finish
CN430	SWRO Bldg - Form/Rebar/Pour/Strip/ - Sumps	5d	18-Apr-16	22-Apr-16
CN520	SWRO Bldg - Form/Rebar/Pour/Strip/ - Chemical Rooms Slab	10d	11-May-16	24-May-16
CN550	SWRO Bldg - Form/Rebar/Pour/Strip/ - Chemical Room Walls	15d	25-May-16	15-Jun-16
CN630	SWRO Bldg - Form/Rebar/Pour/Strip/ - Slab Main Floor	15d	09-Jun-16	29-Jun-16
CN700	SWRO Bldg - Form/Rebar/Pour/Strip/ - Equipment Pads	7d	30-Jun-16	11-Jul-16
CN710	SWRO Bldg - Construct CMU Walls	15d	30-Jun-16	21-Jul-16
CN980	SWRO Bldg - Install Chemical Resistant Coating - Chemical Area	10d	02-Sep-16	16-Sep-16
Structural Steel		30d	22-Jul-16	01-Sep-16
CN770	SWRO Bldg - Erect Structural Steel	15d	22-Jul-16	11-Aug-16
CN830	SWRO Bldg - Install Roof	10d	12-Aug-16	25-Aug-16
CN900	SWRO Bldg - Install Exterior Walls	5d	26-Aug-16	01-Sep-16
Process Equipment		123d	18-Oct-16	17-Apr-17
CN1280	Install Equipment - Chemical Systems	30d	18-Oct-16	01-Dec-16
CN1480	Install Equipment - Chemical Bulk Storage Tanks	10d	16-Nov-16	01-Dec-16
CN1560	Install Equipment - RO System	44d	03-Feb-17	06-Apr-17
CN1840	Install Equipment - RO CIP System	15d	17-Mar-17	06-Apr-17
CN2030	Install Equipment - UV System	7d	07-Apr-17	17-Apr-17
Process Piping		156d	02-Sep-16	20-Apr-17
CN970	Install Processing Piping in Pipe Trench	91d	02-Sep-16	18-Jan-17
CN1060	Install Pipe Supports	68d	19-Sep-16	28-Dec-16
CN1660	Install Process Piping Above Trench	40d	21-Feb-17	17-Apr-17
CN1750	Install Chemical Lines in Chemical Rooms	25d	10-Mar-17	13-Apr-17
CN1890	Install RO Piping	20d	24-Mar-17	20-Apr-17
HVAC and Plumbing		55d	06-Sep-16	23-Nov-16
CN990	SWRO Bldg - Install HVAC Chemical Rooms	15d	06-Sep-16	26-Sep-16
CN1140	SWRO Bldg - Install HVAC Main/Electrical Room	25d	27-Sep-16	01-Nov-16
CN1370	SWRO Bldg - Install Fire Protection System	15d	02-Nov-16	23-Nov-16
Architectural		20d	21-Apr-17	18-May-17
CN2180	SWRO Bldg - Install Stairs/Railing and Landings	10d	21-Apr-17	04-May-17
CN2190	SWRO Bldg - Install Grating	20d	21-Apr-17	18-May-17
CN2260	SWRO Bldg - Install Doors/Windows	5d	05-May-17	11-May-17
CN2290	SWRO Bldg - Install Rollup Doors	5d	12-May-17	18-May-17
Electrical and I&C		163d	17-Nov-16	13-Jul-17
CN1490	SWRO Bldg - Install Conduit and Supports	80d	17-Nov-16	16-Mar-17
CN1570	SWRO Bldg - Install Lighting	20d	05-Dec-16	03-Jan-17
CN2040	SWRO Bldg - Install Chemical System Controls Panels	25d	07-Apr-17	11-May-17
CN2300	SWRO Bldg - Install LP/PLC/VFD's	12d	12-May-17	30-May-17
CN2310	SWRO Bldg - Install Instrumentation	20d	12-May-17	09-Jun-17
CN2330	SWRO Bldg - Install MCC's and Switch Gear	12d	22-May-17	07-Jun-17
CN2400	SWRO Bldg - Pull and Term Wire	25d	08-Jun-17	13-Jul-17
Finishes		55d	21-Apr-17	10-Jul-17
CN2200	SWRO Bldg - Apply Mechanical Coatings	20d	21-Apr-17	18-May-17
CN2320	SWRO Bldg - Apply Paint/Coatings	20d	19-May-17	16-Jun-17
CN2450	SWRO Bldg - Install Electrical Finishes	10d	19-Jun-17	30-Jun-17



Forcasted Work
Critical Forcast Work
Milestone

MPWSP DESALINATION INFRASTRUCTURE PROJECT

Proposed Schedule

Activity ID	Activity Name	Duration	Start	Finish
CN2460	SWRO Bldg - Install Signage and Safety Equipment	15d	19-Jun-17	10-Jul-17
Pre Treatment		245d	11-Mar-16	03-Mar-17
Underslab Utilities		21d	11-Mar-16	08-Apr-16
CN260	Pre-Treatment Bldg - Install Underslab Process Piping	20d	11-Mar-16	07-Apr-16
CN320	Pre-Treatment Bldg - Install Underslab Conduit	5d	04-Apr-16	08-Apr-16
CN340	Pre-Treatment Bldg - Install Underslab Drains	3d	05-Apr-16	07-Apr-16
Structural		136d	11-Apr-16	21-Oct-16
CN360	Pre-Treatment Bldg - Prepare Subgrade	2d	11-Apr-16	12-Apr-16
CN730	Pre-Treatment Bldg - Form/Rebar/Pour/Strip/ - Slab	10d	12-Jul-16	25-Jul-16
CN780	Pre-Treatment Bldg - Form/Rebar/Pour/Strip/ - Vessel Pedestals	10d	26-Jul-16	08-Aug-16
CN1120	Pre-Treatment Bldg - Erect Building Structural Steel	7d	23-Sep-16	03-Oct-16
CN1160	Pre-Treatment Bldg - Install Building Roof	5d	04-Oct-16	11-Oct-16
CN1200	Pre-Treatment Bldg - Install Building Walls	3d	12-Oct-16	14-Oct-16
CN1260	Pre-Treatment Bldg - Install Pipe Supports	5d	17-Oct-16	21-Oct-16
Mechanical and Equipment		49d	02-Sep-16	14-Nov-16
CN960	Pre-Treatment Bldg - Install Media Filters	5d	02-Sep-16	09-Sep-16
CN1240	Pre-Treatment Bldg - Install Blowers	5d	17-Oct-16	21-Oct-16
CN1290	Pre-Treatment Bldg - Install Process Piping	18d	19-Oct-16	14-Nov-16
CN1340	Pre-Treatment Bldg - Install Air Piping	10d	31-Oct-16	14-Nov-16
Electrical and I&C		83d	17-Oct-16	16-Feb-17
CN1250	Pre-Treatment Bldg - Install Conduit	20d	17-Oct-16	14-Nov-16
CN1380	Pre-Treatment Bldg - Install Controls Panels	5d	07-Nov-16	14-Nov-16
CN1940	Pre-Treatment Bldg - Install Instrumentation	10d	01-Feb-17	14-Feb-17
CN2000	Pre-Treatment Bldg - Pull and Term Wire	10d	03-Feb-17	16-Feb-17
Finishes		73d	15-Nov-16	03-Mar-17
CN1430	Pre-Treatment Bldg - Apply Coatings	10d	15-Nov-16	30-Nov-16
CN1440	Pre-Treatment Bldg - Install Misc Metals	5d	15-Nov-16	21-Nov-16
CN2140	Pre-Treatment Bldg - Install Signage and Safety Equipment	10d	17-Feb-17	03-Mar-17
Administration Building		269d	11-Apr-16	05-May-17
Underslab Utilities		19d	11-Apr-16	05-May-16
CN380	Admin Bldg - Install Underslab Electrical	10d	11-Apr-16	22-Apr-16
CN460	Admin Bldg - Install Underslab Piping/Plumbing	10d	22-Apr-16	05-May-16
Structural		132d	06-May-16	14-Nov-16
CN510	Admin Bldg - Prepare Subgrade	5d	06-May-16	12-May-16
CN820	Admin Bldg - Form/Rebar/Pour/Strip/ - Footings	5d	09-Aug-16	15-Aug-16
CN850	Admin Bldg - Form/Rebar/Pour/Strip/ - Slab	10d	16-Aug-16	29-Aug-16
CN940	Admin Bldg - Erect Metal Structure	10d	30-Aug-16	13-Sep-16
CN1050	Admin Bldg - Construct Roofing with Sky Lights	7d	14-Sep-16	22-Sep-16
CN1130	Admin Bldg - Install Exterior Walls	5d	23-Sep-16	29-Sep-16
CN1150	Admin Bldg - Construct Interior Walls Metal Framing	10d	30-Sep-16	14-Oct-16
CN1270	Admin Bldg - Roughin Electrical and Plumbing	20d	17-Oct-16	14-Nov-16
HVAC and Plumbing		55d	24-Oct-16	13-Jan-17
CN1320	Admin Bldg - Install HVAC	20d	24-Oct-16	21-Nov-16

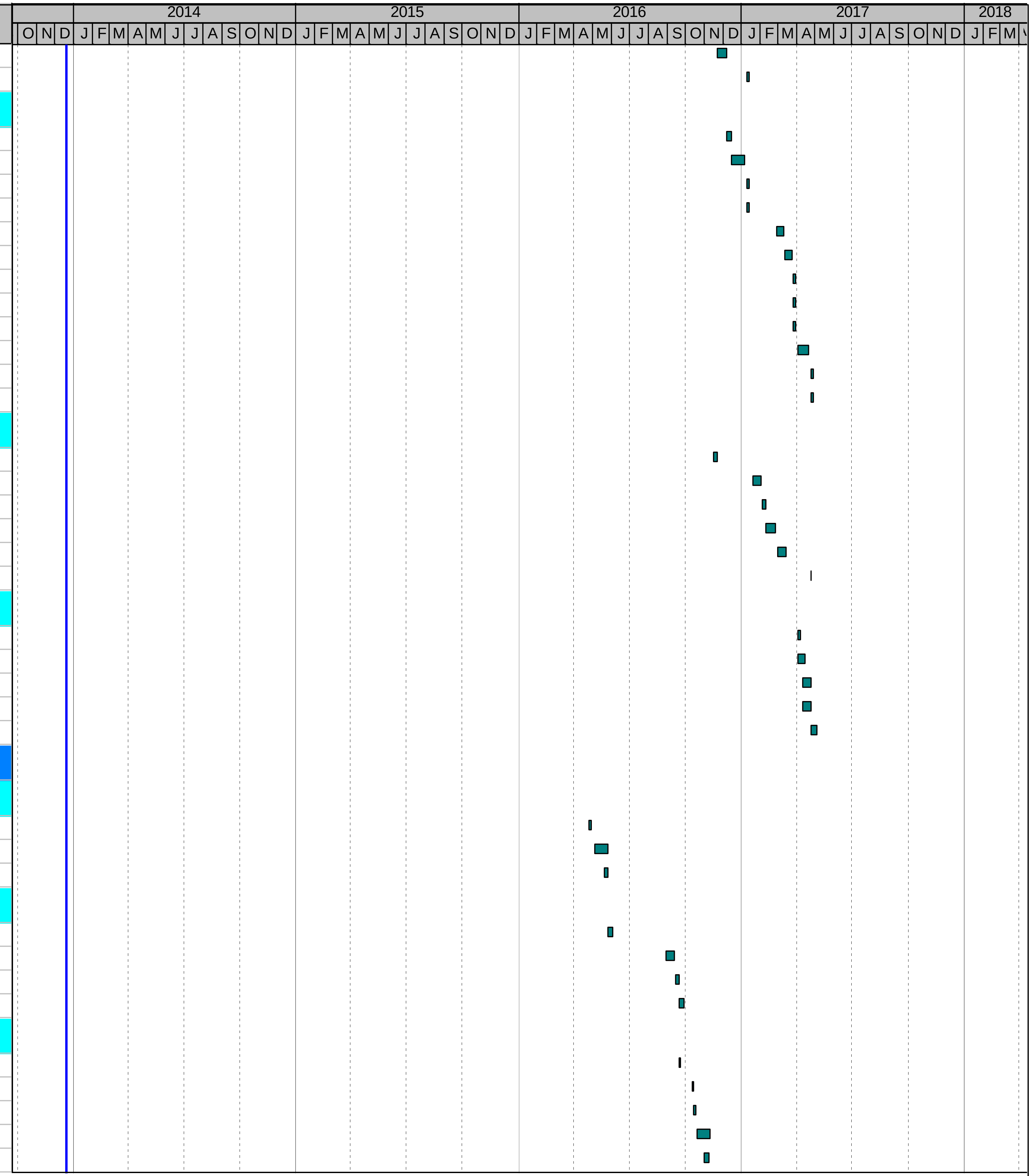
Forcasted Work
Critical Forcast Work
Milestone

MPWSP DESALINATION INFRASTRUCTURE PROJECT

Proposed Schedule

CDM Smith

Activity ID	Activity Name	Duration	Start	Finish
CN1530	Admin Bldg - Install Fire Protection System	10d	22-Nov-16	07-Dec-16
CN1760	Admin Bldg - Install Plumbing Fixtures	5d	09-Jan-17	13-Jan-17
Architectural		98d	08-Dec-16	28-Apr-17
CN1600	Admin Bldg - Install Wall Insulation	5d	08-Dec-16	14-Dec-16
CN1650	Admin Bldg - Install Drywall/Tape	15d	15-Dec-16	06-Jan-17
CN1770	Admin Bldg - Install Tile in Bathroom Floor/Shower	5d	09-Jan-17	13-Jan-17
CN1780	Admin Bldg - Install Interior Doors and Windows	5d	09-Jan-17	13-Jan-17
CN2230	Admin Bldg - Install Ceiling	10d	27-Feb-17	10-Mar-17
CN2280	Admin Bldg - Painting	10d	13-Mar-17	24-Mar-17
CN2340	Admin Bldg - Install Bathroom Locker Room Materials	5d	27-Mar-17	31-Mar-17
CN2350	Admin Bldg - Install Lab Cabinets/Sinks	5d	27-Mar-17	31-Mar-17
CN2360	Admin Bldg - Install Control Room Counter	5d	27-Mar-17	31-Mar-17
CN2380	Admin Bldg - Install Flooring	15d	03-Apr-17	21-Apr-17
CN2480	Admin Bldg - Supply Rooms Furniture	5d	24-Apr-17	28-Apr-17
CN2490	Admin Bldg - Install Window Treatments	5d	24-Apr-17	28-Apr-17
Electrical and Communications		110d	15-Nov-16	25-Apr-17
CN1460	Admin Bldg - Install Grounding	5d	15-Nov-16	21-Nov-16
CN1870	Admin Bldg - Install Communications	10d	20-Jan-17	02-Feb-17
CN2020	Admin Bldg - Install Security Systems	5d	03-Feb-17	09-Feb-17
CN2110	Admin Bldg - Install Lighting	10d	10-Feb-17	24-Feb-17
CN2240	Admin Bldg - Pull and Terminate	10d	01-Mar-17	14-Mar-17
CN2500	Admin Bldg -Set SCADA /TELECOM Tracy/Racks in Utility Room	2d	24-Apr-17	25-Apr-17
Building Finishes		25d	03-Apr-17	05-May-17
CN2370	Admin Bldg - Install Safety Equipment	5d	03-Apr-17	07-Apr-17
CN2390	Admin Bldg - Install Lab Equipment/ Instruments	10d	03-Apr-17	14-Apr-17
CN2410	Admin Bldg - Install Building Exterior Finishes	10d	12-Apr-17	25-Apr-17
CN2420	Admin Bldg - Install Electrical Finishes	10d	12-Apr-17	25-Apr-17
CN2470	Admin Bldg - Construct Bathroom Finishes	10d	24-Apr-17	05-May-17
Cartridge Filters and Pump Stations		208d	25-Apr-16	23-Feb-17
Underslab Utilities		24d	25-Apr-16	26-May-16
CN470	Pump Station/ Cart. Filt - Install Underslab Conduit	5d	25-Apr-16	29-Apr-16
CN500	Pump Station/ Cart. Filt - Install Underslab Process Piping	15d	06-May-16	26-May-16
CN540	Pump Station/ Cart. Filt - Install Underslab Drains	5d	20-May-16	26-May-16
Structural		85d	27-May-16	27-Sep-16
CN560	Pump Station/ Cart. Filt - Prepare Subgrade	5d	27-May-16	03-Jun-16
CN930	Pump Station/ Cart. Filt - Form/Rebar/Pour/Strip/ - Slab	10d	30-Aug-16	13-Sep-16
CN1040	Pump Station/ Cart. Filt - Form/Rebar/Pour/Strip/ - Equipment Pads	5d	14-Sep-16	20-Sep-16
CN1080	Pump Station/ Cart. Filt - Install Pipe Supports	5d	21-Sep-16	27-Sep-16
Mechanical and Equipment		35d	21-Sep-16	09-Nov-16
CN1090	Pump Station/ Cart. Filt - Install Backwash Supply Pumps	2d	21-Sep-16	22-Sep-16
CN1190	Pump Station/ Cart. Filt - Install Filtered Water Pumps	3d	11-Oct-16	13-Oct-16
CN1230	Pump Station/ Cart. Filt - Install Finish Water Pumps	2d	14-Oct-16	17-Oct-16
CN1300	Pump Station/ Cart. Filt - Install Process Piping and Headers	15d	20-Oct-16	09-Nov-16
CN1360	Pump Station/ Cart. Filt - Install Cartridge Filters	5d	01-Nov-16	07-Nov-16



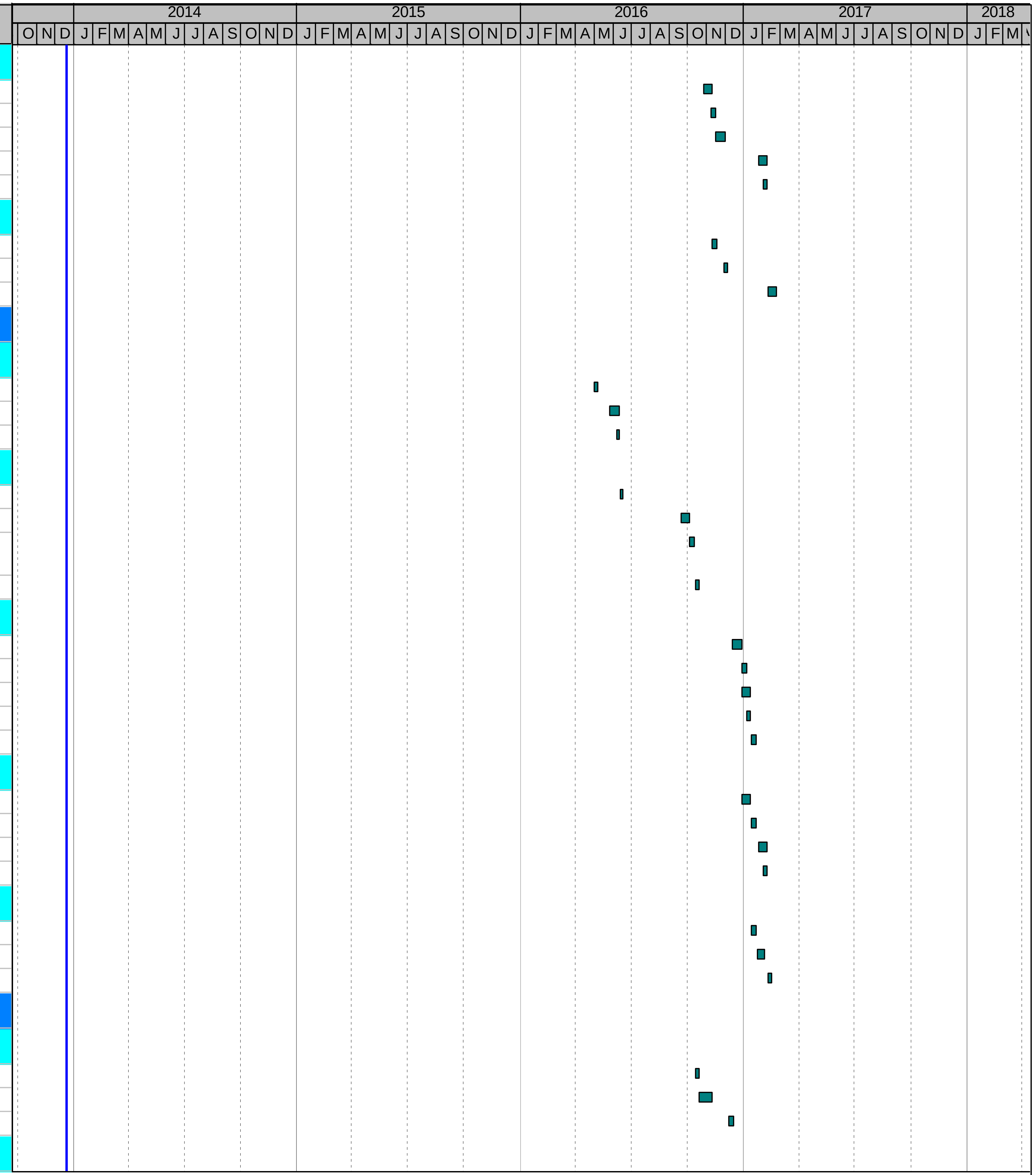
Forcasted Work
Critical Forcast Work
Milestone

MPWSP DESALINATION INFRASTRUCTURE PROJECT

Proposed Schedule

CDM Smith

Activity ID	Activity Name	Duration	Start	Finish
Electrical and I&C		68d	28-Oct-16	08-Feb-17
CN1330	Pump Station/ Cart. Filt - Install Conduit	10d	28-Oct-16	10-Nov-16
CN1400	Pump Station/ Cart. Filt - Install Controls Panels	5d	08-Nov-16	15-Nov-16
CN1470	Pump Station/ Cart. Filt - Install MCC's	10d	16-Nov-16	01-Dec-16
CN1900	Pump Station/ Cart. Filt - Pull and Term Wire	10d	26-Jan-17	08-Feb-17
CN1950	Pump Station/ Cart. Filt - Install Instrumentation	5d	01-Feb-17	07-Feb-17
Finishes		69d	10-Nov-16	23-Feb-17
CN1410	Pump Station/ Cart. Filt - Apply Coatings	5d	10-Nov-16	17-Nov-16
CN1540	Pump Station/ Cart. Filt - Install Misc Metals	5d	29-Nov-16	05-Dec-16
CN2070	Pump Station/ Cart. Filt - Install Signage and Safety Equipment	10d	09-Feb-17	23-Feb-17
Post Treatment		198d	02-May-16	15-Feb-17
Underslab Utilities		29d	02-May-16	10-Jun-16
CN490	Post Treatment - Install Underslab Conduit	5d	02-May-16	06-May-16
CN580	Post Treatment - Install Underslab Process Piping	10d	27-May-16	10-Jun-16
CN620	Post Treatment - Install Underslab Drains	3d	08-Jun-16	10-Jun-16
Structural		90d	13-Jun-16	19-Oct-16
CN650	Post Treatment - Prepare Subgrade	5d	13-Jun-16	17-Jun-16
CN1100	Post Treatment - Form/Rebar/Pour/Strip/ - Slab	10d	21-Sep-16	04-Oct-16
CN1170	Post Treatment - Form/Rebar/Pour/Strip/ - CO2 Slab and Equipment Pads	5d	05-Oct-16	12-Oct-16
CN1220	Post Treatment - Install Pipe Supports	5d	13-Oct-16	19-Oct-16
Mechanical and Equipment		25d	14-Dec-16	20-Jan-17
CN1620	Post Treatment - Install Equipment	10d	14-Dec-16	28-Dec-16
CN1690	Post Treatment - Install CO2 Tank and Accessories	5d	29-Dec-16	05-Jan-17
CN1700	Post Treatment - Install Process Piping and Headers (calcite)	10d	29-Dec-16	12-Jan-17
CN1740	Post Treatment - Install CO2 Pumps	5d	06-Jan-17	12-Jan-17
CN1830	Post Treatment - Install Process Piping and Headers (CO2)	5d	13-Jan-17	20-Jan-17
Electrical and I&C		28d	29-Dec-16	08-Feb-17
CN1710	Post Treatment - Install Conduit	10d	29-Dec-16	12-Jan-17
CN1810	Post Treatment - Install Controls Panels	5d	13-Jan-17	20-Jan-17
CN1910	Post Treatment - Pull and Term Wire	10d	26-Jan-17	08-Feb-17
CN1980	Post Treatment - Install Instrumentation	5d	01-Feb-17	07-Feb-17
Finishes		23d	13-Jan-17	15-Feb-17
CN1820	Post Treatment - Install Misc Metals	5d	13-Jan-17	20-Jan-17
CN1880	Post Treatment - Apply Coatings	10d	23-Jan-17	03-Feb-17
CN2080	Post Treatment - Install Signage and Safety Equipment	5d	09-Feb-17	15-Feb-17
Filtered Water Storage Tanks		77d	13-Oct-16	06-Feb-17
Structural		42d	13-Oct-16	14-Dec-16
CN1210	Filtered Water Tanks - Prepare Subgrade	5d	13-Oct-16	19-Oct-16
CN1310	Filtered Water Tanks - Form/Rebar/Pour/Strip/ - Foundations	15d	20-Oct-16	09-Nov-16
CN1580	Filtered Water Tanks - Install Pipe Supports	5d	08-Dec-16	14-Dec-16
Storage Tanks		30d	31-Oct-16	14-Dec-16



Forcasted Work
Critical Forcast Work
Milestone

MPWSP DESALINATION INFRASTRUCTURE PROJECT

Proposed Schedule

Activity ID	Activity Name	Duration	Start	Finish
CN1350	Filtered Water Tanks - Install Tank #1 Floor	5d	31-Oct-16	04-Nov-16
CN1390	Filtered Water Tanks - Erect Tank #1 Walls	5d	07-Nov-16	14-Nov-16
CN1450	Filtered Water Tanks - Erect Tank #1 Roof and Supports	5d	15-Nov-16	21-Nov-16
CN1510	Filtered Water Tanks - Install Tank #2 Floor	5d	22-Nov-16	30-Nov-16
CN1550	Filtered Water Tanks - Erect Tank #2 Walls	5d	01-Dec-16	07-Dec-16
CN1590	Filtered Water Tanks - Erect Tank #2 Roof and Ladder/Platform	5d	08-Dec-16	14-Dec-16
Mechanical		25d	22-Nov-16	29-Dec-16
CN1520	Filtered Water Tanks - Tank #1 Hydrostatic Test	5d	22-Nov-16	30-Nov-16
CN1630	Filtered Water Tanks - Install Tank Piping	10d	15-Dec-16	29-Dec-16
CN1640	Filtered Water Tanks - Tank #2 Hydrostatic Test	5d	15-Dec-16	21-Dec-16
Electrical and I&C		23d	30-Dec-16	02-Feb-17
CN1720	Filtered Water Tanks - Install Conduit	3d	30-Dec-16	04-Jan-17
CN1930	Filtered Water Tanks - Install Instrumentation	2d	30-Jan-17	31-Jan-17
CN1960	Filtered Water Tanks - Pull and Term Wire	2d	01-Feb-17	02-Feb-17
Finishes		25d	30-Dec-16	06-Feb-17
CN1730	Filtered Water Tanks - Apply Coatings	3d	30-Dec-16	04-Jan-17
CN2010	Filtered Water Tanks - Install Signage and Safety Equipment	2d	03-Feb-17	06-Feb-17
Treated Water Tanks		85d	10-Nov-16	17-Mar-17
Structural		65d	10-Nov-16	16-Feb-17
CN1420	Treated Water Tanks - Prepare Subgrade	5d	10-Nov-16	17-Nov-16
CN1500	Treated Water Tanks - Form/Rebar/Pour/Strip/ - Foundations	20d	18-Nov-16	19-Dec-16
CN2090	Treated Water Tanks - Install Pipe Supports	5d	10-Feb-17	16-Feb-17
Storage Tanks		40d	20-Dec-16	16-Feb-17
CN1670	Treated Water Tanks - Install Tank #1 Floor	5d	20-Dec-16	27-Dec-16
CN1680	Treated Water Tanks - Erect Tank #1 Walls	10d	28-Dec-16	11-Jan-17
CN1800	Treated Water Tanks - Erect Tank #1 Roof and Supports	5d	12-Jan-17	19-Jan-17
CN1850	Treated Water Tanks - Install Tank #2 Floor	5d	20-Jan-17	26-Jan-17
CN1920	Treated Water Tanks - Erect Tank #2 Walls	10d	27-Jan-17	09-Feb-17
CN2100	Treated Water Tanks - Erect Tank #2 Roof and Ladder/Platform	5d	10-Feb-17	16-Feb-17
Mechanical		25d	20-Jan-17	24-Feb-17
CN1860	Treated Water Tanks - Tank #1 Hydrostatic Test	5d	20-Jan-17	26-Jan-17
CN2150	Treated Water Tanks - Install Tank Piping	5d	17-Feb-17	24-Feb-17
CN2160	Treated Water Tanks - Tank #2 Hydrostatic Test	5d	17-Feb-17	24-Feb-17
Electrical and I&C		15d	17-Feb-17	10-Mar-17
CN2170	Treated Water Tanks - Install Instrumentation	5d	17-Feb-17	24-Feb-17
CN2210	Treated Water Tanks - Install Conduit	5d	27-Feb-17	03-Mar-17
CN2250	Treated Water Tanks - Pull and Term Wire	5d	06-Mar-17	10-Mar-17
Finishes		15d	27-Feb-17	17-Mar-17
CN2220	Treated Water Tanks - Apply Coatings	5d	27-Feb-17	03-Mar-17
CN2270	Treated Water Tanks - Install Signage and Safety Equipment	5d	13-Mar-17	17-Mar-17
Backwash Reclamation System		184d	26-May-16	22-Feb-17
Site Civil		44d	26-May-16	28-Jul-16

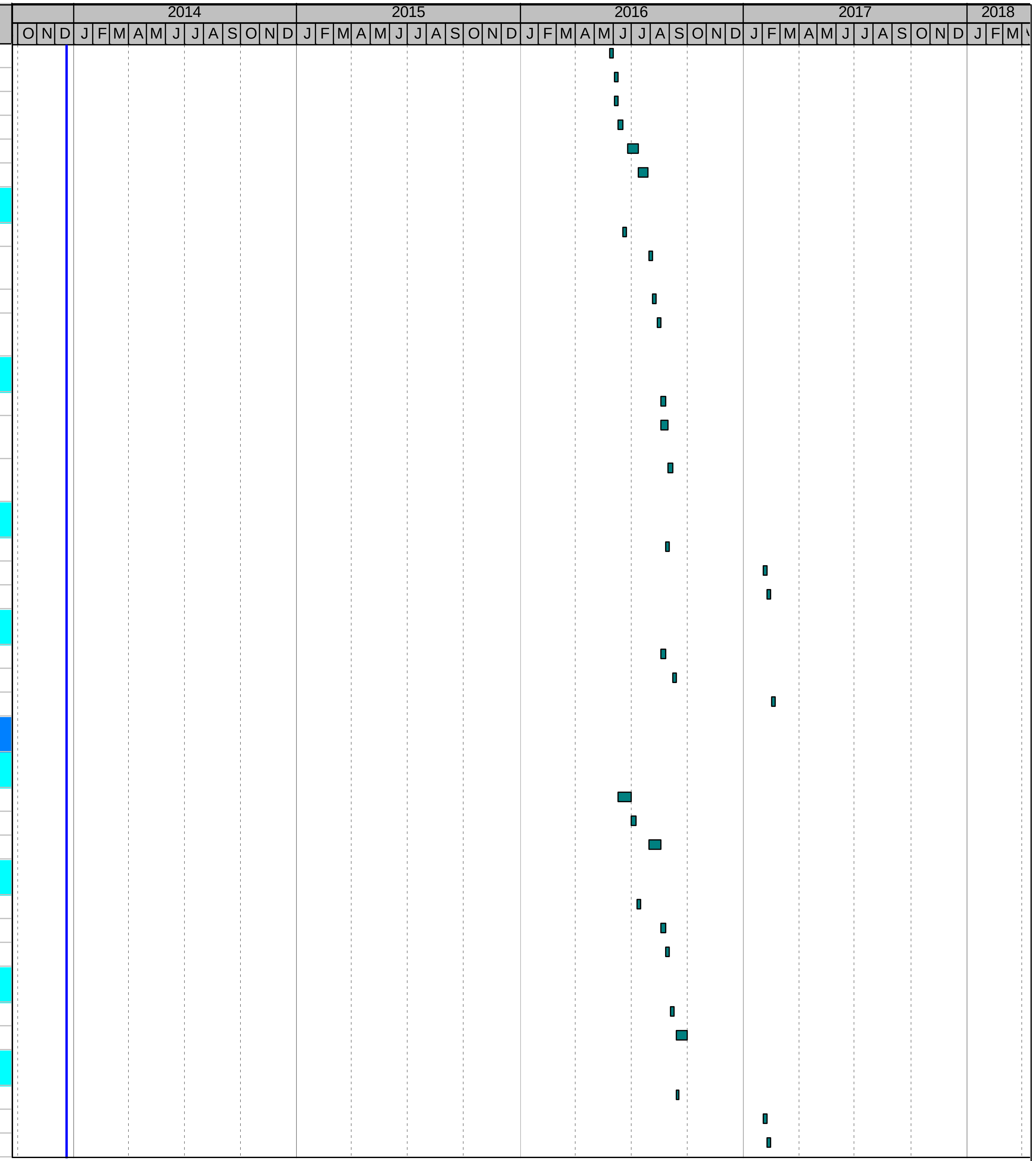
Forcasted Work
Critical Forcast Work
Milestone

MPWSP DESALINATION INFRASTRUCTURE PROJECT

Proposed Schedule

CDM Smith

Activity ID	Activity Name	Duration	Start	Finish
CN570	Backwash/Reclaim System - Construct Basin #1 Berms	5d	26-May-16	02-Jun-16
CN600	Backwash/Reclaim System - Construct Basin #2 Berms	5d	03-Jun-16	09-Jun-16
CN610	Backwash/Reclaim System - Prepare Subgrade Basin #1	5d	03-Jun-16	09-Jun-16
CN640	Backwash/Reclaim System - Prepare Subgrade Basin #2	5d	10-Jun-16	16-Jun-16
CN680	Backwash/Reclaim System - Install Basin #1 Liner	12d	24-Jun-16	12-Jul-16
CN760	Backwash/Reclaim System - Install Basin #2 Liner	12d	13-Jul-16	28-Jul-16
Structural		44d	17-Jun-16	18-Aug-16
CN670	Backwash/Reclaim System - Form/Rebar/Pour/Strip/ - Pond Sump	5d	17-Jun-16	23-Jun-16
CN790	Backwash/Reclaim System - Form/Rebar/Pour/Strip/ - Pump Station Sump Base	5d	29-Jul-16	04-Aug-16
CN810	Backwash/Reclaim System - Install Sump Walls and Cover	5d	05-Aug-16	11-Aug-16
CN840	Backwash/Reclaim System - Form/Rebar/Pour/Strip/ - Equipment Pad	5d	12-Aug-16	18-Aug-16
Mechanical and Equipment		12d	19-Aug-16	06-Sep-16
CN860	Backwash/Reclaim System - Install Backwash Reclamation Pumps	5d	19-Aug-16	25-Aug-16
CN880	Backwash/Reclaim System - Install HDPE RCW Lines (Concrete Incase)	7d	19-Aug-16	29-Aug-16
CN950	Backwash/Reclaim System - Install Process Piping and Header (exposed)	5d	30-Aug-16	06-Sep-16
Electrical and I&C		115d	26-Aug-16	14-Feb-17
CN910	Backwash/Reclaim System - Install Conduit	5d	26-Aug-16	01-Sep-16
CN1970	Backwash/Reclaim System - Install Instrumentation	5d	01-Feb-17	07-Feb-17
CN2050	Backwash/Reclaim System - Pull and Term Wire	5d	08-Feb-17	14-Feb-17
Finishes		125d	19-Aug-16	22-Feb-17
CN870	Backwash/Reclaim System - Install Misc Metals	5d	19-Aug-16	25-Aug-16
CN1010	Backwash/Reclaim System - Apply Coatings	5d	07-Sep-16	13-Sep-16
CN2120	Backwash/Reclaim System - Install Signage and Safety Equipment	5d	15-Feb-17	22-Feb-17
Brine Discharge System		174d	10-Jun-16	22-Feb-17
Site Civil		49d	10-Jun-16	18-Aug-16
CN660	Brine Discharge System - Construct Basin Berms	15d	10-Jun-16	30-Jun-16
CN720	Brine Discharge System - Prepare Subgrade	5d	01-Jul-16	08-Jul-16
CN800	Brine Discharge System - Install Basin Liner (with Trench)	15d	29-Jul-16	18-Aug-16
Structural		39d	11-Jul-16	01-Sep-16
CN740	Brine Discharge System - Form/Rebar/Pour/Strip/ - Pond Sump	5d	11-Jul-16	15-Jul-16
CN890	Brine Discharge System - Install HDPE RCW Lines (Concrete Incase)	5d	19-Aug-16	25-Aug-16
CN920	Brine Discharge System - Form/Rebar/Pour/Strip/ - Equipment Pad	5d	26-Aug-16	01-Sep-16
Mechanical and Equipment		20d	02-Sep-16	30-Sep-16
CN1000	Brine Discharge System - Install Brine Eq Pumps	5d	02-Sep-16	09-Sep-16
CN1020	Brine Discharge System - Install Process Piping and Header/Aeration	15d	12-Sep-16	30-Sep-16
Electrical and I&C		105d	12-Sep-16	14-Feb-17
CN1030	Brine Discharge System - Install Conduit	5d	12-Sep-16	16-Sep-16
CN1990	Brine Discharge System - Install Instrumentation	5d	01-Feb-17	07-Feb-17
CN2060	Brine Discharge System - Pull and Term Wire	5d	08-Feb-17	14-Feb-17

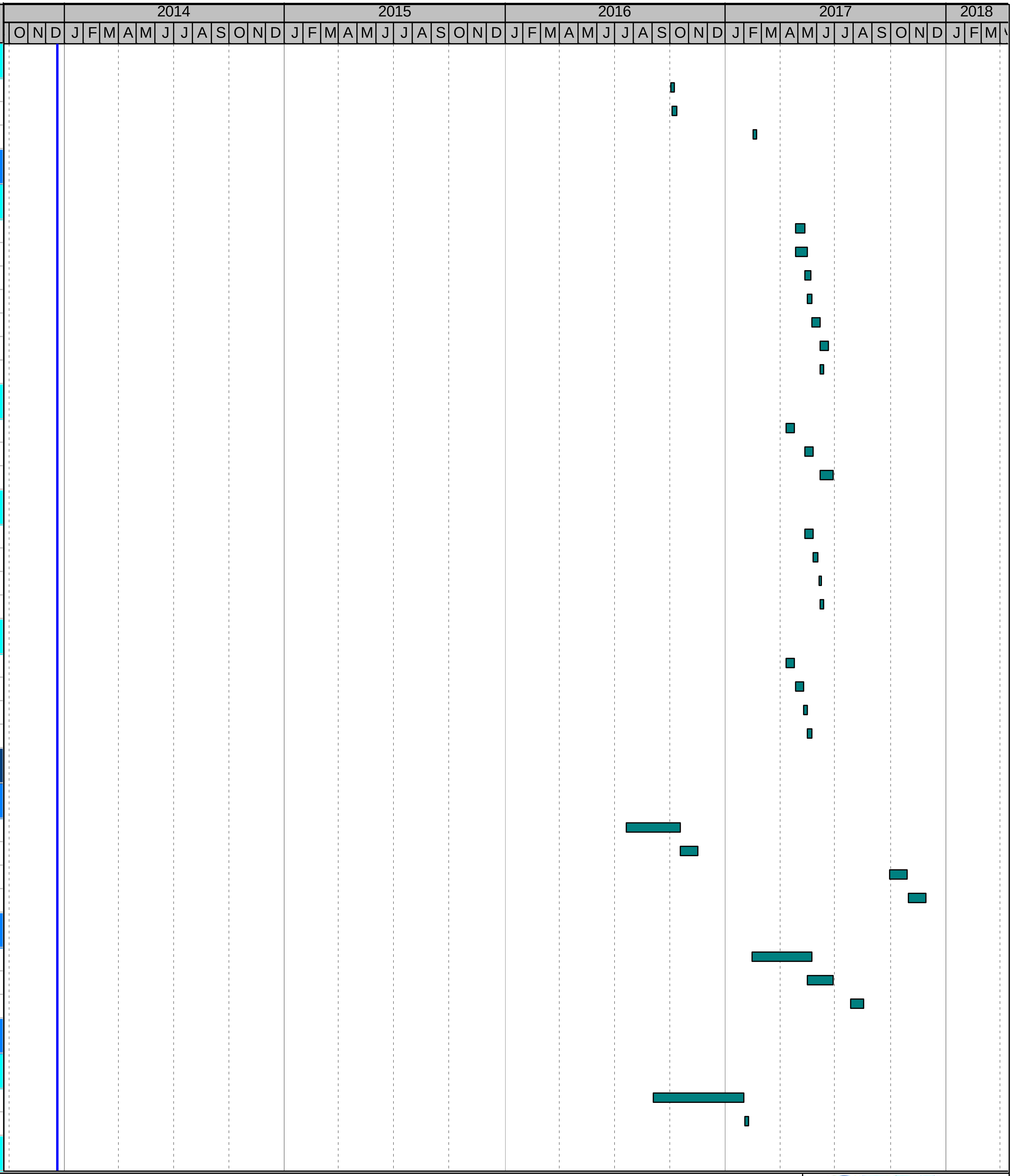


Forcasted Work
Critical Forcast Work
Milestone

MPWSP DESALINATION INFRASTRUCTURE PROJECT

Proposed Schedule

Activity ID	Activity Name	Duration	Start	Finish
Finishes		95d	03-Oct-16	22-Feb-17
CN1070	Brine Discharge System - Apply Coatings	5d	03-Oct-16	07-Oct-16
CN1110	Brine Discharge System - Install Misc Metals	5d	04-Oct-16	11-Oct-16
CN2130	Brine Discharge System - Install Signage and Safety Equipment	5d	15-Feb-17	22-Feb-17
Site Improvements		54d	12-Apr-17	27-Jun-17
Paving/Fencing		39d	26-Apr-17	20-Jun-17
CN2510	Sitework - Construct Concrete Walkways	12d	26-Apr-17	11-May-17
CN2520	Sitework - Install Perimeter Fence	15d	26-Apr-17	16-May-17
CN2550	Sitework - Construct Curbing	7d	12-May-17	22-May-17
CN2580	Sitework - Install Gates	5d	17-May-17	23-May-17
CN2600	Sitework - Pave Road and Parking Lot	10d	23-May-17	06-Jun-17
CN2630	Sitework - Construct Gravel Roads/Access Ways	10d	07-Jun-17	20-Jun-17
CN2650	Sitework - Place Striping	5d	07-Jun-17	13-Jun-17
Landscaping		54d	12-Apr-17	27-Jun-17
CN2430	Sitework - Finish Grade Site	10d	12-Apr-17	25-Apr-17
CN2560	Sitework - Install Irrigation System	10d	12-May-17	25-May-17
CN2640	Sitework - Install Site Landscaping	15d	07-Jun-17	27-Jun-17
Garden / Trellis		22d	12-May-17	13-Jun-17
CN2570	Sitework - Construct Trellis	10d	12-May-17	25-May-17
CN2610	Sitework - Install Garden Walkways	5d	26-May-17	02-Jun-17
CN2620	Sitework - Install Trellis Landscaping	5d	05-Jun-17	09-Jun-17
CN2660	Sitework - Install Garden / Trellis Finishes/Artwork	5d	07-Jun-17	13-Jun-17
Site Lighting/Safety		30d	12-Apr-17	23-May-17
CN2440	Sitework - Install Site Lighting	10d	12-Apr-17	25-Apr-17
CN2530	Sitework - Install Bollards	10d	26-Apr-17	09-May-17
CN2540	Sitework - Install Site Signage	5d	10-May-17	16-May-17
CN2590	Sitework - Install Site Security and Controls to Gate	5d	17-May-17	23-May-17
Startup & Commissioning		422d	19-Jul-16	29-Mar-18
Operation and Maintenance Manual		497d	19-Jul-16	28-Nov-17
SC100	Develop and Submit Draft O&M Manauls	90d	19-Jul-16	17-Oct-16
SC120	Review and Approve Draft O&M Manauls	30d	17-Oct-16	16-Nov-16
SC550	Develop and Submit Final O&M Manauls	30d	30-Sep-17	29-Oct-17
SC580	Review and Approve Final O&M Manauls	30d	30-Oct-17	28-Nov-17
Training		130d	14-Feb-17	17-Aug-17
SC180	Vendor/Equipment Training	70d	14-Feb-17	23-May-17
SC430	Standard Operator Training	30d	17-May-17	28-Jun-17
SC330	Instrumentation and Control System Training	15d	28-Jul-17	17-Aug-17
Instrumentation and Controls		289d	02-Sep-16	30-Oct-17
Factory Acceptance Test (FAT)		105d	02-Sep-16	07-Feb-17
SC110	Prepare for Factory Demonstration Test (FAT)	100d	02-Sep-16	31-Jan-17
SC160	Conduct Factory Acceptance Test (FAT)	5d	01-Feb-17	07-Feb-17
Operational Ready Test (ORT)		67d	24-Apr-17	27-Jul-17



Forcasted Work
Critical Forcast Work
Milestone

MPWSP DESALINATION INFRASTRUCTURE PROJECT

Proposed Schedule

CDM Smith

Activity ID	Activity Name	Duration	Start	Finish
SC310	Install Control Room Computers/Equipment	5d	24-Apr-17	28-Apr-17
SC320	Install Communication Backbone	10d	26-Apr-17	09-May-17
SC340	Connect Computer and SCADA/TELECOM Equipment	5d	10-May-17	16-May-17
SC300	Prepare for Operational Readiness Test (ORT)	20d	21-Jun-17	19-Jul-17
SC380	Conduct Operational Readiness Test (ORT)	5d	20-Jul-17	26-Jul-17
SC400	Submit Operational Readiness Test (ORT) Report	1d	27-Jul-17	27-Jul-17
Functional Demonstration Test (FDT)		6d	28-Jul-17	04-Aug-17
SC420	Conduct Functional Demonstration Test (FDT)	5d	28-Jul-17	03-Aug-17
SC450	Submit Functional Demonstration Test (FDT) Report	1d	04-Aug-17	04-Aug-17
Site Acceptance Test (SAT)		20d	30-Sep-17	30-Oct-17
SC540	Conduct Site Acceptance Test (SAT)	30d	30-Sep-17	29-Oct-17
SC590	Substantial Completion - Instrumentation and Control System	1d	30-Oct-17	30-Oct-17
Plant Process		300d	18-Jan-17	29-Mar-18
Equipment Checkout/Testing		128d	18-Jan-17	19-Jul-17
SC130	Equipment Test - Switch Gear and MCC's	5d	18-Jan-17	24-Jan-17
SC140	PLC/Panel/Loops and Equipment Test - Media Pressure Filter	6d	25-Jan-17	01-Feb-17
SC150	PLC/Panel/Loops and Equipment Test - VFD's	6d	25-Jan-17	01-Feb-17
SC170	PLC/Panel/Loops and Equipment Test - Backwash Supply Pumps	3d	02-Feb-17	06-Feb-17
SC190	PLC/Panel/Loops and Equipment Test - Reclaimed Wash Water Pumps	3d	08-Feb-17	10-Feb-17
SC200	PLC/Panel/Loops and Equipment Test - Filtered Feedwater Pumps	3d	13-Feb-17	15-Feb-17
SC210	PLC/Panel/Loops and Equipment Test - Cartridge Filters	4d	16-Feb-17	22-Feb-17
SC220	PLC/Panel/Loops and Equipment Test - RO Feed Pumps	3d	23-Feb-17	27-Feb-17
SC230	PLC/Panel/Loops and Equipment Test - Post Treatment System	6d	23-Feb-17	02-Mar-17
SC240	PLC/Panel/Loops and Equipment Test - RO Equipment	20d	28-Feb-17	27-Mar-17
SC250	PLC/Panel/Loops and Equipment Test - Finished Water Pumps	4d	03-Mar-17	08-Mar-17
SC260	PLC/Panel/Loops and Equipment Test - RO Concentrate Pumps	4d	28-Mar-17	31-Mar-17
SC270	PLC/Panel/Loops and Equipment Test - UV System	4d	03-Apr-17	06-Apr-17
SC280	PLC/Panel/Loops and Equipment Test - Chemical Metering Pumps	6d	07-Apr-17	14-Apr-17
SC290	PLC/Panel/Loops and Equipment Test - NaOCL Generation System	6d	17-Apr-17	24-Apr-17
SC350	Equipment Test - Standby Generator	4d	14-Jul-17	19-Jul-17
Systems Testing/Start-Up		27d	14-Jul-17	22-Aug-17
SC460	System Test - Brine Disposal Facility	3d	14-Jul-17	18-Jul-17
SC360	System Test - Pretreatment Facility	3d	19-Jul-17	21-Jul-17
SC470	Final Pipe Flush	10d	21-Jul-17	03-Aug-17
SC370	System Test - Filtered Feed Water Facility	3d	24-Jul-17	26-Jul-17
SC390	System Test - RO Facility	3d	27-Jul-17	31-Jul-17
SC410	System Test - Chemical Facility	3d	01-Aug-17	03-Aug-17
SC440	System Test - Post Treatment Facility	3d	04-Aug-17	08-Aug-17
SC480	System Test - Finished Water Facility	3d	09-Aug-17	11-Aug-17
SC500	CAW Deliver Chemicals	5d	17-Aug-17	22-Aug-17
Performance Testing		155d	14-Aug-17	29-Mar-18
SC490	Mechanical Performance Demonstration (MPD) and Bac-t	8d	14-Aug-17	23-Aug-17
SC510	Initial Plant Performance Tests (IPPT)	5d	24-Aug-17	30-Aug-17
SC520	Run-In Plant Performance Tests (RIPPT)	14d	31-Aug-17	13-Sep-17

Forcasted Work
Critical Forcast Work
Milestone

MPWSP DESALINATION INFRASTRUCTURE PROJECT

Proposed Schedule

CDM Smith

Appendix 5

Design-Build Quality Management Plan and Quality Control Requirements

Section 1
Design-Build Quality Management Plan Overview

The purpose of the Monterey Peninsula Water Supply Project is to identify and implement water supplies to serve as alternatives to the utilization of the Carmel River. One of the proposed alternative supplies is sea water desalination as instituted through the Desalination Infrastructure project (Project) sponsored by California America Water (CAW). The desalination plant will be constructed on a currently vacant site consisting of approximately 46 acres. The facility will include the following components:

- pre-treatment filtration process;
- filter backwash supply system;
- filtered feedwater receiving tanks;
- waste washwater storage, clarification, and recycling facilities;
- desalination process;
- post-treatment stabilization process and chemical systems;
- reverse osmosis concentrate equalization discharge, aeration, equalization and pumping facilities;
- desalinated/finished water storage tanks and pumping station;
- electrical systems; buildings to house process and non-process facilities.

The project scope consists of performing the design, permitting, construction, and commissioning and testing of the desalination infrastructure consistent with the requirements of the RFP. The CDM Smith Design-Build Quality Management Plan (Design-Build QMP) defines the processes and procedures required to achieve a successful project throughout all phases of work. In addition, the Plan establishes mechanisms to verify these processes and procedures are being implemented by the project team. These monitoring activities are critical to assure that all elements of the Plan are being incorporated on a consistent basis throughout the project duration.

Defining Characteristics of Project Quality

Project quality is defined as the totality of features, attributes, and characteristics of a facility, product, process, component, service, or workmanship that bear on its ability to satisfy the owner's requirements.

Quality can be characterized as meeting the requirements of:

- The owner as to functional adequacy; completion on time and on budget, life cycle and operation and maintenance costs.

- The design professional as to provision of well defined scope of work; budget to assemble and use qualified staff; budget to obtain field information prior to design; provisions for timely decisions by the owner and design staff; and contract to perform work with adequate time.

- The constructor as to provision of contract plans, specifications, and other documents in sufficient detail for construction; timely decisions on the part of the owner and design professional on issues effecting project delivery; fair and timely interpretation of contract requirements from field supervisors and inspection staff; and contract performance of work on schedule.

- All concerned agencies as to public safety and health; environmental considerations; protection of public property including utilities; and conformance with applicable laws, regulations and codes in the project location.

Quality in the constructed project is also characterized by: complete and open communication among project parties, selection of qualified organizations and personnel by the owner for all phases of the work, implementation of effective change management protocols, and rapid resolution of conflicts and disagreements in the absence of litigation.

Overview of Quality Management at CDM Smith

The comprehensive CDM Smith Quality Management System (QMS) provides the structure required to integrate and coordinate the QA/QC activities for all phases of the Desalination Infrastructure design-build project. Our QMS, implemented on a corporate-wide basis, has been developed consistent with the International Organization for Standardization (ISO 9001) requirements.

The QMS, which addresses CAW's overall program plan, consists of four tiers:

- Tier 1– CDM Smith Quality Manual; The Manual describes the scope of the QMS and presents the processes used within CDM Smith to develop high-quality work products. It includes a detailed description of the quality responsibilities for key personnel.

- Tier 2 – Supplemental Quality Manuals- Specific to the Monterey Peninsula Water Supply Project, the QMP-4 Design-Build Supplement defines the quality processes applicable to the project characteristics unique to design-build delivery including those associated with construction cost estimating updates, transition from design to construction phase, and design team/construction team interactions.

- Tier 3 – Quality Procedures (QPs)- The QPs describe the methods used to implement the processes and policies identified in the Quality Manual. The

QPs establish the specific requirements for a broad range of quality processes from the conductance of the Project Quality Management Workshop kick-off meeting to identify project critical success factors through the use of Technical Review Committees, Lead Practitioners, and Technical Specialist Reviews to the details of both preparing, and performing the independent checking of calculations and modeling output.

- Tier 4 – Records- Requirements for documenting that the requirements of the QMS have been fulfilled.

Design-Build QMP Purpose

The purpose of the Design-Build QMP is to establish the roles and responsibilities for quality management on the Project throughout all phases of the assignment and to document the quality management activities to be implemented by the project team. This Design-Build QMP has been developed using CDM Smith's Quality Management Plan 4- Design-Build Supplement as the central core for establishing the necessary activities. The applicable sections of QMP-4, as well as the pertinent Tier 3-Quality Procedures, have been excerpted and included in this Design-Build QMP, establishing a thorough framework defining all of the QA/QC activities required for the project.

To the extent possible, this Design-Build QMP has been formulated to be a stand-alone, comprehensive document, which is comprised of the quality management information required by the project team to successfully prepare a quality design of the Desalination Infrastructure project, to construct the facilities consistent with the design intent, and to commission and test the plant components providing the positive verification of the delivery of a high-quality facility to CAW.

The attached figure, Organization Chart, depict the members of the project team associated with all phases of the project. Each team member will contribute to the quality of the overall project through the implementation of the required processes and procedures established in the Design-Build QMP. Additional detail on specific roles and responsibilities will be provided in other sections of the plan.

Organization of the Document

The Design-Build QMP is organized into three sections as described below:

- Section 1 – Design –Build Quality Management Plan Overview; presents the purpose and objectives of the Design-Build QMP.

- Section 2 – Design Phase; establishes the procedures and activities associated with implementing the QA/QC requirements associated with the project design;

- Section 3 – Construction Phase; outlines the requirements for implementing the construction quality control measures for the project

Section 2- Design Phase

Overview

The primary objective of the project design phase is to develop a comprehensive set of high-quality plans and specifications to guide the construction of the facilities. The QA/QC activities associated with the design phase of the project are best characterized by the performance of the independent review of all work performed. As described below in more detail, independent review occurs throughout the design process, starting with the independent checking of all calculations to the assembly of a multi-disciplinary technical review committee to review the design packages at the 10%, 30%, and 60% stages of submittal. Constructability and operability reviews by technical experts throughout the design process provide the integration and coordination necessary to develop a set of plans and specifications which results in a cost-effective construction of facilities which meets the design intent and performance requirements.

Project Team Roles and Responsibilities

The primary individuals responsible for the management and implementation of the design phase QA/QC activities are listed below:

- Design Principal – Paul Meyerhofer
- Design-Build QA/QC Manager – Jack Taylor
- Lead Engineer – Michael Zafer
- Process Design Lead- Curtis Kiefer
- Facilities Design Lead – Doug Brown
- Permitting Support Lead – Greg Wetterau

The Project Organization Chart in the previous section depicts the entire team and support services proposed for the design of the Desalination Infrastructure project.

Design-Build QA/QC Manager

The responsibility of the DB QA/QC Manager, Jack Taylor, to oversee the implementation and monitoring of the design quality procedures established in the CDM Smith Quality Management System. Specific tasks include:

- Identifying participants for the technical review committee (TRC) including technical specialists to address constructability and operability issues.
- Documenting the findings from TRC meetings.
- Monitoring that comments from TRC, CAW, and others have been considered, as appropriate implemented into the design and or addressed.

- Verifying that appropriate sign-offs and approvals have been obtained.

- Reporting monthly to the CDM Smith Design-Build Project Manager and Design Principal, any quality concerns. Mr. Meyerhofer will include these concerns in the monthly report to CAW.

- Ensuring that project close-out activities have been accomplished.

- Coordination with the staff responsible for implementing the construction phase of the project.

Technical Review Committee (TRC)

The responsibility of the TRC (Quality Procedure 2.3 Technical Review Committee) is to provide an independent review of all major project deliverables by experienced and technically qualified staff. The design packages to undergo a TRC include those at the 10%, 30%, and 60% stages. A preliminary listing of technical reviewers participating on the TRC is provided below:

- Chairman - Paul Meyerhofer

- DB QA/QC Manager – Jack Taylor

- Desalination Processes– Ken Klinko

- Process Lead Practitioner– Don Thompson

- Pumping Equipment – Ernie Sturtz

- Desalination Processes– Ian Watson

- Pre-treatment and chemical processes – Temple Ballard

Checking

A description of the checking quality management activities as required under the CDM Smith "Quality Procedure 2.2 Independent Checking", is presented below. Individuals identified by the function group leaders (electrical, structural, instrumentation, building mechanical, etc.) to perform both inter- and intra- function checking will be provided to the CDM Smith Design Principal, Paul Meyerhofer.

CAW Reviews

Work products will be submitted to CAW for review following appropriate implementation of quality reviewers and/or TRC recommendations. The CAW project engineer will send the CDM Smith Design Principal a consolidated list of comments in the format of the review comment spreadsheet (see Attachment 1). The CDM Smith Design Principal will assign each comment to the appropriate CDM Smith technical team member. The technical team member will forward all responses to the Design Principal who will send a consolidated list of responses back to CAW's project engineer on the review comment spreadsheet. If any responses are inadequate or there is disagreement, those responses and associated issues will be discussed at the next progress meeting, or at a time established specifically to address the comments for resolution.

Quality Management Activities

Detailed descriptions of the quality control activities required on this assignment are provided in this section. Activities include the development of computations, the checking of drawings, specifications, and calculations, and the implementation of technical reviews. Report and drawing formats are also provided in this section.

Codes and Standards

CDM Smith developed the Basis of Design Report, as required by the RFP (Appendix 2), which identified a range of codes to be applied to the design of the Desalination Infrastructure project. The design shall adhere to the following codes and standards:

Gog Codes and Standards for S and Standards for StructuresGoverning Codes and standand Standards for Structures
California Building Code (CBC) – 2013 (based upon the International Building Code 2012)
ASCE/SEI 7-10 Minimum Design Loads for Buildings and Other Structures, American Society of Civil Engineers
ACI 318-11 Building Code Requirements for Structural Concrete, American Concrete Institute
ACI 350-06 Code Requirements for Environmental Engineering Concrete Structures, American Concrete Institute
ACI 350.3-06 Seismic Design of Liquid-Containing Concrete Structures, American Concrete Institute
CRSI Design Handbook, 2008, 10th Edition, Concrete Reinforcing Steel Institute
AISC 341-10 Seismic Provisions for Structural Steel Buildings, American Institute of Steel Construction
AISC 360-10, Specification for Structural Steel Buildings, American Institute of Steel Construction
AWS D1.1-08 Structural Welding Code – Steel, American Welding Society
AWWA D100-05 Welded Carbon Steel Tanks for Water Storage, American Water Works Association
AWWA D103-09 Factory-Coated Bolted Carbon Steel Tanks for Water Storage, American Water Works Association

Additional Standards for Tank, Equipment and Nonstructural Component Anchorage
ACI 355.2-07 Qualification of Post-Installed Mechanical Anchors in Concrete & Commentary
ACI 355.4-11 Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary
ICC AC308 Post-installed Adhesive Anchors in Concrete Elements—Approved June 2013
ICC AC193 Mechanical Anchors in Concrete Elements—Approved June 2012, Editorially Revised May 2013

Governing Codes and Standards- HVAC
2013 California Mechanical Code based on the 2012 Uniform Mechanical Code of the International Association of Plumbing and Mechanical Officials (IAPMO)
2013 California Energy Code
CALGreen 2010: CBC Title 24, Part II, Mandatory Measures
American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standards 90.1-2010 for Energy Conservation
American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standards 62-2013 for Ventilation of buildings

Governing Codes and Standards- HVAC
NFPA Standard 90A - Installation of Air-Conditioning and Ventilation Systems
UL: Underwriters Laboratories, Inc.
U.S. Green Building Council LEED-NC Reference Guide 2.2
Sheet Metal and Air Conditioning Contractors National Association (SMACNA). Standards
Air Moving and Conditioning Association (AMCA)
National Environmental Balancing Bureau (NEBB)

Governing Codes and Standards- electrical
National Electrical Code (2011 Edition)
International Building Codes (conduit spacing in structural elements – 3 times diameter spacing
California Title 24 Building Codes (2013)
NFPA-1-1 (emergency lighting for occupied spaces)
IES Lighting handbook
California PUC General Orders 95 (overhead work) and 128 (underground work) in public spaces
IEEE 519-1992 (Recommended Practices and Requirements for Harmonid Control in Electrical Power Systems)

Computations

Preparation of Computations

All computations and evaluations must be prepared with sufficient information included to clearly justify resulting decisions as established in "Quality Procedure 3.7 Preparation of Computer Assisted Hand Calculations and Paper Calculations". Calculations and worksheets must also be prepared so that they form a clear record of what was accomplished, how, when, and by whom. The intent is to allow someone not associated with the project to pick up the calculation and be able to ascertain why the calculation was done, what information was used (and its source), what was assumed and why, how the answer was arrived at, and what was concluded.

Computations may be paper or computer assisted. All computations shall conform to the following minimum guidelines for paper-based computations and to the additional guidelines for computer-based calculations provided below. A preliminary list of required calculations should be prepared as one of the initial project steps. Paper calculations must be kept by the CDM Smith Design Principal or design discipline lead, along with all supporting information/backup, in three-ring design notebooks. Subconsultants are responsible for completing and checking their own calculations, and providing copies to CDM Smith when requested.

Minimum Guidelines for Paper-Based Computations

- CDM Smith's standard computation paper should be used for all calculations by CDM Smith staff. Backup data may be on computation paper or standard lined paper, provided that adequate project and individual information data are presented and adequate referencing is made from the calculations. All work shall be printed (not written in script), and at least a 1-inch margin shall be left on the left side of all sheets for binding.

- The entire title block must be filled in, including the name of the preparer and the checker. The page number shall be shown as a fraction (such as 1 of 4), with the latter number designating the total number of pages of calculations.

- The progression of thought behind the work and the rationale used by the preparer shall be delineated. The sheets shall also be neat and legible for ease of use by others.

- Calculations should start by listing the essential factors, such as assumptions, design criteria, available data, etc. Briefly note the source or basis of each factor as appropriate (name of reference, etc.).

- Sketches, details, maps, textbook references, catalog cuts, pump curves, etc., should be included.

- Computations should be as simple as possible and include explanatory notes for clarification. Results shall be underlined or boxed for emphasis.

- A summary sheet as the first page (or pages) of a set of computations shall be provided. Superseded sheets shall be clearly marked as such, referenced to revised sheets, and attached to the back of the revised sheet.

- These calculations shall be submitted to CAW as part of the supporting design documents as specified in the scope of work. Final calculations shall include the proper Professional Engineer's stamp and signature and the signatures of the independent checker.

Computer-Assisted Hand Calculations

Computer-assisted hand calculations (CAHC) include calculations made with the assistance of programmable calculators, spreadsheets, statistical packages, and mathematical computational software.

All common content noted above for paper-based computations must be provided. In addition, the following specific documentation must be made available:

- Copies of all electronic files used in CAHC, either strictly as input data, as output data, or as a combined input/output data set, will be maintained in an electronic medium that cannot be destroyed or edited by ordinary means without detection during the period specified by CDM Smith's document retention policy. Where multiple data sets are needed to fully define a particular calculation (for example, where an output data set exists in a different file from the input data set), all must be identified. A read-only CD or DVD would typically be a good choice for electronic storage purposes.

- Hard copies of electronic files used in CAHC, preserved only to permit ready reference of the original electronic images, will be maintained and identified such that they can be associated with the corresponding electronic sources during the period specified by CDM Smith's document retention policy.

- Specific documentation of the exact version of software environment used, including the name, version number, serial number, manufacturer, and vendor shall be maintained as part of the project files. All electronic and hard copies will include this information, either fully on each copy or by reference to a master reference list, to ensure that the software used to run each specific analysis can be identified.

- Headers and complete reference designation containing the information required on standard calculation paper shall be included on the working versions of electronic files used in CAHC.

- All CAHC output sheets shall be annotated to indicate which data is pertinent. These sheets shall then be sequenced into the overall set of calculations.

- If CAHC involve proprietary or other non-common programs, they shall be validated and validation shall be submitted to CAW.

- As the thought process may not be evident from the electronic file formats, it should be referenced and included on the electronic version or on standard calculation sheets clearly marked to enable association with the electronic and hard copy images noted above.

- Errors arising from CAHC may not be errors of mathematical algorithm or logic, but from structure, references, or logic within the electronic computation environment itself. Checking shall include a review of the electronic image of the computations for logic and consistency with the intended mathematical computation. In the case that spreadsheets are used, this shall include specific checks of all formulas and cell references embedded in the computation areas of the spreadsheet shall be conducted.

- Checking shall also include a review of the formulas and/or design criteria used. These can be shown on a referenced calculation sheet, or printed on the spreadsheet. Particular attention should be paid to "round off" elements, decimals, and "significant digits."

- CAHC shall be submitted to CAW as part of the supporting design documents. Final calculations shall include the proper Professional Engineer's stamp and signature and the signatures of the independent checker.

Construction Drawings

Drawings have been prepared in response to this RFP in general conformance with the CAD drafting quality standards contained below as established in the "Quality Procedure 8.2 Construction Drawing". These quality standards and procedures will apply to the development of the construction drawings as the design advances.

Construction drawings (including text, line work, dimensioning, drawing symbology, sheet layout, and appearance) must conform to CDM Smith graphic standards, as modified to incorporate any CAW requirements. Minimum guidelines to be used when preparing construction drawings are as follows:

- All CDM Smith project construction drawings shall conform to the rules set forth in the *CDM Smith Graphics Production Standards Manual, Volume 1- General*. General and discipline-specific symbologies and line weights are listed in the manual. Any standards required by CAW which differ from those found in Volume 1 shall be documented by the CDM Smith Design Principal and communicated to the design team.

- All CAD drafting shall conform to the requirements set forth in the *CDM Smith Graphics Production Standards Manual, Volume 2- AutoCAD. Any* Standards required by CAW which differ from those found in Volume 2 shall be documented by the CDM Smith Design Principal and communicated to the design team.

- Standard details are set forth in the *CDM Smith Graphic Production Standards Manual, Volumes 4a and 4b* and related projects shall be used. CAW details for civil/utility aspects of the project may be used as requested by CAW and as directed by the CDM Smith Design Principal.

Project-specific construction drawing quality assurance steps include:

- All drawings will be completed in AutoCAD and Bentley Navisworks that can be converted to AutoCad files for submittal to CAW are record drawings at the completion of the project.

- 22 by 34-inch paper size, suitable for reduction to 11 by 17-inches.

- Consistent use of water treatment plant facility terms and abbreviations with those from CAW.

- Plan scales will be identical between design disciplines whenever feasible

- Valves will be numbered per direction from CAW. In general, all valves used in operating procedures will be numbered, including all valves with electric or pneumatic actuators and set points (e.g., pressure relief valves, pressure regulating valves). Valves smaller than 1-inch will not be numbered.

- Process areas for drawing use will be established prior to the start of construction document preparation . These process area numbers will be used for all design discipline drawings of these facilities.

- The plan sheet “background owner”, for example the structural or architectural disciplines, will be responsible for updating the backgrounds for X-referencing into other discipline drawings.

- Process and instrumentation diagram format have already been established and have been applied on the P&ID drawings, presented with the CDM Smith Proposal.

Memoranda and Reports

A number of documents will be prepared by the project team as required under various subtasks. These include:

- Special Reports and Studies
- Technical Memoranda
- Permit Related Deliverables

Memoranda, reports, and special studies will be used to communicate information to various team members. It is important to identify the project team member that the documents are being transmitted to and from. Also, a file number should be included in the memorandum header. An electronic file name should be included in the footer of the memorandum so the document can be easily retrieved.

The submittal of these studies, check list, reports and technical memoranda shall include applicable supporting calculations, studies, and background information such that the document that is provided is comprehensive. An outline of each report and TM will be submitted to CDM Smith's Lead Engineer, Michael Zafer, prior to its preparation. A draft of each document will be submitted to the CDM Smith Design Principal who will arrange for the appropriate technical review prior to the CAW submittal. Under no circumstances will a technical memorandum be submitted directly to CAW by a CDM Smith team member.

Technical Review Committee (TRC) Reviews

The function of the TRC is to provide independent reviews by experienced and technically qualified personnel which include the following areas:

- Conformance to deliverable requirements
- Adequacy and appropriateness of technical data
- Pertinent application of existing and new technology
- Whether a sound, practical, and cost-effective approach has been made and that design earthquake criteria, materials of construction, constructability, safety in design, reliability, and operational concerns have been accounted for.

The TRC members identified above will meet and review the following project deliverables prior to submittal to CAW:

- 30% Updated Design package

- 40-50% Design Package
- 80-90% Design Package
- 100% Approved for Construction Plans and Specifications

The CDM Smith Lead Engineer shall provide TRC members with information in addition to the design package being reviewed which will facilitate the review. A briefing memo shall be submitted to the TRC one week prior to the convening of the meeting consisting of the following, as appropriate:

- Brief description of the project
- Design criteria
- Preliminary layouts
- Process and flow schematics, process and instrumentation diagrams, and preliminary equipment listings
- Alternative significant design concepts considered
- Calculations, memoranda, white papers and reports to support submittal
- Project issues

TRC members will review the design packages consisting of construction drawings and specifications prior to, during, and after the TRC meeting. Individual review comments will be identified as mark-ups to the plans and specifications and/or ancillary notes prepared by TRC members.

The TRC meeting will begin with a brief presentation by the project team providing a history of the assignment and identifying key project drivers that significantly impacted the development of the design packages. Relevant permit and operational issues which influenced the design will be discussed during the presentation phase of the TRC meeting. The meeting will consist of a systematic discussion of the review comments compiled by the TRC members with the objective of identifying modifications in the design package required for the submittal to CAW

TRC meeting notes and follow-up memorandum will be prepared by the CDM Smith Design Lead and distributed to all attendees at the TRC meeting within 15 calendar days after the conclusion of the meeting. These notes should include a brief description of the project as well as a tabulation of recommendations and/or specific questions that require answers. The memorandum will provide a description of how the TRC suggestions will be incorporated into the next design package. Explanations will be provided for suggestions not incorporated into the design.

Comprehensive Final Design Review

The CDM Smith Project Manager and Design Lead shall perform a review of the final design. Selected design discipline leads or senior staff may also be included in this review. The Design-Build Quality Manager, Jack Taylor, shall be informed in writing that the final review has been conducted.

The following items constitute this review:

- Satisfaction that all checking procedures outlined in this document has been done.

- Coordination of drawings and specifications, including references. This must be done using an essentially complete set of drawings and specifications.

The above review is intended to be "overall," and is not a substitute for the detailed intra- and inter-discipline checking discussed below.

The CDM Smith Design Lead must personally view all final "red-yellow-green"-type checked drawings, specifications, and calculations.

Checking

Checking is the heart of quality management and must be undertaken diligently and in a timely manner. Checking should only be done by staff thoroughly knowledgeable about the work being checked as established under "Quality Procedure 2.2 Independent Checking". Individuals identified by the function group leaders to perform both the inter- and the intra- function checking will be provided to the CDM Smith Lead Engineer. Checking must be a continuous effort and not left to the end of the project.

The CDM Smith Lead Engineer will write a specific discipline coordination checklist once the final scope of design work is known and negotiated. This checklist will include such subjects as drawing presentation, structure backgrounds, specific areas to be checked based upon past lessons learned, specification- drawing coordination, omissions of necessary work, operation and maintenance needs, and constructability. Specification - drawing coordination will follow the guidelines described in the Construction Specifications Institute's Project Resource Manual, customized for water treatment plant projects.

Intrafunction Checking

Each function group (e.g., structural, electrical, instrumentation and building mechanical) will perform detailed internal checking of all calculations, reports, memoranda, drawings, specifications, and cost estimates, in accordance with an established procedure and schedule. Intrafunction checking shall be performed when the documents are essentially complete (approximately 95 percent), although interim documents shall also be checked as the project progresses. Special care shall be taken to check any last-minute changes.

Interfunction Checking

The primary purpose of this checking is to minimize conflicts and omissions between interfacing functions. Although coordination between disciplines shall be ongoing throughout the project, a thorough interfunction check shall be performed prior to the submittal of the 90 percent design. The CDM Smith Design Lead shall designate group responsibilities for interfunction checking and clearly designate prime responsibility to a single group at each interface.

The table below provides a recommended responsibility matrix and examples of potential problems for the interfunction checking on the MPWSP Desalination Infrastructure Project.

Inter-function Checking Activities

Function	Checking Responsibility	Example of Possible Problem
Structural	Mechanical	Processing piping conflict with structure
Architectural	Mechanical	Equipment blocking access
HVAC	Mechanical	Air handling systems blocking process piping
Mechanical	Plumbing	Floor drains mislocated at pumps
Mechanical	Electrical	Process piping crossing over MCC
Mechanical	Instrumentation	Unit process not tied into controls; all required controls are specified
Architectural	Plumbing	Piping crossing in front of windows; wall chases not provided
Architectural	Electrical	Lighting controls not accessible
Architectural	Instrumentation	Control panel misoriented aesthetically
Structural	Architectural	Structural cross bracing at windows; architectural detailing matches structural framing
Structural	Plumbing	Pipe chase mislocated; pipe penetrations too close together
Structural	HVAC	Roof openings for fans mislocated; dimensions agree
Structural	Electrical	Large bundle of conduit in too small openings; need to detail how conduit duct bank enters structure; concrete equipment pads properly sized and located
Structural	Instrumentation	Control lines inaccessible
HVAC	Electrical	Air handling units not wired; power to thermostats covered
HVAC	Instrumentation	Location conflict; controls coordination
Electrical	Instrumentation	Omission of power to control panel
Civil	Mechanical	Underground process yard piping conflict with pipe drains
Civil	Structural	General grading conflicts
Civil	Architectural	Sloping sidewalk towards building entrance; allowance for ADA access
Civil	Plumbing	Roof scuppers discharge mislocated; location and continuation of pipelines coordinated
Civil	Electrical	Site yard lighting conflict with underground pipe; manholes and handholes at high points of roadways and coordinated with other utilities

The name of the person who performs the interfunction check shall be indicated on the title block, or other documents, as "Cross-Checker."

The checker is responsible for checking for code violations in their own function due to the checked discipline's work. They are not responsible for checking for code violations in any other function than their own.

In addition to the above designations of responsibilities, the following specific considerations are extremely important:

- The mechanical group is responsible for ensuring adequate lifting capacity and accessibility to all pertinent equipment to be serviced. All other groups (e.g., HVAC, electrical, architectural, etc.) are responsible for checking for conflicts with their work.

- All motor control sequences shall be carefully reviewed with electrical by the appropriate functional group. The resulting control sequencing should be written down with appropriate sketches and backup data. This information shall be filed with the pertinent project records for passing along to "downstream" staff (i.e., those involved with such phases as construction and start-up).

Checking Procedures

What is to be Checked and by Whom?

- Calculations, drawings, and sketches (including cross checking with text or specifications) must be checked by a person other than preparer.

- Specifications, equipment data sheets, tables, charts, text should be checked by preparer.

How is the Checking Performed

Calculations

- The complete "thought process," including use of appropriate data, formulas, assumptions, and criteria, shall be reviewed--and not just the mathematics. The review of the thought process should be done by a senior person (such as the Lead Practitioner) prior to the math check being performed by others.

- Original calculations shall be checked. A new set of calculations should not be prepared.

- Corrections shall be clearly noted on the original calculations in a red marker (or in red text for electronic documents); erroneous figures shall be crossed out in red marker (leave legible), but must not be erased.

- All revisions shall be reviewed with the individual who made the original calculations.

- The name of the checker and date of checking shall be included in the appropriate places on all calculation sheets.

Drawings, Figures, and Specifications (Note: for electronic documents, use the same color scheme with the appropriate method of indication.)

- Checking activities for drawings, figures and specifications shall include the initial check by the checker, the backcheck of the checked documents by the individual who created the original document, and the verification of the backchecked document by the checker to determine that all agreed corrections have been incorporated.

- Checking shall be done when the documents are essentially complete (approximately 95 percent), although interim documents shall be checked as the project progresses. Special care shall be taken to check any last-minute changes. A marking system is described below, but an alternate method of checking and backchecking may be used.

- Every correct dimension and note shall be marked out with a yellow marker; revisions and/or additions shall be indicated in red and reviewed with the original designer.

- The person making the corrections shall circle the red marks on the print with a green marker to indicate that the change has been made. Any additional changes not picked up by the check shall be added in blue. The document shall then be returned to the checker for verification. If requested by the checker, a final checking print shall be used in the verification process. The checker will then indicate that the proper corrections have been made by using yellow to cover the previously indicated red and green marks. The intent is that at the completion of the final backchecking, every line and item on the document being checked is completely correct and covered in yellow. These marked up documents shall be stored and maintained for the duration of the project.

- The name of the checker and dates of checking and backchecking shall be written in red near the title box of each sheet checked and backchecked. The name of the checker also shall be indicated on the original drawing.

- For design projects (such as this project) involved with expansions/modifications to existing facilities, a final site visit by the CDM Smith Design Principal (with others as appropriate), with the 95 percent drawings as a "final" check for interferences, is mandatory. Obviously, site visits need to take place at appropriate times during design development as well.

- Every page of specifications and equipment data sheets shall be thoroughly read to ensure correctness, appropriateness, and coordination with the drawings and equipment data sheets. Also, if a specification references another document (e.g., specification, catalog number, etc.), it must be determined to be current. The specification checker must be provided an up-to-date set of drawings and equipment data sheets. Similarly, all references to the specifications on the drawings must also be checked for compatibility.

- Redundant material and excess verbiage shall be eliminated. Specifications should be as concise as possible.

- Procedures shall be the same as noted for drawings (i.e., corrections noted in red, with the person making the corrections marked in green, and at the end, the entire correct checking documents should be covered in yellow). Special care shall be taken to ensure that the graphics agree with the text and tables. These files shall be stored and maintained for the duration of the project.

- The checking set shall identify the checker and dates of checking and backchecking. The final document shall include the proper Professional Engineer's stamp and signature and the signature of the independent checker.

Tables and Charts

- Every table and chart will be thoroughly read to ensure correctness, appropriateness, and coordination with the text.

- All corrections shall be marked in red marker and the revised tables and charts backchecked against the red marked checking set using a green marker.

- The checking set shall identify the checker and dates of checking and backchecking.

Equipment/Processes

Use of Equipment Data Sheets

Procedures for development and maintenance of equipment data sheets will be delineated by the CDM Smith Design Principal, coordinating with design team members, early in the preliminary design phase. Data sheets form the basis for the development of detailed equipment specifications. They will be prepared by the appropriate function groups (usually the process group, as well as HVAC) and circulated to all other team members on a timely basis, as the design progresses, whenever changes are made, and/or at frequencies determined by the CDM Smith Design principal. Data Sheets have already been prepared for most equipment proposed to be included in the project and they are included in the CDM Smith Proposal. Current equipment data sheets will also be kept on the office network project drive for access to all CDM Smith staff.

"Last Minute Changes"

Particular caution will be taken regarding last-minute requested changes to drawing or specifications. Such changes can have ripple effects, all the impacts of which can be overlooked and lead to construction and functionality problems. The Design-Build Quality Manager will be consulted whenever situations such as this occur to determine if such changes is absolutely necessary and the best procedure for implementation.

Geotechnical Work

Supplemental site-specific detailed geotechnical investigations will be conducted as part of the Project, including soil borings, soil analyses, seismic slope stability analysis, fault identification investigation, and recommendations for final foundation and seismic design criteria.

During the design phase of the Project, information from detailed test borings and soils analyses will be evaluated by the CDM Smith team geotechnical engineer (GE) along with anticipated loadings, and other appropriate information. Soil bearing capacity, equivalent lateral pressure, cohesiveness, plasticity, groundwater depths, dewatering capability, and soil corrosivity will be evaluated as required, and recommendations for foundation design and pipe bedding systems provided as appropriate.

The results of all test borings, soils analyses, and recommendations from the CDM Smith geotechnical engineer shall be in written form, GE stamped, and included with the pertinent project records. Furthermore, the geotechnical engineer shall review the design documents, such that a letter is issued from the GE that states the design meets the recommendations in the geotechnical report. Such a letter will be incorporated into the design deliverables and be forwarded to CAW.

In areas of known or suspected high levels of soil corrosivity, a corrosion consultant shall provide a soils analysis, and if required, recommend a corrosion protection system of a coating and/or cathodic protection.

Hazardous materials in soils are not expected at this site and such an investigation or further work is not a part of this contract.

Sealing Plans and Specifications

Design documents prepared for this project for CAW, including the Geotechnical Report, construction drawings, specifications, and addenda, shall be stamped and/or sealed in accordance with applicable California state requirements. Electronic stamping and sealing of documents shall be in accordance with the laws of the state of California.

Information on stamping requirements will be included in the project records. The “Designed” or “Approved By” box on the title sheet should bear the name of the person who stamps the drawing unless otherwise directed by CAW. All documents shall be stamped and sealed by those responsible for the work, including each discipline of the work.

Controlling and Tracking All Documents

All hard copy documents will be filed in accordance with CDM Smith’s standard filing system (Quality Procedure 3.1 Project Filing System and Records Management) . Copies will also be kept electronically, in accordance with the same filing system.

During the design phase CDM Smith will use a common electronic file structure on a secure server with automatic back-up capabilities to facilitate the communication of current drawings and specifications between all design team members. The electronic file structure has a document tracking function to document changes in documents and who accessed the documents.

Section 3- Construction Phase

Overview

The primary objective of the project construction phase is to safely construct the facilities established in the design drawings resulting in desalination infrastructure which meets treatment performance requirements and is flexible and reliable in its operation. The central QA/QC activities associated with the construction phase of the project consist of the three phases of quality control:

1. Preparatory Phase- Meeting conducted before the initiation of construction activities associated with a specific definable feature of work (DFOW) to establish that all prerequisite work and requirements have been completed.

2. Initial Phase- Meeting conducted immediately prior to the beginning of construction activities on a specific DFOW which verifies that the control s for work developed in the preparatory phase has been implemented and the work is to be performed to the level of workmanship mutually agreed upon (i.e. confirm that appropriate inspectors, testing personnel, and equipment is place.).

3. Follow-up Phase- The objective of this phase of quality control, conducted during the performance of the work activity, is to ensure that the construction work implemented is in conformance with the plans, specifications, and standards required.

The procedures and protocols required to implement these phases of construction quality is described in more detail below. Integration and coordination with the design team members is achieved through the active participation of responsible design staff in the review and approval of construction submittals and in specialty inspections. Commissioning and start-up staff will participate in the construction efforts throughout the construction period. The objective is to install process equipment and ancillary components with the ability to readily monitor system performance and to facilitate system start-up.

Duties, Responsibilities and Authority of the Quality Control Team Members

The section describes the duties, responsibilities and authority of the Quality Control Team. it consists of personnel, organization, procedures and documentation necessary to produce the Desalination Infrastructure project in conformance with the contract requirements. The actual practices are not limited to this plan and where a discrepancy exists between this plan and the contract requirements, the contract requirements shall prevail.

Project Construction Team

The individuals responsible for the implementation of the construction phase QA/QC activities are presented in this section. Key team members include the following:

- Design-Build Project Manager – Paul Meyerhofer
- Construction Principal- Chad Brown
- Design-Build QA/QC Manager – Jack Taylor
- Field QA/QC Manager- Kelly Roach
- Quality Control Specialists for civil/architectural work, mechanical work, electrical and instrumentation work and testing coordinator.
- Construction Superintendent – Kenny Vassar
- Project Controls – Cody Belcher
- Procurement and Expediting – Randall Redmann
- Site Safety Officer – Joe Leslie

The Project Organization Chart in Section 1 of this plan depicts the entire team and support services proposed for the design of the Desalination Infrastructure project.

Project Design Support Team During Construction

The design team that prepared the design documents will perform engineering support services during the construction phase. Paul Meyerhofer, Design Principal, will remain the manager of the design team for it role during construction. Services provided by the design team members include:

- Review submittal for conformance with design requirements.
- Develop responses to design issues raised by either CAW or the CDM Smith construction team (RFIs).
- Prepare drawing and specifications for changes to the work.
- Witness selected equipment testing, both field and factory as appropriate.
- Assist in development of plans for, and participate in actual, start-up and commissioning.

Field QA/QC Manager

The responsibility of the Field QA/QC Manager is to oversee the implementation and monitoring of the quality management plan. Specific tasks include:

- Conduct independent review, inspection and testing of the work such that the quality of the work complies with the requirements of the Contract.
- Attend post award conference, design meetings, QC planning meetings, and special coordination meetings.
- Interact directly with CAW's representative regarding the effectiveness and capability of the quality control organization.
- Coordinate communications between field and office engineering efforts.
- Coordinate submittal review process and review and implement final approved submittals.
- Monitor the adherence to procedures for submittal reviews and RFIs including turnaround times.
- Manage and coordinate the three phases (viz Preparatory, Initial and Follow-Up) of control and documentation.
- Review status of record drawing updates on a regular basis to ensure that they are being maintained current.
- Attend weekly progress meetings during design and construction phases. Prepare agenda and meeting minutes for distribution.
- Review daily inspector reports and compile a weekly progress status report to be included in the weekly progress meeting agenda.
- Supervise construction inspection activities.
- Coordinate documentation control efforts.
- Coordinate start-up/testing activities.
- Maintain authority to stop any portion of the work due to less than quality performance.
- Coordinate off-site inspection of fabricator and supplier products.
- Overseeing independent testing and inspection firms, such as soils, concrete, welding and coatings; review and submit test results.
- Attend on-site job progress meetings.

- Review the need for and extent of proposed changes to the work.
- Interact with the site Safety Office to ensure that the site safety plan is being implemented.
- Verify that appropriate sign-offs and approvals have been obtained.
- Report monthly to the CDM Smith Project Manager any quality concerns. The CDM Smith Project Manager will include these concerns in the monthly report to CAW.
- Ensure that project close-out activities have been accomplished.

Quality Control Specialists

The QC specialists (QCS) shall report directly to the Field QA/QC Manager and obtain all authority as directed. The duties and responsibilities of the QCSs include the following:

- Perform daily on-site inspection of construction activities to assure compliance with the intent of the contract documents.
- Review and assure implementation of the approved submittal data.
- Prepare daily inspection reports of construction activities on the project.
- Attend weekly progress meetings as necessary and directed by the Field QA/QC Manager.
- Prepare and maintain a daily log book of all construction activities.
- Report to the Field QA/QC Manager any work that does not comply with the QMP and or the project requirements.
- Photograph construction activities and maintain photo log and album.
- Inspection of construction materials delivered to construction sites.

Construction Superintendent

The contractor's Superintendent office and field personnel shall work pro-actively with the construction quality control team to ensure project compliance with the contract documents. The Superintendent's responsibilities include the following:

- Assure all work is executed in accordance with the Safety Program.
- Daily monitoring of constructor work activities and support the Field QA/QC Manager with control of each phase of the work.

- Coordinate with construction quality control management team prior to work activities such that required inspection, testing, and documentation efforts can be safely completed.

- Submit three-week look ahead schedules to facilitate inspection scheduling and required documentation.

- Track construction project schedule and report deficiencies to the Field QA/QC Manager.

- Provide the Field QA/QC Manager notification of definable features of work to allow sufficient time for implementing the three phases of quality control, including the Preparatory and Initial Phase meetings. (Refer to the section below of this Construction Phase portion of the plan for details on the three phases.)

Submittal Procedures & Initial Submittal Register

This section provides the procedures and protocol for submitting, reviewing, approving, and tracking submittals for the work.

CDM Smith Submittal Responsibilities

- The submittal process will be integrated into the project schedule to allow for review, approval, procurement, delivery, and QC preparatory and initial phase implementation. The schedule will be updated on a monthly basis.

- The Field QA/QC Manager will assure that on-site design-build team management remains attentive to submittal procedures during the course of the project.

- The Field QA/QC Manager will be responsible for ensuring that all submittals are in full compliance with the intent of the contract documents.

- The Field QA/QC Manager will assure that any variations to the contract documents will be identified and justified in the submittal package.

- The Field QA/QC Manager will assure that no work is initiated until associated submittals have been approved.

CAW Submittal Responsibilities

- The design-build team proposed submittal list will be extracted from the project schedule and submitted to CAW for review and tracking.

- CAW will review and approve submittals as necessary

Submittal Requirements

CDM-Smith

Any item that CDM Smith is required to "submit" to CAW as a requirement of the design-build contract is considered a submittal. There are items to be submitted before certain activities are performed, items to be submitted periodically throughout the life of the project, and items to be submitted after–the-fact to verify acceptance or conformity. A submittal register will be maintained to document and monitor the submittal process.

The Lead Engineer will specify equipment and materials required for the project. A submittal list will be generated and submitted to CAW for review and comment, as appropriate.

CAW

CAW will review and append the submittal list generated by the Lead Engineer. Determinations will be made on the submittal register by CAW as to conformance with the contract documents.

Quality Control

All submittals, shop drawings, catalog cuts, samples, etc., unless otherwise specifically noted, will be reviewed by the Design-Build QA/QC Manager for conformance to the drawings and specifications.

The design component of the design-build team will specify equipment and materials required for the project. Review responsibilities will be established for the approval of the equipment and materials. The construction component will prepare and submit the required information (submittals) for review and approval. As determined by CAW, some submittals will be reviewed and approved by CAW while the remaining submittals will be reviewed and approved by the Design-Build QA/QC Manager. In any event, work will not commence in any area until the associated equipment and materials have been reviewed and approved.

Procedures

1) The construction component of the design-build team shall prepare required submittal packages and submit to the Field QA/QC Manager using the transmittal form attached to this section. The dated transmittal shall initiate the 5-day submittal review period.

2) The Field QA/QC Manager shall distribute the submittal to the design team for review and approval. The Field QA/QC Manager will track the progress of the review, log status, and report to the Project Manager, as appropriate.

3) Disapproved submittals will be returned to the Field QA/QC Manager who will return the unapproved submittal to the constructor component of the Design-Build Team.

4) Submittals, approved by the design team and CAW, will be returned to the Field QA/QC Manager who will in turn forward to the construction team of the design-build team.

5) The following certification statement will be attached to each submittal.

Certifications

Certifying Statement

I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated with contract number (______) , is in compliance with the contract drawings and specifications, can be installed in the allocated spaces, and is submitted for CAW approval.

Certified by Submittal Reviewer __________________________ Date _______

Certified by Field QA/QC Manager ________________________________ Date _______

Approval Statement

I hereby certify that the (material) (equipment) (article) shown and marked in this submittal and proposed to be incorporated with contract Number (______) is in compliance with the contract drawings and specifications, can be installed in the allocated spaces, and is ______ approved for use.

Certified by the Submittal Reviewer ________

Testing Laboratory Information

This section describes the testing laboratory information that is proposed at the initial stage of the project. It is anticipated that as the project develops, additional testing requirements will be identified and this section will be expanded to provide the appropriate testing laboratory coverage.

The CDM Smith will be utilizing several firms to provide soils engineering and testing services as well as specific materials testing as indicated herein. These laboratories are all accredited by the American Association of State Highway and Transportation Officials (AASHTO) in Aggregate, Soil, and Portland Cement Concrete or other accreditation organizations as applicable.

Specific details on Laboratory Tests Certified by AASHTO and USACE for these services will be provided with submittal of the final Quality Management Plan.

Testing Procedures

The Field QA/QC Manager will coordinate all testing activities including scheduling, scope direction, oversight, and reporting.

Preparatory Phase

The preparatory phase will be performed prior to beginning work on each testing DFOW, as determined by the Design-Build QA/QC Manager. The preparatory phase meeting may be performed concurrently with other project preparatory phase meetings or may be stand-alone meetings to discuss specific testing protocol and scheduling. Items discussed will include:

- Review of applicable specifications and references
- Review of applicable previous testing
- Review of appropriate activity hazard analysis
- Review testing plan to assure that provisions have been made to provide the required testing and identification of required standards
- Discuss testing procedures and required work access
- Review safety plan
- Review reporting requirements
- Review appropriate repetitive deficiencies
- Review procedures to follow should test results indicate failure

Initial Phase

The initial phase will be conducted at the beginning of each DFOW, as determined by the Field QA/QC Manager. The initial phase meeting may be performed concurrently with other project initial phase meetings or may be stand-alone meetings. Items discussed will include:

- Review minutes of the preparatory phase meeting
- Verify that required testing materials and personnel are on-site
- Confirm that quality control specialists are prepared
- Resolve any testing issues that may affect the progress of the work
- Revisit safety concerns and the activity hazard analysis
- Confirm that safe access will be provided

Follow-up Phase

The follow-up phase will be conducted during the course of the work activity. During the follow-up phase, testing will be performed. Activities associated with the follow-up phase include:

- Ensure work is in compliance with contract documents
- Work is being performed in a safe manner
- Proper sampling procedures are being followed
- Ensure sufficient information is obtained to complete Testing Plan and log forms.

Reporting

Field test reports will be generated by the testing laboratory and submitted to the Field QA/QC Manager in a timely manner. Copies of the test reports will be submitted to CAW attached to the last Contractor Quality Control Report of each month.

Quality Control Validation will be maintained during construction. A copy of the current Testing Plan and Log form along with copies of the field test reports, arranged by specification section, will be included in the field office 3-ring binder set for CAW review.

The forms used for reporting test results will be the standard reporting forms of the testing laboratory. Format will be reviewed and approved by CAW to reporting requirements upon initial submission due to the magnitude of possible tests and the variance of reporting formats.

If a test result fails to conform, the Field QA/QC Manager will notify the CAW Representative immediately. The testing laboratory will stamp the cover sheet for each report in large red letters “CONFORMS” or “DOES NOT CONFORM” to the specification requirements, whichever is applicable. Test results will be signed by the testing laboratory representative authorized to sign certified test reports.

Testing Plan and Log

The maintenance of the Testing Plan and log form will be the responsibility of the Field QA/QC Manager. As field test reports are received from the testing laboratory, the Field QA/QC Manager will record on the Testing Plan and log the following:

- By whom the sample was taken by
- By whom the test was taken by
- If the test is taken on-site or off-site
- When the test date was completed
- The date the test was conducted
- The date the test results were forwarded to CAW’s representative

- Remarks and acknowledgement that an accredited or CAW's representative approved the testing laboratory

Each month the Field QA/QC Manager will forward an updated copy of the Testing Plan and log along with last daily Contractor Quality Control Report to CAW's representative. A copy of these logs and reports are included in Appendix A.

Procedures to Complete Rework Items

Rework of items found in the field that conflict with the intent of the contract documents can cause serious problems with respect to time, cost, and quality. The quality management team will proactively plan ahead of construction and provide detailed inspection to minimize the potential for these types of problems. However, when discovered, the issue must be addressed as soon as possible to minimize further impacts to the project. It is the intent of this section to establish procedures to resolve issues that require rework.

Conflicts can be identified by any party to the project. The conflict would first be reported to the Field QA/QC Manager where the conflict would be assigned an identification number, logged, and the pertinent information detailed in a project discrepancy report. A copy of this report is included in Appendix A.

The discrepancy report numbering system will include the contractor code. The code will be followed by a sequential numbering system for each contractor.

The Field QA/QC Manager will then submit a copy of the discrepancy report to CAW, Contractor, and the Lead Engineer for review. The review will establish the severity of the issue with respect to the intent of the project goals. A determination will be made, in concert with CAW and Lead Engineer, as to the appropriate course of action. In some cases, the issue may be resolved at the Field QA/QC Manager level and require immediate remedial response from the Contractor. If the discrepancy requires rework, the Contractor will be requested to plan, schedule, and rework the discrepancy. At completion of the rework, the Contractor shall request a final inspection by the Field QA/QC Manager.

Tracking of the status of the discrepancy will include line items in the progress meeting agenda/minutes as a point of discussion. Discrepancy reports will not be closed until final sign-off by the Field QA/QC Manager. At sign-off, a copy of the resolved report will be provided to the Contractor, design engineer, and CAW. A Discrepancy Log and a Non-Compliance Notice and Notice of Suspension will be developed; a copy of these notices are included in Appendix A.

Documentation Management and Procedures

Documentation management control will be one of the primary responsibilities of the Field QA/QC Manager. The goal is to maintain accurate and consistently current records of the work. A construction management information system (CMIS), utilizing Primavera Contract Manager, will be used for collaboration with the project stakeholders for various information/documentation management functions, including, but not limited to, submittals, Requests for Information (RFI), Requests for Deviations (RFD) or substitutions, quality control, punchlists, change initiation and management, correspondence, meeting minutes, and environmental compliance reporting.

The three phases of the construction quality control, including test protocol and result documentation, will be controlled via the proposed documentation procedures outlined below.

This section describes those documentation procedures that are specific to the field construction effort and include:

- Project design drawings, approved for construction
- Submittals
- Requests for information
- Changes to the approved design
- Daily constructor reports
- Daily QC reports
- Off-site inspection reports
- Concrete placement reports
- Notification of Non-compliance
- QC Specialists Reports
- Quality Control Validation
- Meeting Agenda and Minutes

Drawing and Contract Document Control

The Field QA/QC Manager will accept approved contract documents from the Design Team for implementation in the field. Additional work orders, change orders, approved submittal data, and clarifications will be incorporated into the field set of contract documents after information is logged, reviewed, and clarified. The field set of contract documents, maintained at the QC field office, will be considered the Construction Team official contract documents set and used for project quality control activities.

Requests for Information (RFIs)

RFIs will be submitted electronically in pdf format to the Design-Build QA/QC Manager using the standard Expedition RFI form. RFIs can be submitted by the Contractor or the quality control team in the form of questions concerning the design. After being logged by the Field QA/QC Manager, the RFIs will be sent to the Design Team or other appropriate party for resolution. They will review and respond to the RFIs within 7 Calendar Days and return to the Field QA/QC Manager. The Field QA/QC Manager will log the response and return to the Construction Team. Hard and electronic copies will be maintained at the QC field office. A "running" list of RFIs will be maintained by the Field QA/QC Manager and unresolved RFIs will be discussed at the weekly progress meetings until a response is received. A copy of the RFI and Design Team response will be provided to CAW for record purposes.

Daily Construction Reports

A Contractor Production Report will be submitted on a daily basis. The report will be prepared, signed, and dated by the construction superintendent and shall contain the following information:

- Date of report
- Report number
- Name of constructor
- Contract number
- Title and location of contract and superintendent
- Weather conditions and temperature
- Work performed by corresponding schedule activity number
- List of constructor and subcontractor personnel on the work site and their trade, employer, work location, hours worked by trade, and total hours worked
- Listing of job safety actions with complete description and associated schedule activity number identification
- Schedule activity number, submittal number, and list of equipment/material received each work day that is to be incorporated into the work
- Schedule activity number and construction plant equipment utilized including the number of hours used
- Remarks section that lists all actions, directions, and problems encountered

The report will be submitted to the Superintendent/Project Manager by the next working day after each day that work is performed. The Field QA/QC Manager will review and forward the report to CAW. An (electronically) signed hard copy will be sent, or hand delivered, to CAW on the same day following submission of the electronic version.

A copy of this report is included in Appendix A.

Daily QC Reports

The Contractor QC Report will be submitted by the Field QA/QC Manager on a daily basis. The report will be prepared, signed, and dated by the Field QA/QC Manager and shall contain the following information:

- Date of report
- Report number
- Contract number
- Contract title
- Listing of preparatory phase work conducted
- List of initial phase work conducted
- Results of follow-up work conducted
- Remarks including direction received, QC issues/problems, deviations from the Quality Management Plan, construction deficiencies encountered, construction quality management meetings held, acknowledgement that record drawings have been updated, corrective directions given to constructors, and associated corrective action taken by the constructors
- The Contractor QC Report will be certified, signed, and dated and submitted to CAW.

A copy of this report is included in Appendix A.

Off-site Inspection Reports

A narrative report will be submitted to the CAW within 2 working days after all off-site testing and/or inspections. The task inspector will prepare the report. The narrative report will include:

- Date of inspection
- Schedule activity number
- Testing/inspection protocol established during the preparatory phase meeting
- Report number

- Contract title
- Description of initial phase work conducted
- Materials tested/inspected
- Results (or schedule for receiving test results)

The off-site inspection report will be submitted as a memorandum to file narrative and distributed to the Design Team, quality management team, constructor, and CAW by the Field QA/QC Manager.

A copy of this report is included in Appendix A.

Concrete Placement Reports

Concrete Placement Reports will be prepared by the quality control specialists and submitted to the Field QA/QC Manager the same day as the concrete is placed. The report will identify the activities of the constructor during the placement and will include the following information:

- Date of placement
- Schedule activity number
- Discussion of testing/inspection protocol established during the preparatory meeting
- Report number
- Contract title
- Copy of concrete delivery slips
- Description of all site concrete additives
- Time trucks arrive on-site
- Placement times
- Ambient temperatures
- Equipment used by constructors to place concrete
- Locations in the work for each truck
- Number and size of concrete vibration devices used
- Pour duration

- Curing methods
- Tests conducted
- Field testing results (slump, entrained air)

A copy of this report is included in Appendix A.

Notification of Non-Compliance

The Notice of Non-Compliance will be distributed to the constructor and Field QA/QC Manager the day after the issued is identified. Tracking and follow-up activities are also described below in this plan.

QC Specialists Reports

Daily QC Specialists Reports will be prepared each day that work is performed in their areas of responsibility. The QC Specialists Reports will mirror the Contractor QC Report content, submitted by the Field QA/QC Manager, which will summarize the QC Specialists reports, and will provide detailed descriptions of the contractor's work effort. The reports will be prepared, signed, and dated by the QC Specialists and will accompany the Field QA/QC Manager Contractor QC Report submitted by the Field QA/QC Manager to CAW.

Quality Control Validation

Three-ring binders will be maintained at the QC field office that will contain the following:

- All preparatory and initial phase checklists arranged by specification section
- All milestone inspections, arranged by activity/event number
- Current up-to-date copy of the Testing Plan and forms log with supporting field test reports arranged by specification section
- Contract modifications arranged in numerical order
- Current up-to-date copy of the rework items list
- Up-to-date list of punch-list items identified

Progress Meeting Agenda & Minutes

Field agendas and meeting minutes will be managed by the Field QA/QC Manager. Agendas and the minutes from the previous meeting will be distributed via email prior to the progress meeting. Minutes will be distributed to each meeting participant for review and correction during the meeting. The minutes from the previous meeting will be approved at the subsequent progress meeting. A copy of the approved meeting minutes will be distributed to each participant. Distribution will be by electronic (e-mail) means. Progress meeting agendas will include the following:

- Review of previous meeting minutes

- Status of work and review schedule, including update of three phases of control in testing
- Design issues
- Status of deficiencies and outstanding punchlist items (establish completion daily)
- Status of RFIs
- Status of offsite work or testing
- Review of previous testing
- Documentation review
- Three-week look-ahead schedule review
- Invoice issues
- Submittal review
- Safety issues (including upcoming activity hazard analysis and Health & Safety Plan)

In general, all documentation efforts will be managed by the Field QA/QC Manager and copies will be maintained at the QC field office; copies will be provided to CAW and the CDM Smith Walnut Creek office as a backup.

Quality Control List of Definable Features

The Definable Features of Work (DFOW) mark those features that will define topics for the preparatory and initial phase meetings. A design-build project allows for identification of the DFOW as a projection of anticipated features only. Upon completion of design, a more thorough evaluation of features can be made. The listing presented below will be appended at completion of design and DFOW will be assigned activity numbers for inclusion in the project schedule.

These DFOW's are intended to support the "Three Phases of Control" format of the Quality Management Plan. The standard 16 Divisions of the Construction Specification Institute (CSI) format will serve as the general DFOW while noting that special preparatory and initial phase meetings may be required for specific sub-features, as noted in the listing below.

The preparatory phase meetings are performed and documented prior to the commencement of each feature of the work. A check list will be prepared that verifies the items to addressed at these meetings. The meeting agendas will include the following:

- Review applicable contract documents
- Testing requirements

- Safety concerns
- Review of Activity Hazard Analysis
- Inspection and storage of delivered materials and equipment
- Construction standards and contract interpretation
- Inspection protocol
- Submittal review
- Plant coordination, potential shut-down requirements
- Traffic control issues

The Initial Phase meetings are performed and documented at the beginning of each DFOW at specific locations. Most of the items discussed during the preparatory phase meeting will be revisited and updated. Additional discussion items include:

- Specific safety concerns
- Confirmation that needed materials and equipment are ready
- Manufacturer's storage and installation instructions are understood

During the follow-up phase, inspection, documentation, continuation of compliance with the contract documents, quality of workmanship, safety methods, and the remaining issues discussed during the preparatory and initial phase meetings are surveyed. The follow-up phase will be performed on a daily basis.

A preliminary list of DFOWs for the Desalination Infrastructure project is as follows:

- Excavate & backfill
- Install underground Pipe
- Cast-in-Place concrete
- Structural steel
- Masonry
- Painting and coatings
- Equipment installation
- Stainless steel piping
- Fiberglass Reinforced Plastic/Polymer (FRP)

- PVC piping
- Building plumbing
- Building HVAC
- Room Finishes (gypsum board, flooring, etc)
- Conduit and raceways
- Wiring and termination
- Grounding systems
- Switchboard, distribution panels, transformers, MCC's
- Final inspection
- Commissioning

Procedures for Performing the Three Phases of Control

This section will outline the proposed procedures to be used to schedule, control, and document the three phases of work. The three phases of control are:

- Preparatory Phase
- Initial Phase
- Follow-up Phase

The purpose of the "Three Phases of Control" is to require the constructor to plan and schedule the work to ensure that each DFOW is properly planned, implemented, inspected, and tested. Of specific importance is the philosophy of preventing deficiencies as opposed to the need to find deficiencies—preventive measures in lieu of the need for corrective actions.

The preparatory phase activities will be identified in the project schedule such that a detailed schedule of proposed dates can be extracted for meeting schedule planning. Dates and times of scheduled meetings will be distributed by the Field QA/QC Manager.

All preparatory and initial phase meetings will be held at the QC field office.

Three-Phase Control Responsibilities

- Develop, schedule, and implement procedures for tracking control phase meetings for each DFOW

- Notify appropriate personnel of time, date, and agenda for each meeting
- Document actual discussions and provide minutes to attendees
- Monitor work through the follow-up phase
- Identify additional coordination meetings as necessary

Preparatory Phase

This phase is performed prior to beginning each definable feature of work (DFOW). Notify CAW's Representative at least five (5) working days in advance of the Preparatory Phase meeting. The meeting will be attended by CAW, the Field QA/QC Manager, the Superintendent and other appropriate QC personnel relevant to the DFOW. The Field QA/QC Manager will prepare minutes of the meeting. Prior to the meeting, the Superintendent shall confirm the following:

1) Review of contract requirements-plans, specifications codes and other requirements
2) Check to assure that all required submittals have been submitted and approved.
3) Check to assure that all materials and/or equipment are on site and have been tested, as required.
4) Review all relevant RFIs, field memos and changes to the design of the definable feature of work.
5) Review QC requirements for the work including inspection, testing, and acceptance and tolerance requirements.
6) Check to assure access to work has been made to allow for required control testing
7) Confirm work areas to assure that all predecessor and preliminary work has been accomplished
8) Check availability of resources required to perform the work
9) Review hazard analysis to address safety precautions
10) Determine commencement of the Initial Phase.

Initial Phase

This phase is performed at the beginning of a definable feature of work. Notify CAW's representative at least five (5) working days in advance of the Initial Phase meeting which will be attended by CAW, the Field QA/QC Manager, the Superintendent and other QC personnel as appropriate for the particular DFOW.

Minutes of the meeting will be documented by the Field QA/QC Manager. Prior to the meeting, the Superintendent shall verify the following:

1) Check preliminary work
2) Check proposed work for compliance with the contract documents
3) Review of control testing
4) Establish level of workmanship
5) Check for use of defective or damaged materials
6) Check for omissions and resolve any differences of interpretation with the Design-Build QA/QC Manager
7) Check of dimensional requirements
8) Check safety compliance

The initial phase checklist form is included in Appendix A.

Follow-up

Perform daily checks to assure continued compliance with workmanship established at the initial phase. Document the daily checks in the Daily QC Inspection Report. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work that may be affected by the deficient work. Resolution of deficiencies shall include establishing quality and workmanship standards for future DFOW work. Daily reports will be generated by each QC specialist and testing technician and included with the Contractor QC Report.

Activities associated to the follow-up phase include:

- Ensure work is in compliance with the design documents
- Maintain quality of workmanship
- Ensure that required testing established in the preparatory phase and agreed upon in the initial phase is being performed
- Ensure that rework (deficiencies) are being corrected
- Monitor safety activities and verify activity hazard analysis conformance with procedures established during the preparatory and initial phase meetings

The follow-up phase activities will be performed by the assigned QCS, test technician, Safety Manager and the Field QA/QC Manager. CAW representatives will be allowed to inspect any portion of the work. The constructor will make all preparations to allow for safe access to the work areas. CDM Smith's Quality

Management Plan- Management Process Manual No. 2A – Observation Guidelines, Field Manual, will be the basis of field observations.

The Contractor QC Report will document all follow-up phase activities on a daily basis. Discrepancies and or problematic issues will be reported to the Field QA/QC Manager as soon as discovered. The Field QA/QC Manager will resolve all issues during this phase of work.

Note that any safety or quality issues deemed significant by the CQCM will initiate a work stoppage for that issue and all associated work.

Off-site Work

Activities that require work off-site will be controlled with the same procedures defined above except that 10 work days' notice will be provided to CAW with 12 work day's confirmation from the Contractor to the Field QA/QC Manager.

Additional Meetings

Additional preparatory and initial phase meetings may be required on the same DFOW if the quality of the work is deemed unacceptable to the Field QA/QC Manager. Causes for additional meetings include:

- Unacceptable work
- Significant changes to the on-site production supervision or work crew. If work on a specific DFOW is resumed after substantial period of inactivity, as determined by the Field QA/QC Manager
- Determinations made by CAW

Procedures for Identifying and Documenting the Completion Inspection

This section describes the proposed procedures to plan, implement, record, and follow-up the final inspection of the work. The procedures will be managed by the Field QA/QC Manager with support from the Quality Control Specialists. In addition, technical support will be provided by the Commissioning Manager, and the component design engineers.

The completion inspection will occur after the notification has been provided to the Field QA/QC Manager that the work is substantially complete and ready for testing and a preparatory meeting has been conducted. The Field QA/QC Manager will notify CAW's representative.

The final inspection preparatory meeting will identify and discuss the procedures to be implemented during the walk-thru. As with all preparatory meetings, an agenda will be distributed that will include the following items:

- Activity Hazard Analysis review
- Review safety constraints during the walk-thru
- Ensure safe access is available to all parts of the work
- Review of inspection equipment needed
- Identify test requirements and inspection criteria
- Review of unresolved, previously identified, discrepancies
- Review of proposed punch-out list format

The three components of the completion inspection will include:

(i) Punch-list compilation during the construction work

(ii) Pre-final inspection

(iii) Acceptance inspection

Punch-list Compilation During the Construction Work

During the course of construction, punch-list items will be developed in the form of discrepancy reports and memoranda to the Contractor detailing deficiencies observed. A "running" list will be maintained and serve as the precursor to the final punch-out process. These items will be discussed on a regular basis at the progress meetings. The intent is to actively pursue corrections during the work to minimize punch-out responses at the project end. The "running" list will be posted and maintained at the QC field office.

The Contractor, construction quality management team, CAW representatives, and any other observing party are charged with identifying deficiencies during the work and reporting to the Field QA/QC Manager. As identified items are corrected, the corrective procedure will be documented on the "running" list and will not be included in the final inspection process. Should the Contractor protest the identified discrepancy, the issue will be discussed during progress meetings with final determination being made by the Field QA/QC Manager, in consultation with CAW representative.

11.2 Pre-final Inspection

Upon notification from the Contractor that the work is complete and ready for inspection, a pre-final inspection (walk-thru) will be scheduled and notifications made as to date and time of the proposed walk-thru. A 7 day notice will be submitted to the CAW representative prior to the pre-final inspection. The walk-thru process will generate a "final punch-list". The walk-thru will consist of inspection of the work by the final inspection team. This team will consist of:

(iv) CAW Representative

(v) Field QA/QC Manager Quality Control Specialists

(vi) Contractor's personnel

(vii) Design Manager and applicable Lead Design Engineer(s)

(viii) Operation & Maintenance personnel

(ix) Project Manager

(x) Other interested parties

The deficiencies identified during the walk-thru will be itemized and copies of the listing will be distributed to the Contractor and all other participants of the walk-thru. The Contractor will diligently pursue corrective action and report to the Field QA/QC Manager the completion of each discrepancy. The quality management team will provide on-going assistance and documentation of corrective actions.

The inspection activities will include:

(xi) Conformance of the work to the contract documents

(xii) Conformance of the work to code and regulatory requirements

(xiii) Workmanship

(xiv) Safety

(xv) Cleanliness of site and equipment

(xvi) Identification of equipment

(xvii) Protective coatings

(xviii) Removal of unused materials

Final Acceptance Inspection

Upon notification from the Contractor to the Field QA/QC Manager that all corrective action items identified during the pre-final inspection are complete, a final walk-thru will be scheduled. The same participants present during the pre-final inspection will be invited to attend. The purpose of the acceptance inspection will be to verify that corrective action was implemented for each of the discrepancies identified during the pre-final inspection. A 7 day notice will be submitted to the CAW representative prior to final acceptance inspection.

The final acceptance inspection will be repeated until all discrepancies are corrected. Upon completion, the listing will be documented as completed and certified by the Field QA/QC Manager and the previously identified discrepancies will be recommended for acceptance to the CDM Smith Project Manager and CAW.

Formal testing of equipment and processes will commence at completion of the acceptance inspection process or as planned, scheduled and approved by the Field QA/QC Manager. The reasoning for this protocol is to ensure that all systems are prepared, installed correctly, protective coatings applied, electrical installation completed, and required instrumentation is in place.

Training Procedures and Training Log

This section will be prepared during the early phases of construction. Requirements for training CAW personnel are contained in the various locations throughout the contract documents. Equipment manufacturers' will provide training for their specified equipment items, such as pumps, generators, filters, and UV reactors. A detained training plan and schedule will be developed and submitted to CAW for review and approval well in advance of the first training sessions.

Procedures for Project Testing, Start-Up and Commissioning

This section describes the proposed QA/QC procedures to plan, implement, record, and follow-up for testing, start-up, commissioning and certification of the desalination facilities. The procedures will be managed by the Field QA/QC Manager with support from the QCS's, the Commissioning Manager, the systems integrator, the mechanical, electrical and process design engineers, manufacturer's representatives, and CAW representatives, including its operations staff and SCADA programmer.

Testing that will be conducted includes the following:

(xix) Control Systems Functional Acceptance Testing that demonstrates the proper interaction between the facility PLC and the related equipment individual control systems

(xx) Electrical Testing (all Div 16 components)

(xxi) Functional Testing to determine that installed equipment/system will operate as specified

(xxii) Performance Testing to demonstrate that the equipment or system meets all of the contract performance requirements

(xxiii) Pre-Start-up Testing to demonstrate that all systems operating together provide satisfactory performance of the Tesla Treatment Facility as a whole.

(xxiv) Final Commissioning Test demonstrating performance connected to CAW's system and for the specified test period of seven (7) consecutive calendar days without failure.

A detailed testing and start-up will be prepared by CDM Smith and submitted to CAW for review a minimum of 120 days before the first functional test. The Plan will conform with the requirements of the RFP and after approval by CAW will be incorporated into this Quality Management Plan, Section 3- Construction Phase.

Appendix A
Representative Forms

(Example forms from City of Stockton Delta Water Supply Project)

- Revision Log
- Catalog Cut/Shop Drawing, Transmittal, and Approval
- Testing Plan and Log
- Non-Compliance Notice
- Discrepancy Log
- Notice of Suspension or Resumption of Work
- Contractor Quality Control Report
- Contractor Production Report
- Construction Safety Audit
- Concrete Placing Inspection Daily Report
- Daily Construction Report (Pipeline Installation)
- Preparatory Phase Checklist
- Initial Phase Checklist

Form 1. Daily Contractor Quality Control Report

CONTRACTOR QUALITY CONTROL REPORT

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

DATE: Enter (DD/MMM/YY)

REPORT NO: Enter Rpt # Here

PHASE	CONTRACT NO	Enter Cnt# Here	CONTRACT TITLE	Enter Title and Location of Construction Contract Here

PREPARATORY

WAS PREPARATORY PHASE WORK PREFORMED TODAY? YES ☐ NO ☐

IF YES, FILL OUT AND ATTACH SUPPLEMENTAL PREPARATORY PHASE CHECKLIST.

Schedule Activity No.	Definable Feature of Work	Index #

INITIAL

WAS INITIAL PHASE WORK PREFORMED TODAY? YES ☐ NO ☐

IF YES, FILL OUT AND ATTACH SUPPLEMENTAL INITIAL PHASE CHECKLIST.

Schedule Activity No.	Definable Feature of Work	Index #

FOLLOW-UP

WORK COMPLIES WITH CONTRACT AS APPROVED DURING INITIAL PHASE? YES ☐ NO ☐

WORK COMPLIES WITH SAFETY REQUIREMENTS? YES ☐ NO ☐

Schedule Activity No.	Description of Work, Testing Performed & By Whom, Definable Feature of Work, Specification Section, Location and List of Personnel Present

REWORK ITEMS IDENTIFIED TODAY (NOT CORRECTED BY CLOSE OF BUSINESS)		REWORK ITEMS CORRECTED TODAY (FROM REWORK ITEMS LIST)	
Schedule Activity No.	Description	Schedule Activity No.	Description

REMARKS (Also Explain Any Follow-Up Phase Checklist Item From Above That Was Answered "NO"), Manuf. Rep On-Site, etc.

Schedule Activity No.	Description

On behalf of the contractor, I certify that this report is complete and correct and equipment and material used and work performed during this reporting period is in compliance with the contract drawings and specifications to the best of my knowledge except as noted in this report.

AUTHORIZED QC MANAGER AT SITE DATE

CITY OF STOCKTON QUALITY ASSURANCE REPORT

DATE

QUALITY ASSURANCE REPRESENTATIVE'S REMARKS AND/OR EXCEPTIONS TO THE REPORT

Schedule Activity No.	Description

CITY OF STOCKTON QUALITY INSPECTOR DATE

Form 1. Daily Contractor Quality Control Report

CONTRACTOR QUALITY CONTROL REPORT

(CONTINUATION SHEET)
(ATTACH ADDITIONAL SHEETS IF NECESSARY)

DATE	Date (DD/MMM/YY)	REPORT NO.	Enter Rpt # Here

PHASE	CONTRACT NO	Enter Cnt# Here	CONTRACT TITLE	Enter Title and Location of Construction Contract Here

FOLLOW-UP

WORK COMPLIES WITH CONTRACT AS APPROVED DURING INITIAL PHASE? YES ☐ NO ☐

WORK COMPLIES WITH SAFETY REQUIREMENTS? YES ☐ NO ☐

Schedule Activity No.	Description of Work, Testing Performed & By Whom, Definable Feature of Work, Specification Section, Location and List of Personnel Present

REMARKS (Also Explain Any Checklist Item From Above That Was Answered "NO"), Manuf. Rep. On-Site, etc.

Schedule Activity No.	Description

Form 2. Sample Construction Inspection Checklist

PROJECT NAME	Pour Number
WTP ☐ Pipeline ☐	TIME
CONTRACTOR OR SUBCONTRACTOR	
LOCATION: Station Number, drawing Grid/Column number.	SPECIFICATION: 03300
REPORT NO: (Inspectors Initials, Date) i.e. JDW0429	

CONCRETE

POUR DESCRIPTION:	
REFERENCES (Plan sheets, etc.):	
APPROVED MIX DESIGN NO. :	
PROPOSED PLACEMENT METHOD:	

PRE - PLACEMENT

IF NOT APPLICABLE, NOTE "N/A"	INSPECTOR		
	ACCEPTED Y/N	DATE	REMARKS
Has the Contractor submitted the Working Drawings and Calculations for Falsework? (03100, para 1.3A.2)			
Has the Falsework Designer of Record inspected the falsework prior to the concrete pour? (03100, para 3.4A)			
Are cold joints and construction joints in the locations as allowed in the Project Plans? (03300, para 3.5A)			
Are forms tight, clean, treated with form release agent, and wetted prior to the placement of concrete? (03100, para 2.1A)			
Is the reinforcing steel installed per plan? (see Quality Checklist for Steel Reinforcement) (03200, para 3.1A)			

READY FOR CONCRETE PLACEMENT ☐ YES ☐ NO
if yes, go to next sheet

DATE

CONCRETE PLACEMENT

CONCRETE (CTS) TECHNICIAN ON SITE: NAME / CARD NO.	☐ YES ☐ NO
TESTING FIRM:	
Concrete supplier's Mix Design Number	

Form 2. Sample Construction Inspection Checklist

FIRST LOAD INFORMATION PRIOR TO PLACEMENT TO CONFIRM SPEC MATERIAL					
AMBIENT TEMP:	BATCH TIME	TIME LOAD ARRIVED ON SITE	SLUMP:	DRYING SHRINKAGE (CLASS D) IF REQUIRED	MIX TEMP:

	ACCEPTED Y/N	DATE	REMARKS Y/N
Does the contractor have two or more vibrators available for each 8 c.y. placed per hour (03300, para 3.1B.2)			
Is the air temperature above 40 °F and below 90 °F? (03300, para 2.9d)			
Maximum time to discharge concrete: Above 90° - 60 minutes (03300, para 2.9d)			
Maximum time to discharge concrete: 70° to 90° - 60 minutes(03300, para 2.9d)			
Maximum time to discharge concrete: 40° to 69° - 90 minutes(03300, para 2.9d)			
Maximum time to discharge concrete with a superplasticizer - 90 minutes (0330, para 2.9d)			
Do conditions require the hot or cold weather protection measures? (03300, para 2.2C.9)			
Is the concrete being finished to the required texture as outlined under (03300, para 3.1B.4)			

POST - PLACEMENT			
IF NOT APPLICABLE, NOTE "N/A"	ACCEPTED Y/N	DATE	REMARKS Y/N
Has the Contractor left the forms in place the proper number of days and until the specified strength was achieved? (03300, para 3.1F)			
Is burlap and polyethylene placed as soon as possible after the concrete placement? (03300, para 3.1C.2a.2)			
Is the concrete surface being kept wet throughout the seven day period? (03300, para 3.1C.2a.1)			
Prior to striping, does the contractor have time and cylinder breaks? (03300, para 4.1A.1)			
Is the appropriate finish being applied to the concrete surface? (03300 para 3.1A.6)			
Have the rock pockets, honeycombs, and other blemishes been repaired? (03300, para 4.1B.2)			
NON CONFORMANCE REPORT?	No	N/A	Report No.

COMMENTS ON BACK ☐

INSPECTOR'S SIGNATURE

Form 3. Sample CDM Submittal Form

CDM

11373 Lower Sacramento Road
Lodi, CA 95242

Phone: 209-365-4631
Fax: 209-365-4639

SUBMITTAL
NO. PL-02610-001
PACKAGE NO: PL-002

TITLE:	Permalok Steel Casing Pipe	**REQUIRED START:**	
PROJECT:	Stockton DWSP	**REQUIRED FINISH:**	10/30/2009
DRAWING:		**DAYS HELD:**	19
STATUS:	NEW	**DAYS ELAPSED:**	19
BIC:	CCI	**DAYS OVERDUE:**	10

RECEIVED FROM	SENT TO	RETURNED BY	FORWARDED TO
VADNAIS RVO			

Revision No.	Description/Remarks	Received	Sent	Returned	Forwarded	Status	Sepias	Prints	Drawing Date	Held	Elapsed
A	Permalok Steel Casing Pipe	10/21/2009				NEW	0	0		19	19

Form 4. Reworkable Discrepancy/Non Conformance Report

RDR/NCR NUMBER:	**CATEGORY** RDR ☐ NCR ☐	**SUBCONTRACTOR/CONTRACTOR NAME:**
DWG. NO.	**SPEC NO.**	**LOCATION:**

DESCRIPTION OF THE DISCREPANCY OR NONCONFORMANCE:

INITIATOR SIGNATURE: **DATE:**

DISPOSITION/CORRECTION: (Contractor Responsibility)

CATEGORY RDR: Rework: ☐ Scrap ☐ **CATEGORY NCR:** Use-As-Is: ☐ Repair: ☐

Description of measures taken to correct item: (Contractor Responsibility

Design Engineer of Record Signature/Date (if Category NCR):

Responsible Superintendent/ACM Signature/Date (if Category RDR):

CORRECTIVE ACTION REQUIRED: (To be completed by CDM CQCM Only) YES ☐ NO ☐

DESCRIPTION OF CORRECTIVE ACTION REQUIRED TO PREVENT RECURRENCE OF NONCONFORMANCE:

CDM Quality Manager Signature/Date:

ACTION VERIFIED AND RDR OR NCR CLOSED:

Verifying Inspector Signature/Date:

Responsible Superintendent/ACM Signature/Date: **CQC Manager Signature/Date:**

Form 5. Quality Control Surveillance Report

SURVEILLANCE REPORT	TYPE OF OBSERVATION: ☐ OBSERVATION ☐ NONCOMPLIANCE	SURVEILLANCE DATE:	STAGE OF WORK ☐ INPROCESS ☐ COMPLETE

INSPECTION CHECKLIST, SPECIFICATION, OR DRAWING USED AS REFERENCE: (CDM to Provide)

DESCRIPTION OF ITEM/WORK OBSERVED: (CDM to Provide)

FINDING: (CDM to provide)

PERSON NOTIFIED OF OBSERVATIONS NOTED: (CDM to provide)

NAME______________________________**TITLE**__________________________

SUBCONTRACTOR ____

CORRECTIVE ACTION TAKEN: (Subcontractor to Provide)

VERIFICATION OF CORRECTIVE ACTION TAKEN: (CDM to Provide)

FINAL ACCEPTANCE SIGNATURES

INITIATOR:____________________________________**DATE:**________________

QUALITY MANAGER:______________________________**DATE:**________________

Form 6. Sample CDM Request for Information Form

CDM

REQUEST FOR INFORMATION
No. 00001

11373 Lower Sacramento Road
Lodi, CA 95242

Phone: 209-365-4631
Fax: 209-365-4639

TITLE:	Pass Hole Detail	**DATE:**	10/21/2009
PROJECT:	Stockton DWSP	**JOB:**	CDM 61585
TO:	Attn: Robert L. Allen		
	Camp Dresser & McKee Inc.		
	100 Pringle Avenue, Suite 300	**STARTED:**	
	Walnut Creek, CA 94596	**COMPLETED:**	
	Phone: 925-296-8038	**REQUIRED:**	10/23/2009

QUESTION:

As previously discussed and approved.

Please confirm your approval of the use of 4" 3000# 1/2 couplings for the Pass Holes for the Ameron Mainline pipe.

ANSWER:

Mark,

Looks good to me. I have seen a steel threaded cap backwelded for a leak-tight seal work very effectively for hand holes on previous projects.

Requested By: CDM Constructors Inc.

Date: 10/21/2009

Signed: ______________________
Mark. R. Andrews

Form 7. Sample Daily Report

CDM

11373 Lower Sacramento Road
Lodi, CA 95242

Phone: 209-365-4631
Fax: 209-365-4639

DAILY REPORT
No. KV006

COMPANY: CDM Constructors Inc. **DATE:** 10/30/2009

REPORT PERIOD: Daily **DAY:** Friday

PROJECT: Stockton DWSP **JOB:** CDM 61585

TEMPERATURE: 80-90 **PRECIPITATION:** None **SKY:** Clear **WIND:** 40-50

ACTIVITY

Office trailers were delivered to the site by mobile modular. The set up was started on the City's quad complex. Power plus formed and placed the concrete for the Temp.

Certified By: CDM Constructors Inc. **Date:** 11/9/2009

Signed: ______________________
Chad E. Brown

Form 8. QC Specialist Inspection Report.

QC SPECIALIST INSPECTION REPORT		DATE
CONTRACT NO	TITLE AND LOCATION	REPORT NO
CONTRACTOR	SPECIALTY INSPECTOR	

WORK INSPECTED/OBSERVED TODAY

Schedule Activity No.	WORK LOCATION AND DESCRIPTION	EMPLOYER	TRADE

Schedule Activity No.	LIST SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED

EQUIPMENT/MATERIAL RECEIVED TODAY TO BE INCORPORATED IN JOB (INDICATE SCHEDULE ACTIVITY NUMBER)

Schedule Activity No.	Submittal #	Description of Equipment/Material Received

INSPECTION ACTIVITIES OF WORK ACTIVITIES LISTED ABOVE

Schedule Activity No.	INSPECTION ACTIVITIES

Schedule Activity No.	REMARKS

INCLUDE ALL PERSONNEL WORK HOURS IN THE WORK PERFORMED SECTION ON THIS SHEET INTO THE FRONT CONTRACTOR PRODUCTION REPORT

Signed:

Form 8. QC Specialist Inspection Report.

QC SPECIALIST INSPECTION REPORT (CONTINUATION SHEET) (ATTACH ADDITIONAL SHEETS IF NECESSARY)	DATE	Date (DD/MMM/YY)
	REPORT NO.	Enter Rpt # Here

PHASE	CONTRACT NO	Enter Cnt# Here	CONTRACT TITLE	Enter Title and Location of Construction Contract Here

FOLLOW-UP

WORK COMPLIES WITH CONTRACT AS APPROVED DURING INITIAL PHASE?	YES	☐	NO	☐
WORK COMPLIES WITH SAFETY REQUIREMENTS?	YES	☐	NO	☐

Schedule Activity No.	Description of Work, Testing Performed & By Whom, Definable Feature of Work, Specification Section, Location and List of Personnel Present

REMARKS (Also Explain Any Checklist Item From Above That Was Answered "NO"), Manuf. Rep. On-Site, etc.

Schedule Activity No.	Description

Form 9. Receiving Inspection Report

Purchase Requisition No: ____________________ Date Ordered/Received: ____________________

Document Catalog No.: ____________________ Ordered By: ____________________

Description of Material: ____

Note: Receiving inspection performed by the purchase requisition requester shall be documented using the checklist criteria to the extent it is applicable to the item or material purchased. Results shall be evidenced by a check mark (✓) in the appropriate ***"NA/Accept/Reject/Yes/No Box"***.

Receipt Inspection Checklist Criteria	N/A	Accept	Reject
1. Verify item/material received is correct per the purchase documents.			
2. Visually inspect received condition for shipping damage.			
3. Verify quantity, dimensions, identification, and markings are correct.			
4. Review quality assurance requirements and verify quality clause conformance for the following:			
• Certifications required by the purchase requisition are correct/complete /authenticated.			
• Inspection and test records conform to manufacturers published data.			
• Item/Component Marking/Serialization is traceable to test data.			
• Limited Shelf Life Material is marked with applicable expiration date.			
• Certified Material Test Reports (CMTRs) were included.			
5. Manufacturers Certificate of Conformance identifies the following, as a minimum:			
• Materials or equipment traceability to the purchase requisition requirements.			
6. Verify all deliverables (documents only) meet the minimum requirements.			

Remarks:

Deficiency Closed ☐ Yes ☐ No Date:__________ Comments: ____________________

Placed in Storage ☐ Yes ☐ No ☐ N/A Location:

Verification of Inspection:

I have verified that this receipt inspection was properly conducted and the items and/or material meets requirements as identified in the appropriate purchase requisition (Confirmed by).

Received by: ______________________________ Quality Inspector ______________________________

print name, then sign (Date) print name, then sign (Date)

Form 10. Sample Inspection and Testing Data Control Log

City of Stockton
Delta Water Supply Project
Water Treatment Plant and Pipelines
Inspection and Testing Data Control Log

Contract Number:

Contractor: CDM

Specification Section and Paragraph Number	Schedule Activity ID	Test Required	Accredited/Approved Lab		Sampled By	Tested By	Location of Test		Date Completed	Date Forwarded to CDM Field Office	Remarks
			Yes	No			On-Site	Off-Site			

Form 11. Preparatory Phase Meeting Checklist

PREPARATORY PHASE MEETING CHECKLIST		SPEC SECTION Enter Spec Section # Here	DATE Enter Date (DD/MMM/YY)
CONTRACT NO Enter Cnt# Here	DEFINABLE FEATURE OF WORK Enter DFOW Here	SCHEDULE ACT NO. Enter Sched Act ID Here	

PERSONNEL PRESENT

CITY OF STOCKTON REP NOTIFIED _____ HOURS IN ADVANCE: YES ☐ NO ☐

NAME	POSITION	COMPANY/CM

PROCEDURE COMPLIANCE

IDENTIFIY FULL COMPLIANCE WITH PROCEDURES IDENTIFIED AT PREPARATORY. COORDINATE PLANS, SPECIFICATIONS, AND SUBMITTALS.

COMMENTS: ____________________

PRELIMINARY WORK

ENSURE PRELIMINARY WORK IS COMPLETE AND CORRECT. IF NOT, WHAT ACTION IS TAKEN?

WORKMANSHIP

ESTABLISH LEVEL OF WORKMANSHIP.

WHERE IS WORK LOCATED? ____________________

IS SAMPLE PANEL REQUIRED? YES ☐ NO ☐

WILL THE INIITAL WORK BE CONSIDERED AS A SAMPLE? YES ☐ NO ☐

(IF YES, MAINTAIN IN PRESENT CONDITION AS LONG AS POSSIBLE AND DESCRIBE LOCATION OF SAMPLE) ____________________

RESOLUTION

RESOLVE ANY DIFFERENCES.

COMMENTS: ____________________

CHECK SAFETY

REVIEW JOB CONDITIONS USING APPLICABLE SAFETY REGULATIONS AND ACTIVITY HAZARD ANALYSIS

COMMENTS: ____________________

OTHER

OTHER ITEMS OR REMARKS

____

QC MANAGER DATE

Form 12. Initial Phase Checklist

INITIAL PHASE CHECKLIST (CONTINUED ON SECOND PAGE)		SPEC SECTION Enter Spec Section # Here	DATE Enter Date (DD/MMM/YY)
CONTRACT NO Enter Cnt# Here	DEFINABLE FEATURE OF WORK Enter DFOW Here	SCHEDULE ACT NO. Enter Sched Act ID Here	

PERSONNEL PRESENT

CITY OF STOCKTON REP NOTIFIED #HRS HOURS IN ADVANCE: YES ☐ NO ☐

NAME	POSITION	COMPANY/AGENCY

SUBMITTALS

REVIEW SUBMITTALS AND/OR SUBMITTAL REGISTER. HAVE ALL SUBMITTALS BEEN APPROVED? YES ☐ NO ☐

IF NO, WHAT ITEMS HAVE NOT BEEN SUBMITTED? ______

ARE ALL MATERIALS ON HAND? YES ☐ NO ☐

IF NO, WHAT ITEMS ARE MISSING? ______

CHECK APPROVED SUBMITTALS AGAINST DELIVERED MATERIAL. (THIS SHOULD BE DONE AS MATERIAL ARRIVES.)

COMMENTS: ______

MATERIAL STORAGE

ARE MATERIALS STORED PROPERLY? YES ☐ NO ☐

IF NO, WHAT ACTION IS TAKEN? ______

SPECIFICATIONS

REVIEW EACH PARAGRAPH OF SPECIFICATIONS. ______

DISCUSS PROCEDURE FOR ACCOMPLISHING THE WORK. ______

CLARIFY ANY DIFFERENCES. ______

PRELIMINARY WORK & PERMITS

ENSURE PRELIMINARY WORK IS CORRECT AND PERMITS ARE ON FILE.

IF NOT, WHAT ACTION IS TAKEN? ______

Form 12. Initial Phase Checklist

INITIAL PHASE CHECKLIST (CONTINUED FROM FIRST PAGE)		SPEC SECTION Enter Spec Section # Here	DATE Enter Date (DD/MMM/YY)
CONTRACT NO Enter Cnt# Here	DEFINABLE FEATURE OF WORK Enter DFOW Here	SCHEDULE ACT NO. Enter Sched Act ID Here	INDEX # Enter Index# Here

TESTING

IDENTIFY TEST TO BE PERFORMED, FREQUENCY, AND BY WHOM.

WHEN REQUIRED?

WHERE REQUIRED?

REVIEW TESTING PLAN.

HAS TEST FACILITIES BEEN APPROVED?

SAFETY

ACTIVITY HAZARD ANALYSIS APPROVED? YES ☐ NO ☐

REVIEW APPLICABLE PORTION OF EM 385-1-1.

MEETING COMMENTS

COMMENTS DURING MEETING.

OTHER ITEMS OR REMARKS

OTHER ITEMS OR REMARKS:

QC MANAGER DATE

Form 13. Sample Design Change Notice Form

Design Change Notice

Project Name: Delta Water Supply Project	DCN Number__________ Date:______
Customer: City of Stockton	Location: Stockton California
Proposed Design Change Details:	
Issued By:____ (EOR) Print Name and Title_____________________________________	Date:_______________
Change Implementation Details: New Plans are/will be issued by Engineering ☐ Construction Manager to as-built this change ☐	
Design Change Notice Approval: Approved By:__________________________ Deputy PM-Design Approved By:__________________________ City Engineer (optional)	Date:____________ Date:____________

Construction Management Actions:

Subcontracts affected:	
Cost Impact yes ☐ no ☐	Schedule Impact yes ☐ no ☐
Request an estimate from the Subcontractor? yes ☐ no ☐	
ACM Signature:	Date:

Appendix 6

Design-Build Work Review Procedures

APPENDIX 6

DESIGN-BUILD WORK REVIEW PROCEDURES

6.1 PURPOSE

The purpose of this Appendix is to set forth the procedures for the Owner's review of each aspect of the Design-Build Work to verify that the Project has been designed and constructed in accordance with the Design and Construction Requirements set forth in Appendix 2, the General Design-Build Work Requirements set forth in Appendix 4, and the terms and conditions of the Design-Build Agreement.

6.2 PARTNERING SESSION and INITIAL MEETING

Within thirty (30) days after the Contract Date, two consecutive one-day meetings will be held. The first day, a conference attended by Design-Builder, the Owner, and others shall be held with the assistance of a facilitator in order to establish a partnering relationship amongst the parties as to the Design-Build Work. At such conference, the parties shall develop common Project objectives in the form of a partnering charter and shall develop working arrangements for periodic meetings amongst the parties, including subsequent partnering meetings, and for the rapid resolution of issues that may develop. Owner and Design-Builder shall mutually agree on the selection of the Facilitator. The cost of the facilitator and the cost of the meeting facilities for all partnering sessions will be paid for by the Owner. Each party shall be responsible for the travel and living expenses of their employees and their subcontractors or consultants designated to attend the meeting.

On the second day, Design-Builder, the Owner and others shall attend another meeting to discuss the schedules, design issues, applications for payments and other submittals, maintaining required records and Project procedures and community relations.

6.3 DOCUMENT SUBMITTAL PROTOCOL

No later than 30 days following the Contract Date, the Design-Builder shall submit to the Owner a document submittal protocol ("Protocol"). The Protocol shall identify the key document submittal packages to be prepared by the Design-Builder and the expected submittal dates to the Owner. The Protocol shall also identify the frequency of the Design-Builder's design progress meetings during various phases of the design. The Protocol shall require the Design-Builder to submit a minimum of one original and four paper copies of each document submittal with two electronic copies of each submittal on CD disks, to the Owner, the Owner Engineer and the Contract Administrator. The Design-Builder may propose to create a Project web site, accessible to the Owner and its designees, for posting all submittals and other reference information. All major submittals shall be accompanied by a transmittal letter which states the: (i) date; (ii) "Monterey Peninsula Water Supply Project Desalination Infrastructure"; (iii) Design-Builder's name and address; (iv) identification number of each shop drawing, piece of data and sample submitted; and (v) notification of any deviations from the Design and Construction Requirements of Appendix 2.

At a minimum, the Protocol shall require the Design-Builder to include all submittals that are required to obtain the Governmental Approvals and the following Design-Build Work submittals and design package submittals:

A. Design-Build Work Submittals

- Communication Plan
- Vulnerability Assessment
- Manufacturer's warranties, certifications and other data
- Site-specific Health and Safety Plan
- Regulated Substances Management Program
- Emergency/Spill Response Plan
- Monthly Progress Schedule Updates
- Security Plan submittals

B. Design Package Submittals

Design package submittals will be defined in detail in the Protocol submittal. The submittals will be organized in a fashion to best meet the critical schedule requirements of design, permitting and construction activities. A general description of the organization of submittals follows:

1) Technical Submittal #1 (typical of a 15% overall design completion) including the following:
    - A. Draft Design Memorandum/Basis of Design Report;
        1. Following format provided in Appendix 2;
        2. Tabbed sections with concise text, tabular format, equipment schedules
        3. Identify equipment and equipment manufacturers
    - B. Topographic Survey of Site
    - C. Preliminary Site Plan showing structures and roadways
    - D. Preliminary Piping Plan
    - E. Preliminary Building Layouts showing equipment location
    - F. Preliminary P&IDs for Treatment and Pumping Systems
    - G. Hydraulic Profiles for treatment and waste processes
    - H. Electrical Single Line Diagram
    - I. Single Line Diagram for Medium Voltage Power Distribution
    - J. Preliminary Electrical Load Table
    - K. Preliminary Layout of Medium Voltage Switchgear and 480 Volt Switchboards
    - L. Preliminary Electrical Site Plan
    - M. SCADA Architecture Schematic
2) Technical Submittal No. 2 (typical of 30% Overall Design completion)
    - A. Updated versions of items in previous submittal
    - B. Landscaping Plan
    - C. Initial versions of Architectural Plans and Sections
    - D. Initial versions of Structural Plans and Sections
    - E. Preliminary Control Descriptions
    - F. First draft of Specifications for Division 11, 13, and 15

3) Technical Submittal No. 3 – Electrical Design Submittal (Typical of 30% Electrical Design Review)
    A. One Line Power Distribution Riser Diagram
        1. Preliminary sizing based on initial loads
        2. Information dealing with obtaining electrical service
    B. Electrical Site Plan
    C. NEMA Designation Plans for Buildings
    D. Power and Lighting Plans
    E. Initial Electrical Specifications- Division 16
    F. Initial Motor Control Center Elevations and Schedules
    G. Standby Generator Sizing and Interconnection
    H. Initial Power System Study/Analysis
4) Technical Submittal No. 4 (Typical of 60% Overall Design completion)
    A. Updated versions of items in previous submittal
    B. First draft of Specifications
    C. Drawings, specifications, and reports to be submitted for permits
    D. Initial HVAC and Plumbing Drawings
    E. Initial Electrical – Lighting Plans
    F. Operational Narrative
5) Technical Submittal No. 5 –Electrical Design Review (Typical of 60% Electrical Design Completion)
    A. Updated versions of items submitted in previous Electrical Design submittal
    B. Initial Short Circuit and Load Flow Calculations
    C. Preliminary Protective Coordination
        1. Information outlining equipment and design approach
    D. Updated Power System Study/Analysis
6) Technical Submittal No. 6 (Typical of 90% Design completion)
    A. All drawings and specifications
    B. Final Design Memorandum/Basis of Design Report
    C. Drawings, specifications, and reports to be submitted for permits
    D. Final Power System Study/Analysis including Arc Flash Hazard Analysis
7) Technical Submittal No. 7 - Drawings and specifications issued for construction

Electrical Design submittals shall be timely and in compliance with the Power System Study (Short Circuit, Protective Coordination, and Arc Flash Hazard Analysis/Evaluation) identified in Appendix 2.

All submittals shall be carefully reviewed by the Design-Builder prior to submission for review to the Owner, the Owner Engineer and the Contract Administrator. Each submittal shall be dated, signed and certified by the Design-Builder as being correct for the current stage of design completion. All submittals shall have a level of detail such that the Owner and its representatives can confirm compliance with the Design and Construction Requirements. The Owner may return any submittal that does not contain information sufficient for the Owner or its representatives to ascertain compliance with the Design and Construction Requirements. In the event the Owner returns a design submittal to the Design-Builder, the Owner shall notify the Design-Builder of any additional information that will be necessary for the Owner and its representatives to ascertain conformance with the Design and Construction Requirements, and the Design-Builder shall be responsible for making all necessary corrections at its sole cost and expense. Design submittals re-submitted by the Design-Builder shall direct specific attention, in writing or on the resubmitted submittal, to revisions.

Construction activities shall not vary from the final Design Documents submitted to the Owner except where such variations are allowed, subject to the Owner's and applicable Governmental Body's review and approval, in accordance with this Appendix. Adherence to the final Design Documents will be one factor used by the Owner in its review and approval of the Design-Builder's applications for payment during construction.

The Design-Builder shall provide the following design information in the appropriate design package in accordance with the Protocol:

A. Specifications, Design Narratives, and Lists

A. Project design criteria
B. Basis of design report
C. Specifications list
D. Process systems piping line list
E. Process system valve list
F. Electrical loads list
G. Major Equipment list (process, mechanical, electrical, instrumentation and control, support systems, other)
H. Proprietary technology/equipment list
I. Specifications for major equipment
J. Narrative description of the following systems: controls, remote monitoring and operating capability, voice and data communications, and security.
K. Specifications (general requirements, civil, structural, architectural, equipment, specialties, mechanical, and electrical and instrumentation and controls sections)

B. Drawings

A. Cover sheet
B. Drawing index
C. Process flow diagram for all primary and secondary processes
D. Layout of the Project Site
E. Hydraulic profile
F. Major outside piping layout
G. Layout of operations building
H. Project Site master planning layouts
I. Landscape inventory plan
J. Landscape and irrigation plans with landscape details/plant materials list
K. Project Site grading and utility plans, with sections as needed for construction clarity or dimensioning
L. Surface drainage system and features plans and details
M. Erosion control system plans and details
N. Stormwater Retention System plans and details
O. Fire protection and security system plans
P. Project Site sections and details

Q. Process and support facilities general arrangement plans, with sections as needed for construction clarity or dimensioning
R. Piping system plans, sections and details
S. Corrosion control plans and details
T. Major building structure foundation plans and sections
U. Major building and structure floor plans
V. Major building and structure exterior elevations and sections
W. Typical sections through all major wall, roof and floor sections of major buildings and structures
X. Architectural door, window, finish and hardware schedules and details
Y. Architectural renderings
Z. Non-process mechanical systems plans, details and schedules
AA. Electrical site plan
BB. Electrical one line drawing
CC. Electrical point-to-point wiring diagrams
DD. Process and instrumentation diagrams for all primary and secondary processes
EE. SCADA system network drawings
FF. Instrumentation and control system drawings, including loop drawings illustrating the functional elements in the path of the sensor to each control system input/output (ISA S5.4)

6.3.1 Electronic Drawing Submittal Format

All drawings submittals shall be in Portable Document Format (PDF), compliant with the Adobe PDF Specification Version 1.3, or the latest version. Such submittals shall be PDF formatted text and graphics or PDF searchable images. All drawings available in native format (i.e., AutoCAD) shall be provided as electronic files, in a native format supported by available viewers, in addition to in PDF format.

6.4 OWNER REVIEW OF DESIGN-BUILDER DESIGN

6.4.1 Integrated Design Review Procedures

In accordance with the terms and conditions of the Design-Build Agreement, the Owner will review the Design Documents for compliance and consistency with the Design and Construction Requirements, the Owner’s shall have the ability to provide input on all issues including technical, as well as selection of finishes, architectural concept, landscaping, and environmental mitigation. the Owner’s input to the design process shall be solicited by the Design-Builder on an integrated basis as the work is being performed. The Owner will make reasonable efforts to bring staff or representatives with review and decision-making authority to the work sessions as requested and scheduled by the Design-Builder. The Design-Builder shall provide the Owner with advance notice of the work sessions and agenda topics to facilitate the Owner’s scheduling of the appropriate participants for the work sessions.

All design submittals shall comply with the Design and Construction Requirements. Any Design-Builder-requested change to the Design and Construction Requirements (regardless of prior discussion) must be clearly identified by the Design-Builder in its cover letter that transmits the request and must be fully documented with compelling justification of the Design-Builder's request for a change to the Design and Construction Requirements and the benefits to the Owner for consenting to such a change. No change to the Design and Construction Requirements shall be made except with the Owner's approval pursuant to Section 3.10 of the Design-Build Agreement. All proposed deviations from the Design and Construction Requirements shall be clearly identified. The Owner would expect such benefits may include a corresponding reduction in the Fixed Design-Build Price. The Design-Builder shall assume all risks associated with obtaining the Owner approval of any change to the Design and Construction Requirements.

The Owner shall be provided ten (10) Business Days to conduct a meaningful review of the Design Documents for compliance with the Design and Construction Requirements and to determine if any of the Design-Build Work is nonconforming.. The Design-Builder shall solicit the Owner's input to the design process during the design progress meetings and at key stages in the design preparation based on the Protocol. All design calculations shall be made available to the Owner upon request.

The Owner will provide its written comments in a tabular summation as to any concerns, problems, or non-compliance of such submittal. The tabular summation will be on a form created mutually by the Design-Builder and the Owner, with provisions on the form for the Design-Builder's responses. The Design-Builder will provide a written response to the Owner's comments within five Working Days of receipt of the Owner's comments, primarily through use of the tabular summary form, including documentation of responses and agreed upon action items. Design progress meetings will be scheduled as necessary to address review comments and facilitate timely completion of the submittal review. Any outstanding review comments not satisfactorily resolved will be transferred to an issues tracking form by the Design-Builder for subsequent follow-up. Governmental Approval application submittals will be reviewed in accordance with Section 3.11 of the Design-Build Agreement and this Appendix.

6.4.2 Design Progress Meetings and the Preconstruction Meeting

For the purpose of facilitating the design and design review process, the Design-Builder shall schedule design progress meetings with the Owner on a routine basis and at least monthly throughout the design development period in accordance with this Appendix 6. The parties shall schedule and participate in a preconstruction meeting that will be conducted no more than ten (10) days prior to the anticipated Construction Date. Representatives of Governmental Bodies having jurisdiction over the Project may attend such meetings. Design-Builder representatives with responsibility for design, permitting, and construction of the Project will participate in the meetings. the Owner will be appropriately represented by staff or representatives responsible for administering the Design-Build Agreement and monitoring the Design-Build Work in accordance with the Design-Build Agreement. Design progress meetings may coincide with construction progress meetings. The Design-Builder shall maintain an accurate updated submittal log and shall bring this log to each scheduled design progress meeting. The submittal log shall include: (i) submittal description and assigned identification number; (ii) date of submission to the Owner, the Owner Engineer and Contract Administrator.

6.4.3 Design Submittals During Construction

It is anticipated that there could be some re-design or design clarifications needed during construction. This continuing design effort will be subject to the Owner's review for compliance and consistency with the Design and Construction Requirements in the same manner as set forth in subsection 6.4.1 of this Appendix.

Design changes to a particular Design Document performed following the issuance of the Design Document for construction shall be issued under a Design Change Notice ("DCN") process that accurately tracks and documents changes to the design. No later than 30 days prior to initiation of construction, the Design-Builder shall submit to the Owner additions to the document submittal Protocol to include the DCN process. The DCN process shall include provisions for the Owner to be provided with copies of all DCNs in a timely manner to allow review, comment, and, where appropriate, approval in the same manner as set forth in subsection 6.4.1 of this Appendix and in accordance with subsection 6.4.4 of this Appendix. Design clarifications shall be issued in a timely manner using a similar procedure. If a DCN requires a material change from what was reflected in the Governmental Approval applications, the DCN must be approved by the appropriate Governmental Body.

6.4.4 Design Change Authority

The Design-Builder shall be responsible for providing design changes to the Design Documents necessary to complete the Project for its intended purposes. All such changes shall be implemented in accordance with the DCN process described above and in compliance with the Owner's rights under Article III of the Design-Build Agreement. No DCN shall operate to change the Design and Construction Requirements. Any DCN which requests a change to the Design and Construction Requirements shall be subject to the Owner's rights under Sections 3.4, 3.9 and 3.10 of the Design-Build Agreement.

6.4.5 Design Changes Directed by Owner

The procedures to be followed for incorporating design changes directed by the Owner are specified in subsections 3.10(D) and 3.14 of the Design-Build Agreement.

6.5 OWNER REVIEW DURING GOVERNMENTAL APPROVAL PROCESS

The Design-Builder's responsibilities for obtaining and maintaining the Governmental Approvals required for construction of the Project are described in Article III of the Design-Build Agreement. The Owner shall have the right to review and comment on Design-Builder submittals as provided by the Design-Build Agreement and herein. To the extent that Governmental Approval applications include design specifications or drawings that the Owner has not previously reviewed, the Design-Builder shall submit draft copies of the Governmental Approval applications and supporting documents to the Owner in the same manner as described in subsection 6.3.1 of this Appendix for design reviews. For all other Governmental Approval applications, the Design-Builder shall provide draft copies of the applications and supporting documents for Owner review in accordance with Section 3.6 of the Design-Build Agreement.

6.6 OWNER REVIEW DURING CONSTRUCTION

6.6.1 Construction Review Intent

In accordance with the terms and conditions of the Design-Build Agreement, the Owner and its designated representatives, including the Contract Administrator and the Owner Engineer, will have full access to the Project at all times and will periodically review construction activities and participate in construction progress meetings as needed to verify compliance with the Design-Build Agreement. In addition, the Owner will monitor the progress of construction to review and verify all applications for payment covering all construction work performed during the preceding calendar month in accordance with the procedures set forth in Appendix 13. the Owner's review of construction activities shall not extend to means, methods, techniques, sequences, or procedures of construction, or to safety precautions and programs which are all the responsibility of the Design-Builder. It is anticipated that the Owner will have full-time representation at the Project Site throughout construction, start-up and Acceptance Testing.

The Owner's review and involvement in construction activities is intended for the informational purposes of the Owner and to monitor compliance with the Design-Build Agreement. Such activities shall not be viewed as part of the Design-Build Quality Management Plan and shall not limit or otherwise affect the Design-Builder's full responsibility for the performance of the Design-Build Work. The Design-Builder shall provide the Owner with copies of minutes and other documentation produced as a result of any construction progress meeting.

6.6.2 Equipment and Materials Submittals

The Design-Builder shall provide submittals for equipment and materials, shown on the Design Documents prepared by the Design-Builder, in accordance with all procedures and requirements specified in the Contract Standards. Submittals for Project equipment and materials shown or specified in Design Documents prepared by the Design-Builder shall be reviewed and approved by the Engineer-of-Record and shall be provided to the Owner. When making a submittal to the Owner, five copies of the submittal shall be provided. The Design-Builder shall create a secure Project website, accessible to the Owner, for posting all submittals and other reference information. The Owner may reduce the requirements for hard copies of submittals in consideration of access to information on the website. The Design-Builder shall have at least seven (7) working days to review approved submittals.

A list of shop drawings requiring the Owner's review and approval will be defined by the Owner during the preliminary design phase. Detailed procedures for numbering will be outlined at the pre-construction meeting.

Each submittal shall have an identifying title stamp as follows:

Design-Builder
Project Title
Specification Section ___________________
Shop Drawing No. __________ Rev. _____________]

6.6.3 Materials and Equipment Samples

The Design-Builder shall furnish samples of materials and equipment inspected by the Design-Builder if requested by the Owner, the Owner Engineer or Contract Administrator. Such samples shall be delivered to the requesting party at the Project Site. The Design-Builder shall prepay all shipping charges on samples. Materials or equipment for which samples are required shall not be used in the Design-Build Work until reviewed by the Owner. Samples provided pursuant to this subsection shall be of sufficient size and quantity to clearly illustrate the functional characteristics of the product, with integrally related parts and attachment devices and a full range of color, texture and pattern. Each sample shall clearly identify the material or equipment being represented, the place of origin, the name of the producer (if any) and the location in the Project where it will be used. The Design-Builder shall provide a minimum of two samples of each item for which samples are requested, unless otherwise directed by the Owner.

6.6.5 Construction Corrections and Owner Directed Changes

Section 3.15 of the Design-Build Agreement discusses the procedures to be followed for correction of non-conforming Design-Build Work and for instituting changes and additions to such work.

6.6.6 Construction Photographs and Audio-Video Records

The Design-Builder shall employ a professional photographer and videographer to record digital construction record photographs weekly and color digital audio/video pre- and post-construction records during the course of construction of the Project. Photographs and videography shall be taken in conformance with this subsection and shall be furnished to the Owner with each application for payment. The photographs and videography shall be a factual presentation of the condition and progress of the construction of the Project. Photographs and videography shall be taken at each of the major areas of construction of the Project and shall comply with the following requirements:

A. <u>Views and Quantities</u>

A. Existing Project Site conditions before Design-Builder site work is started. The number of views shall be adequate to cover the Project Site.

B. Five views of the overall Project, on a weekly basis, clearly showing the construction of the Project that is in progress.

C. Each group of weekly photographs shall include at least two photographs taken showing the same overall view as was taken during the previous week's photographs.

D. The Design-Builder shall consult with the Owner for instructions concerning the required views.

E. The Design-Builder shall provide the Owner with two image CD disks (containing the photographs in JPEG or BMP format) with each application for payment.

F. The Design-Builder shall provide bi-monthly color aerial photographs.

B. <u>Videography Required</u>

The Design-Builder shall prepare a color digital audio/video record of all the areas to be affected by construction prior to beginning any construction, and at Substantial Completion. The initial digital audio/video record shall be done one week prior to placement of materials or equipment on the Project Site. Prior to mobilization at the site, furnish to the Owner a CD or DVD recording of all planned construction areas, material storage areas, areas adjacent to these areas, including but not limited to, streets, driveways, sidewalks, curbs, ditches, fencing, railing, visible utilities, retaining structures and adjacent building structures. The purpose of the recording is to document existing conditions and to provide a fair measure of required restoration. Care should be taken to record all existing conditions which exhibit deterioration, imperfections, structural failures or situations that would be considered substandard.

The recording shall be performed by a professional firm specializing in audio-video work. The tapes shall be high quality, color and in a digital format. Temporary lighting shall be provided as necessary to properly tape areas where natural lighting is insufficient (indoors, shadows, etc.). The recording shall include an audio soundtrack to provide the following information:

- detailed description of location being viewed referenced to Design Documents (ie. station no., building designation, pipeline route etc.)
- direction (N, S, E, W, looking up, looking down, etc.) of camera view
- date, time, temperature, environmental conditions at time of taping.

Any areas not readily visible by the recording shall be described in detail. Unless otherwise approved by Owner, recording shall not be performed during inclement weather or when the ground is covered partially or totally with snow, ice, leaves, etc.

Prepare and provide as many CD/DVD as are necessary to satisfy the requirements of this section. The original recording shall be submitted to the Owner accompanied by a detailed log of the contents of each CD/DVD. The recording will be maintained by the Owner during construction and may be viewed at any time upon request. Upon final acceptance, the recording will become the permanent property of the Owner.

C. <u>Digital Photographs and Audio/Video Records</u>

- Digital images shall be color, high resolution and sharpness, maximum depth-of- field with minimum distortion. Cameras utilized for such images shall be professional digital models capable of High Definition recording.

- The audio/video recordings shall be in NTSC DVD +R format for easy viewing on standard DVD players.
- Each CD/DVD and image shall be identified on the CD/DVD, listing the following:
  1. Name of Project: "Monterey Peninsula Water Supply Project Desalination Infrastructure"
  2. Orientation of view
  3. Description of image
  4. Date image was taken
- To preclude the possibility of tampering or editing in any manner, all video recordings shall, by electronic means, generate and display continuously and simultaneously on the screen digital information to include the date and time of recording. The time information shall consist of hours, minutes and seconds, separated by colons (i.e., 10:35:18).
- The rate of speed in the general direction of travel of the conveyance used during digital videography shall be controlled to provide a usable image. Panning rates and zoom-in, zoom-out rates shall be controlled sufficiently such that playback will produce clarity of the object viewed.
- All digital audio/video records shall be done during times of good visibility. No digital audio/video records shall be done during periods of visible precipitation, unless otherwise authorized by the Owner.

6.6.7 Resident Project Representation

The duties, responsibilities and limitations of authority of the Resident Project Representative shall be as follows:

A. General

The Resident Project Representative (RPR) is Owner's agent at the site, will act as directed by and under the supervision of Owner.

B. Duties and Responsibilities of RPR

1. Conference and Meetings: Attend meetings with Design-Builder, such as preconstruction conferences, progress meetings, job conferences and other Project-related meetings.

2. Liaison: Serve as Owner's liaison with Design-Builder working principally through Design-Builder's superintendent and assist in understanding the intent of the Design-Build Agreement; and assist the Owner in serving as liaison with Design-Builder when Design-Builder's operations affect Owner's on-site operations.

3. Shop Drawings and Samples: Advise Owner and Design-Builder of commencement of any Work requiring a Shop Drawing or sample if the submittal has not been approved by Design-Builder's design professional or Owner.

4. Review of Work, Rejection of Defective Work, Inspections and Tests:

a. Conduct on-site observations of the Design-Build Work in progress to assist Owner in determining if the Design-Build Work is in general proceeding in accordance with the Design-Build Agreement.

b. Report to Owner whenever RPR believes that any Work is unsatisfactory, faulty or defective or does not conform to the Design-Build Agreement, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made.

c. Verify that tests, equipment and systems startup and operating and maintenance training are conducted in the presence of appropriate personnel, and that Design-Builder maintains adequate records thereof.

5. Modifications: Consider and evaluate Design-Builder's suggestions for modifications in Drawings or Specifications and report with RPR's recommendations to Owner. Transmit to Design-Builder decisions as issued.

6. Payment Requests: Review applications for payment with Design-Builder for compliance with the established procedure for their submission and forward with recommendations to Owner, noting particularly the relationship of the payment requested to the schedule of values, Work completed and materials and delivered at the site but not incorporated in the Design-Build Work.

7. Completion:

a. Before Owner issues a certificate of Substantial Completion, submit to Design-Builder a list of observed items requiring completion or correction.

b. Conduct final inspection in the company of Owner and Design-Builder and prepare a final list of items to be completed or corrected.

c. Observe that all items on final list have been completed or corrected and make recommendations to Owner concerning acceptance.

C. Limitations of Authority

The Resident Project Representative:

1. Shall not authorize any deviation from the Design-Build Agreement or substitution of materials or equipment unless authorized by Owner.

2. Shall not exceed limitations of Owner's authority as set forth in the Agreement or the Design-Build Agreement.

3. Shall not undertake any of the responsibilities of Design-Builder, subcontractors or Design-Builder's superintendent.

4. Shall not issue directions relative to, or assume control over, any aspect of the means, methods or techniques of construction unless such directions or control are specifically required by the Design-Build Agreement.

Appendix 7

Acceptance Test Procedures and Requirements

[NOTE: Appendix under review.]

Appendix 7

Acceptance Test Procedures and Requirements

SECTION 7.1. PURPOSE AND OBJECTIVES

The purpose of the Acceptance Test is to demonstrate that the Project complies with the performance and reliability requirements of the Design-Build Agreement, including the Design and Construction Requirements in Appendix 2 and all other applicable Contract Standards. The following steps are required for Acceptance:

1) Equipment and System Startup Testing and Commissioning, including the Initial Plant Performance tests ("IPPT") (described in Appendix 4), which is prerequisite to the following two steps;
2) Run-In Plant Performance Tests ("RIPPT"), fourteen (14) day duration (described in Appendix 4), which is a prerequisite to Acceptance Testing;
3) Acceptance Testing, sixteen (16) day duration, described below in this Appendix.

Equipment and System Testing, which precedes RIPPT, is designed to test individual pieces of equipment and systems to be sure each component operates appropriately over the full range of operating conditions. The RIPPT is designed to demonstrate that all equipment, systems, and other elements of the Project function properly on a continuous basis as a complete unified facility prior to initiation of Acceptance Testing. Acceptance Testing is designed to demonstrate continuous stable operation of the Design-Build Improvements at both the rated capacity and the maximum capacity.

Throughout both the RIPPT and the Acceptance Testing, the Design-Builder shall be required to comply the applicable requirements of CDPH and other Governmental Bodies.

SECTION 7.2. ACCEPTANCE TESTING

Acceptance Testing shall be conducted over a sixteen (16) day continuous period. The objective of Acceptance Testing is to demonstrate continuous stable operation of the Design-Build Improvements. Testing shall demonstrate that the facility is able to produce Finished Water that is in compliance with all Applicable Law water quality standards as well as the Additional Finished Water Quality Standards and Requirements listed in this Appendix and Appendix 2. Acceptance Tests shall be conducted at the rated capacity for all but two days when testing shall be conducted at the maximum capacity.

The Acceptance Test data collection locations, frequency, accuracy, measurement conditions, detection levels, and format of presentation, reporting and recordkeeping shall be consistent with meeting all requirements of all applicable Governmental Approvals, Applicable Law, and Subcontractor and equipment vendor warranties.

For the purpose of Acceptance Testing, the following definitions for Off-Specification Water and Unacceptable Water shall apply:

- **"Off-Specification Water"** means Finished Water that does not strictly conform to the Finished Water Quality Acceptance Standards and Requirements in every respect and to any extent whatsoever, particularly with regard to the Additional Finished Water Quality Acceptance Standards and Requirements, but is still considered potable under Applicable Law. Off-Specification Water does not include Unacceptable Water.

- **"Unacceptable Water"** means water produced by the Design-Build Improvements that do not comply with the Finished Water Acceptance Standards and Requirements (subsection 7.2(D) of this Appendix) to such an extent that it (1) is non-potable under Applicable Law; (2) presents a risk to public health or safety; or (3) has the potential to damage or destroy Owner property or private property or create a need to clean, repair, replace or restore any such property.

(A) Preconditions for Acceptance Testing

Acceptance Testing will begin following successful completion of the RIPPT. The Design-Builder shall certify that the following preconditions have been met prior to beginning Acceptance Testing of the Design-Build Improvements and all system:

- The Design-Builder shall have completed the requirements of Section 4.3 of the Design-Build Agreement.

- The Design-Builder shall have successfully completed both the Equipment and System Testing and the RIPPT described in Appendix 4.

- The Design-Builder shall have obtained the Owner's approval of the Acceptance Test Plan, requirements of which are discussed below in subsection (B).

- The Design-Builder shall have trained the Owner's staff to operate the Design-Build Improvements, as described in Appendix 4 (General Design Build Work Requirements) and Article 4 of the Design-Build Agreement.

- The Design-Builder shall have received written notice from the Owner that the MPWSP—slant wells and Raw Water pump station, all pipelines, and ancillary facilities—has been completed and is ready to provide Raw Water at the capacity required for the Acceptance Test, receive Finished Water, and discharge brine and other waste streams.

- All Utilities specified or required under the Design-Build Agreement are connected and functioning properly.

- The Design-Builder shall have met with the Owner at least 60 days prior to the Scheduled Acceptance Test to provide a forecast of expected Finished Water production and delivery, and described the intended management of Finished Water and Off-Specification Finished Water.

(B) Acceptance Test Plan

The Design-Builder shall prepare an Acceptance Test Plan that outlines in detail the procedures and requirements for all Acceptance Testing, and provides the necessary checklist and forms for performing and tracking this work. The Acceptance Test Plan shall be submitted to the Owner for review and approval, at least 180 days before the planned commencement date for the Acceptance Test, in accordance with Article 4 of the Design-Build Agreement. The Acceptance Test Plan shall describe all operating procedures, clearly indicating that all equipment and systems shall be operated as intended within established operating boundaries as defined in Appendix 2. All Acceptance Tests shall be conducted at the facility's rated capacity, except for two days (48 hours) when testing shall be conducted at the facility's maximum capacity (as defined in Appendix 2).

The Acceptance Test Plan shall include the following information:

- Proposed Acceptance Test schedule.
- All Governmental Body monitoring requirements needed for obtaining a New Domestic Water Supply Permit.
- Procedures and operating conditions for Acceptance Testing of all facilities, equipment and systems.
- List of all parameters to be monitored and measurements to be made—including water quality, flow rates, and pressures—along with sampling/monitoring frequencies, in addition to the minimum water quality monitoring requirements set forth in Tables A7-1 through A7-6, presented in Attachment 1 to this Appendix.
- A proposed schedule for the number of pretreatment filters and membrane trains to operate at a time, as operations work toward continuous Raw Water flow necessary to produce the facility's rated capacity. Facility operation at flow rates less than the rated capacity shall not be included in the 16 days of Acceptance Testing.
- Identification of the State certified laboratory that will perform water quality analyses. The laboratory selected by the Design-Builder to analyze samples during Acceptance Testing shall be experienced in analyzing ocean water matrix samples. As discussed in Attachment 1 of this Appendix, the selected laboratory shall provide references and contact information for its experience analyzing ocean water matrix samples. The laboratory selected by the Design-Builder shall be subject to the approval of CDPH and the Owner.
- Standard methods proposed for all on-site chemical analyses and QA/QC plan for ensuring the accuracy of the measurements.
- SCADA system monitoring and control functions with a list of real-time data fields that shall be captured during Acceptance Testing.
- List of all necessary permanent and temporary monitoring and testing equipment needed to support the Acceptance Tests. The equipment shall be functioning and on-site at the start of Acceptance Testing.
- Instrument calibration procedures.

- Forms for tracking chemical consumption, power consumption, energy recovery.
- Forms for tracking individual unit process performance.
- Protocols for comparing collected data with Acceptance Standards and Requirements, defined in subsection (D) of this Section of this Appendix.
- Procedures for conducting tracer tests through the clearwell, in accordance with CDPH requirements, over the range of Owner anticipated flow rates to determine baffle factors and applicable T_{10} for calculating disinfection credit through the clearwell if a baffling factor was not automatically granted and a tracer test is required by CDPH. If required, tracer testing may be performed prior to Acceptance Testing.
- Acceptance Test report outline.

(C) Performing Acceptance Test and Monitoring Requirements

The Design-Builder shall provide the Owner with at least 30 days prior written notice of the expected start of the Acceptance Test, in accordance with the requirements of Article 4 of the Design-Build Agreement. The Design-Builder shall be responsible for providing all personnel necessary to supervise the plant operation during Acceptance Testing and to_document the testing results. The Owner will operate the Project during the Acceptance Testing. At all times during Acceptance Testing, the Finished Water shall be in compliance with all Applicable Law standards as well as the Additional Finished Water Quality Standards and Requirements listed in this Appendix and Appendix 2.

Acceptance Testing shall achieve successful operation and shall meet all Acceptance Standards and Requirements throughout the continuous 16 days, 24 hours per day, Acceptance Test period. If any equipment, subsystem or system malfunctions during the 16-day period, the item or equipment shall be repaired and the test resumed. Credit towards meeting the 16 day test will be given for the elapsed time before the malfunction, as long as the system operates without malfunction continuously for at least eight (8) days. The testing period shall be restarted at time zero, with no credit given for the elapsed time before the malfunction if either of the following occur: (1) less than eight (8) days has elapsed between the time of beginning the 16-day test period and the time of the malfunction, or (2) any subsystem or system malfunctions more than twice during the 16-day Acceptance Test period. The Finished Water produced during Acceptance Testing must be in compliance with Applicable Law water quality standards and with the Additional Finished Water Quality Standards and Requirements defined in this Appendix and Appendix 2, at all times. If the Finished Water is out of compliance with any of these water quality Acceptance Standards and Requirements, the testing period shall be restarted at time zero, with no credit given for the elapsed time of Acceptance Testing.

Acceptance Testing shall be conducted at the facility's rated capacity, except for two days (48 hours) of testing at the facility's maximum capacity. Facility operations at flows less than the rated capacity shall not by included in the 16 days of Acceptance Testing.

Acceptance Testing shall demonstrate that each system is able to comply with all performance Acceptance Standards and Requirements defined either in Section (D) of this Appendix or as established during design and equipment selection and described in the forms in Appendix 2 (Design and Construction Requirements) and this Appendix. Performance requirements shall including chemical consumption, electricity utilization, desalination system recovery and salt rejection over a range of temperatures, water production, waste stream flows, finished water stabilization, and final disinfection. The Design-Builder shall operate all Systems in a manner that does not require any extraordinary operational effort[1] or maintenance effort when operated at the ratings established by the equipment manufacturer or designer for the equipment throughout the entire duration of the Acceptance Test. For the RO system in particular, cartridge filter replacement or CIP operation shall not be performed during Acceptance Testing unless required for operational reasons in order to maintain conformance with manufacturer's recommendations for equipment operation.

Minimum monitoring requirements for Acceptance Testing are discussed for the following Project systems in Attachment 2 of this Appendix:

a) Seawater Intake System
b) Pretreatment Filtration System
c) Reverse Osmosis / Energy Recovery / Brine Discharge System
d) UV System
e) Post-treatment Stabilization System
f) Final Disinfection / Finished Water Pumping System
g) Waste Backwash and Recycle System
h) Chemical Storage and Delivery System

At a minimum, the monitoring plans for these systems shall include: chemical consumption, water quality throughout the facility, all process and waste stream flows, and pressures at relevant locations throughout the treatment train. Minimum monitoring requirements are discussed in Attachment 2 of this Appendix. The Design-Builder shall be responsible for ensuring the monitoring plan and all associated tracking forms are complete for ensuring successful operation and performance of the Project throughout Acceptance Testing.

Minimum water quality monitoring requirements for each of the Project systems during Acceptance Testing is provided in Tables A7-1 through A7-6, in Attachment 1 to this Appendix. Allowances to be paid by the Owner for water quality analyses during Acceptance Testing are discussed in Appendix 2. The Analytical methods to be used during Acceptance Testing, for all water quality monitoring, are also defined in each of the minimum water quality monitoring requirement tables—Tables A7-1 to A7-6. Analytical methods are stipulated to ensure the Design-Builder uses methods with sufficiently low method detection limit (MDL) to ensure successful performance during Acceptance Testing. All analytical methods used during Acceptance Testing shall be CDPH approved methods. If a particular parameter does not have a method approved by CDPH, methods currently approved by the EPA or contained in the most recent edition of the *Standards Methods Online - Standard Methods for the Examination of Water and Wastewater* shall be used by the Design-Builder subject to approval by CDPH and by the Owner.

[1] Extraordinary operational effort shall be defined as: (1) operation of any equipment outside of the operating conditions envelope recommended by the equipment manufacturer, or (2) the need for any material temporary repairs or for material override of any equipment protective devices to keep equipment running during the Acceptance Test.

(D) Minimum Performance Standards and Requirements for Achieving Acceptance

The Design-Builder shall be responsible for completion of Acceptance Testing in accordance with the Acceptance Test Plan that was prepared by the Design-Builder and approved by the Owner. The purpose of the Acceptance Test is to demonstrate the ability of the Project to satisfy the applicable Acceptance Standards and Requirements for the entire 16-day Acceptance Test period.

This Section of Appendix 7 describes the minimum Acceptance Standards and Requirements that must be met for each Project system and the Finished Water production and Finished Water quality that must be met in order for the Design-Builder to have effectively demonstrated acceptable plant performance. The Acceptance Standards and Requirements consider the following:

General Acceptance Standards and Requirements for Achieving Acceptance:

- Water Production
- Finished Water, Pretreatment Effluent, and Combined RO Permeate Water Quality
- Electricity Utilization
- Brine Stream and Other Waste Stream Flow
- Microbial Removal/Inactivation
- Chemical Consumption
- Permit Compliance

Individual System Acceptance Standards and Requirements for Achieving Acceptance:

- Pretreatment Filtration System
- Reverse Osmosis / Energy Recovery / Brine Discharge System
- UV System
- Post-treatment Stabilization System
- Final Disinfection / Finished Water Pumping System
- Waste Backwash and Recycle System

The following are the minimum Acceptance Standards and Requirements that must be met in order for the Design-Builder to achieve Acceptance (the “Acceptance Standards and Requirements”). Failure to comply with any of the Acceptance Standards and Requirements shall result in the Design-Builder failing the Acceptance Test. The Design-Builder shall refer to Article 4 of the Agreement for failure to achieve acceptance. If Acceptance Testing is restarted because of failure to meet the Acceptance Standards and Requirements, the 16-day testing period shall be restarted at time zero, unless otherwise noted in the following subsections discussing Acceptance Standards and Requirements. The Finished Water produced during Acceptance Testing must be in compliance with all Applicable Law water quality standards and with the Additional Finished Water Quality Standards and Requirements defined in this Appendix and Appendix 2, at all times. If the Finished Water is out of compliance with any of these water quality Acceptance Standards and Requirements, the testing period shall be restarted at time zero, with no credit given for the elapsed time of Acceptance Testing. If the duration of Acceptance Testing is extended to accommodate the Design-Builder’s failure to meet the

Acceptance Standards and Requirements, the Design-Builder shall pay damages in accordance with the Design-Build Agreement.

(a) General Performance Standards and Requirements for Achieving Acceptance

(i) Water Production

During the Acceptance Test, the Design-Build Improvements shall operate for a period of 16 consecutive days (as may be adjusted pursuant to compliance with the minimum Acceptance Standards and Requirements). During the Acceptance Test, the Design-Build Improvements shall produce 9.6 mgd of Finished Water when operated at the design rated capacity and, when operated at the design maximum capacity, shall produce the flow rate corresponding to the maximum capacity that can be treated and delivered with the spare RO train in operation. If the Owner elects the Capacity Reduction Modification, during the Acceptance Test, the Design-Build Improvements shall produce 6.4 mgd of Finished Water when operated at the design rated capacity and, when operated at the design maximum capacity, shall produce the flow rate corresponding to the maximum capacity that can be treated and delivered with the spare RO train in operation. Facility operation at flow rates less than the rated capacity shall subtracted from the required 16 days of Acceptance Testing. Off-Specification Water shall not be counted as acceptable Finished Water produced by the Design-Build Improvements for purposes of this subsection.

(ii) Finished Water, Pretreatment Effluent, and Combined RO Permeate Water Quality

All Finished Water produced by the Design-Build Improvements shall be in compliance with Applicable Law including all enforceable primary and secondary drinking water standards established by CDPH as specified in Title 22 of the California Code of Regulations, all enforceable federal drinking water regulations (e.g., primary maximum contaminant levels (MCLs), pathogen removal and inactivation regulations, disinfection byproduct control regulations) promulgated by the EPA, and all contaminants with a drinking water notification level (NL) established by CDPH which require notification of exceedances as stipulated by State law (Health & Safety Code §116455). In addition, all Finished Water shall be in compliance with the Additional Finished Water Quality Standards and Requirements listed in Table A7-7 of this Appendix and the additional standards for boron and chloride as specified in Table A7-14. Table A7-8 lists the raw water conditions for specified Raw Water quality parameters under which the Design-Builder shall be entitled to relief during Startup and Acceptance Testing. Maximum Raw Water quality conditions, which shall serve as the basis of design for the desalination facility, are summarized in Attachment 2 of Appendix 2.

Table A7-7. Additional Finished Water Quality Acceptance Standards and Requirements[1, 2]

Parameter	Analytical Method	Sampling Frequency	Maximum Average Concentration [3, 4]	Allowed Variance from Maximum Average Concen-tration	Not to Exceed Concen-tration [5]
General and Inorganic					
Total Dissolved Solids (mg/L)	SM 2540C	one grab per day			300
Turbidity (NTU)	EPA 180.1	Continuous	0.5 [6]	NA	1.0
Boron (mg/L) [11]	EPA 200.7	one grab per day	0.5	NA	0.7
Chloride (mg/L) [11]	EPA 300.0	one grab per day	60	NA	100
Bromide (mg/L)	EPA 300.0	one grab per day	0.3	NA	0.5
Sodium (mg/L)	EPA 200.7	one grab per day	35	NA	60
Product Water Stabilization [7]					
Calcium Hardness [8] (mg/L as $CaCO_3$)	SM 2340B	four grabs per day (every 6 hrs)	40 to 100 [12]	± 10%	–
pH [8]	EPA 150.1	Continuous	7.7 to 8.7 [12]	± 0.20	–
Alkalinity, total [8] (mg/L as $CaCO_3$)	SM 2320B	four grabs per day (every 6 hrs)	40 to 100 [12]	± 10%	–
Orthophosphate [8] (mg/L as PO_4)	SM 4500P-E	Calculated daily	Set by Owner within the range of 1.0 to 3.5 mg/L [12]	± 0.3	3.5
Disinfection and Disinfection Byproducts					
Total Chlorine Residual (mg/L) [8]	Amperometric Titration (SM 4500-Cl D or SM 4500-Cl E, as appropriate)	Continuous	Set by Owner for a target of 2 mg/L, within the range of 1.5 to 2.5 mg/L	± 10%	3.5
Trihalomethanes, total (µg/L) [9]	EPA 551.1	one grab per week	40	NA	64
Haloacetic Acids, total of 5 (µg/L) [9]	SM 6251B	one grab per week	30	NA	48

Parameter	Analytical Method	Sampling Frequency	Maximum Average Concentration [3, 4]	Allowed Variance from Maximum Average Concen-tration	Not to Exceed Concen-tration [5]
Total Nitrosamines [9,10] (µg/L)	SM 6450	one grab per week	5	NA	8
Bromate (µg/L)	EPA 317	one grab per week	5	NA	8

[1] The Point of Performance Measurement for all these Finished Water quality parameters is the Finished Water leaving the clearwell that is (a) in compliance with Applicable Law; (b) sufficiently downstream from the last point of chemical addition that affects the parameters being monitored so that the chemical added is uniformly mixed in the Finished Water, and (c) before the first customer as defined by Applicable Law.

[2] At all times during Acceptance Testing, the Finished Water shall be in compliance with all Applicable Laws. Production of Unacceptable Water or Off-Specification Water shall constitute failure of the Acceptance Test. Off-Specification Water, which is still considered potable under Applicable Law, may be pumped into the distribution system. However, Unacceptable Water <u>may not</u> be pumped into the distribution system.

[3] The **average** of the measured concentrations shall be below the Maximum Average Concentration at all times. This footnote <u>does not</u> apply to (a) turbidity or (b) finished water calcium hardness, pH, alkalinity, chlorine residual, or phosphate; separate footnotes apply to these parameters.

[4] Maximum Average Concentration cannot be exceeded during the applicable period, which shall be (i) daily for continuous samples and samples collected every 15 minutes; and (ii) for the duration of the Acceptance Test, for samples collected daily or weekly.

[5] No measurement shall exceed this value, at any time.

[6] Measured values must be less than the “maximum average” concentration 95% of the time.

[7] Then Owner will set the conditions for product water stabilization to minimize corrosion in the existing distribution system.

[8] Finished Water shall be within the “target range” at all times, where the target range is the target concentration set by the Owner, plus or minus the allowed variance.

[9] TTHM, HAA5, and total nitrosamine concentrations shall be determined using the Simulated Distribution (SDS) test method in Standard Methods (Method 5710C). Samples of the Finished Water leaving the clearwell (as described in footnote 1) shall be collected, with no adjustment of chlorine residual or pH, and held at the temperature of the Finished Water at the time of collection (±2ºC) for a 48-hour holding time.

[10] Total Nitrosamines includes the 6 nitrosamine compounds on the EPA’s UCMR2-List 2; NDEA, NDMA, NDBA, NDPA, NMEA and NPYR.

[11] During Acceptance Testing, the Design-Builder must meet additional standards for boron and chloride as specified in Table A7-14.

[12] Compliance with “target range” for calcium hardness, pH, alkalinity, chlorine residual, and phosphate shall be based on ***the median***, rather than the average, of samples taken during the applicable monitoring period.

Performance relief shall be offered for Uncontrollable Circumstances, but applies only during Project Startup and Acceptance Testing. No relief shall be provided for Uncontrollable Circumstances, unless the specified Raw Water conditions persist and cause the Design-Builder a delay in meeting the Scheduled Acceptance Date. If the Design-Builder can demonstrate to the satisfaction of Owner that the duration of Uncontrollable Circumstances has caused the delay in meeting the Scheduled Acceptance Date, the Owner shall provide the Design-Builder cost relief in accordance with Article 9 of the Design-Build Agreement.

The Finished Water shall be in compliance with all Applicable Law Water Quality Standards and with all Additional Finished Water Quality Standards and Requirements stipulated in Table A7-7 at all times during Acceptance Testing, unless the Raw Water quality is out of the range of "typical" anticipated water quality for the specified parameters in Table A7-8 below.

Table A7-8. Specified Raw Water Quality Parameters

Parameter	Raw Water Condition of Relief [1, 5]	Definition of Relief [2, 3]
Boron (mg/L)	> 5.4	Performance Relief on Boron
Bromide (mg/L)	> 110	Performance Relief on Bromide
Chloride (mg/L) [4]	> 21,000	Performance Relief on Chloride
Sodium (mg/L)	> 11,700	Performance Relief on Sodium
Iron, total (mg/L)	> 2	Production Volume Relief
Manganese, total (mg/L)	> 0.2	Production Volume Relief
Salinity (PSS) [5]	> 37	Performance Relief
Temperature (ºC)	< 8ºC or > 20ºC	Production Volume Relief when < 8ºC Performance Relief when > 20ºC
TOC (mg/L)	> 4	Production Volume Relief
Turbidity (NTU)	> 10 NTU	Production Volume Relief

[1] Condition of Relief shall be based on daily average concentrations using the analytical methods specified in Table A7-1 (Minimum Raw Water Quality Monitoring during Acceptance Testing). To claim relief, the daily average shall be based on all measurements taken during that 24-hour period, which shall be a minimum of three measurements, from samples collected a minimum of four (4) hours apart. For parameters measured on a continuous basis, the daily average shall be calculated from measurements taken at intervals of 15 minutes or less.

[2] Performance or production volume relief only shall be provided unless the Uncontrollable Circumstance Raw Water condition persists and causes a delay in meeting the Scheduled Acceptance Date.

[3] Relief is offered from the Additional Finished Water Quality Acceptance Standards and Requirements (Table A7-7) but not from Applicable Law drinking water standards.

[4] Based on the measurement of chlorinity using the analytical method provided in *Methods of Seawater Analysis* (Grasshoff, 1999).

[5] The analysis of salinity and the other constituents in this table shall be performed by a State Certified Laboratory that specializes in seawater analyses, mutually agreed upon by both the Design-Builder and the Owner.

(iii) Electricity Utilization

The Electricity Utilization ("EU") is the measured amount of electricity in kilowatt-hours that will be used by the Project per thousand gallons (kgal) of Finished Water produced during the Acceptance Test. The EU shall be measured and calculated using the revenue grade electrical consumption meters required for the facility, or the electrical utility's billing meters, and the volume of finished water treated and delivered to the distribution system over the 16-day period of Acceptance Testing.

The measured EU during the Acceptance Test shall not exceed the Maximum Electricity Utilization ("MEU") defined in Attachment 3 and Table A7-9 of this Appendix. The MEU shall be adjusted for the weighted average temperature and salinity values for the duration of the Acceptance Test, as determined in Attachment 3 of this Appendix.

The MEU in Attachment 3 of this Appendix includes all the power used to operate the Project including all facilities and ancillary facilities, from downstream of the slant well pump station through the finished water pump station. Differences in the actual supply pressure to the cartridge filters from the values stated by the Design-Builder on Proposal Form 17 shall allow for adjustment of the MEU upward or downward based on a pumping wire to water efficiency of 76% and a fluid specific gravity of 1.02.

If the measured EU exceeds the MEU during Acceptance Testing, the Design-Builder shall prepare a report identifying alternatives to achieve the MEU, and after consulting with the Owner, the Design-Builder shall make modifications to the Design-Build Improvements necessary to achieve the MEU within 90 days at the Design-Builder's cost. The Acceptance Test shall be terminated until the problem is rectified, and the Acceptance Test restarted at time zero.

(iv) Brine Stream and Other Waste Stream Flow

As required by CDPH, spent filter backwash water decant that is recycled to the head of the plant, prior to any chemical addition, shall not exceed 10% of the Raw Water influent plant flow nor have a turbidity greater than 2.0 NTU. Including a 20% factor of safety, the recycled spent backwash water shall not exceed 8% of the Raw Water influent plant flow, on a daily basis, and the turbidity of this return water shall be less than 1.6 NTU at all times. The brine discharge flow and water quality shall comply with all permit requirements including NPDES requirements and requirements from the Owner's agreement with the Monterey Regional Pollution Control Agency. In addition, the brine discharge leaving the Project Site shall have a dissolved oxygen within ten percent of the ambient ocean seawater at the ocean outfall discharge location.

(v) Microbial Removal/ Inactivation

As discussed in Appendix 2 (Design and Construction Requirements), two disinfection cases are considered for the Project design because the slant wells are not in place for source water microbial monitoring. The first case assumes the source water is placed in Bin 2 of the long-term 2 enhanced surface water treatment rule (LT2ESWTR) and the highest level of *Giardia* and virus reduction is required. This first case requires UV disinfection facilities. The second case assumes the source water is classified as being in Bin 1 of the LT2ESWTR, and *Giardia* and virus reduction is the same as required by the surface water treatment rule (SWTR). The second case will not require UV disinfection facilities.

The Design-Builder shall design and construct the Project Facility to meet the Acceptance Standards and Requirement for microbial removal and inactivation as defined in Table A7-10a or Table A7-10b below, to ensure compliance with CDPH and Federal regulations pathogen removal and inactivation (i.e., SWTR, IESWTR, LT2ESWTR). Sampling and monitoring requirements included in the Acceptance Monitoring Plan shall have been designed to demonstrate compliance with the microbial reduction requirements shown in Table A7-10a or Table A7-10b, depending on whether UV disinfection is required.

Table A7-10a. Acceptance Standards and Requirements of Minimum Log Reduction for *Cryptosporidium*, *Giardia*, and viruses (Case 1, with UV disinfection)

Treatment System	Log Reduction Requirement		
	Cryptosporidium	*Giardia*	Viruses
RO Membranes [1]	2	2	2
UV Disinfection	4	4	
Chlorine Final Disinfection		1	4
TOTAL	6	7	6

[1] Determined by achieving 2-log reduction of TDS, as measured by specific conductance, through the RO membrane system and as determined by CDPH.

Table A7-10b. Acceptance Standards and Requirements of Minimum Log Reduction for *Cryptosporidium*, *Giardia*, and viruses (Case 2, without UV disinfection)

Treatment System	Log Reduction Requirement		
	Cryptosporidium	*Giardia*	Viruses
RO Membranes [1]	2	2	2
Chlorine Final Disinfection		1	4
TOTAL	2	3	6

[1] Determined by achieving 2-log reduction of TDS, as measured by specific conductance, through the RO membrane system and as determined by CDPH.

(vi) Permit Compliance

The Design-Build Improvements shall comply with all permit requirements and all other Applicable Law during Acceptance Testing.

(b) Individual System Acceptance Standards and Requirements for Achieving Acceptance

(i) Pretreatment Filtration System

The Acceptance Standards and Requirements for the Pretreatment Filtration System are provided in Table A7-11, below. Failure to meet these pretreatment Acceptance Standards and Requirements at any time shall constitute an Acceptance Test failure and the Acceptance Test will be stopped until the condition is remedied. Once the condition is rectified, the Acceptance Test shall be restarted at time zero.

Table A7-11. Acceptance Standards and Requirements for the Pretreatment Filtration System

Parameter	Performance Standards and Requirements
Media Pressure Filter	
Backwash cycle	≤ 2 backwashes per day per filter
Total backwash volume	≤ 200 gal/ft^2/wash
Filtered water turbidity (NTU)	≤ 0.15 NTU for 95% of the time; Not to exceed 1.0 NTU at any time.
Filter effluent Iron, total (mg/L)	≤ 0.06 mg/L average; Not to exceed 0.10 mg/L at any time
Filter effluent Manganese, total (mg/L)	≤ 0.03 mg/L average; Not to exceed 0.05 mg/L at any time
Cartridge Filter	
Filter effluent SDI (15)	≤ 3 for 95 % of the time and ≤ 4 at all times (unless more stringent requirements apply based on SWRO membrane supplier warranty)
Differential pressure across cartridge filters (other than cartridge filters having a mechanical defect) during the Acceptance Test above and beyond the initial pressure drop across any of the cartridge filter vessels used at the end of the Acceptance Test	Demonstrate that: (i) the Plant has operated without replacement of any cartridge filters (other than cartridge filters having a workmanship or materials defect), and (ii) without exceeding a 15 psi differential pressure increase over the initial startup (“clean”) differential pressure across any of the cartridge filter vessels used at the end of the Acceptance Test.
Number of cartridges replaced per vessel (for each vessel in operation at any time, other than cartridge filters having a mechanical defect)	None

(ii) Reverse Osmosis / Energy Recovery / Brine Discharge System

The Design-Builder shall demonstrate compliance with the Performance Acceptance Standards and Requirements for the Reverse Osmosis System by performing all monitoring required by the Acceptance Test Plan and meeting the performance Acceptance Standards and Requirements provided in Table A7-12, A7-13, and A7-14 at all times during Acceptance Testing. Failure to meet these performance Acceptance Standards and Requirements at any time shall constitute an Acceptance Test failure and the Acceptance Test will be stopped until the condition is remedied. Once the condition is rectified, the Acceptance Test shall be restarted at time zero.

Table A7-12. Minimum Performance Acceptance Standards and Requirements for the RO Membrane System

Parameter	Performance Standard and Requirement
Reverse osmosis membrane replacement	None (other than membranes having a workmanship or materials defect).
Reverse osmosis membrane end cap, connector, seal, spacer or blank replacement	None (other than those having a workmanship or materials defect).
Maximum membrane feed pressure, measured at pump discharge	Demonstrate that the maximum membrane feed pressure, measured at the pump discharge, does not exceed a five percent increase over the software design maximum membrane feed pressure and does not exceed 1000 psi.
Normalized permeate flow	Demonstrate that the membrane trains do not lose more than five percent of the software design normalized permeate flow.
Normalized salt passage	Demonstrate that the membrane trains do not gain more than five percent of the software design normalized salt passage
RO membrane cleaning	None

The concentrations of boron, chloride, bromide and sodium will be sampled from the combined permeate during the Acceptance Test to determine if the Project is in compliance with the Project's RO System Performance Acceptance Standards and Requirements.

The Design-Builder shall first demonstrate that the proposed overall system is operating under conditions that meet all the requirements of the Design-Build Agreement and produces a combined RO permeate that is in compliance with the Project's treated water performance Acceptance Standards and Requirements. Said compliance shall be demonstrated using the membrane manufacturer's publically available model as described in Step One below.

As described below, the Design-Builder shall then use the same model to describe the expected performance of new membranes during Acceptance Testing (Step Two, below). Performance during the Acceptance Test shall be based on achieving average performance equal to or better than model predictions.

<u>Step One:</u> Use Membrane Manufacturer's Model to Demonstrate Performance of the Overall System Design.

The Design-Builder shall use the membrane manufacturer's publically available membrane computer model to assess future salt rejection in the Design-Builder's overall system design, that is, to demonstrate the system's ability to meet the water quality Acceptance Standards and Requirements for the RO system. The Raw Water conditions to be used as the basis for design are provided in Appendix 2, Attachment 2. The design proposed by the Design-Builder shall meet the performance Acceptance Standards and Requirements shown in Table A7-13, Appendix 7 and Appendix 2. The model results shall demonstrate that the Maximum Average and Not-to-Exceed concentrations shown in Table A7-13 are met under the Average and Design Maximum conditions shown Table 1 of Appendix 2 Attachment 2, respectively.

Table A7-13. Combined RO Permeate Water Quality Performance Standards and Requirements

Parameter	Combined RO Permeate Concentrations, mg/L	
	Maximum Average [1]	Not-to-Exceed [2]
Boron (mg/L) [3]	0.5	0.7
Chloride (mg/L) [3]	60	100
Bromide (mg/L)	0.3	0.5
Sodium (mg/L)	35	60

[1] The **average** of the measured concentrations shall be below the Maximum Average Concentration at all times.
[2] No measurement shall exceed this value, at any time.
3 During Acceptance Testing, the Design-Builder must meet additional standards for boron and chloride as specified in Table A7-14.

The model, which shall be made available for the Owner to use in evaluation and Acceptance Testing, shall demonstrate compliance under the three following conditions:

Condition 1: Model Run 1 – for compliance with the RO combined permeate maximum average concentrations:

1. Average Raw Water quality conditions shown in Appendix 2, Attachment 2
2. Average age of SWRO membranes in the model at 5 years
3. Average age of BWRO membranes in the model at 5 years
4. Temperature of 12°C

Condition 2: Model Run 2A – for compliance with the RO combined permeate not-to-exceed concentrations:

1. Maximum water quality conditions shown in Appendix 2, Attachment 2
2. Average age of SWRO membranes in the model at 5 years
3. Average age of BWRO membranes in the model at 5 years
4. Temperature of 20°C

Condition 3: Model Run 2B – for compliance with the RO combined permeate not-to-exceed concentrations and maximum first pass feed pressure:

1. Maximum water quality conditions shown in Appendix 2, Attachment 2
2. Average age of SWRO membranes in the model at 5 years
3. Average age of BWRO membranes in the model at 5 years
4. Temperature of 8°C

All modeling shall assume an annual salt passage increase of 7% and an annual fouling factor of 5%.

The Design-Builder shall provide copies of separate runs of the same model demonstrating compliance with both the Maximum Average Concentrations and the Not-to –Exceed Concentrations in Table A7-13.

Step Two: Generation of Table to be Used During Acceptance Testing

During Acceptance Testing, when combined RO permeate samples shall be taken, all RO trains must each produce their design permeate flowrate, at their design recovery (as defined in Appendix 2). This statement applies to each train of the first pass and each train of the second pass.

During Acceptance Testing, the RO system performance shall be evaluated with respect to compliance with the standards for salt rejection as a function of temperature, set forth in Table A7-14. The Design-Builder shall include data necessary to substantiate such performance, including but not limited to, results from the manufacturer's model for the overall system design at years zero (0) and five (5) years as well as existing plant performance data demonstrating that similar concentrations or rejections have been achieved

Table A7-14 Maximum of Average Combined Permeate Concentrations[(1)]

Membrane Age	Year 0 (Maximum Average Concentration for Acceptance Test)		Year 5 (Maximum Average Concentration for Compliance with Table A7-13)	
Temperature (ºC)	Boron (mg/L)	Chloride (mg/L)	Boron (mg/L)	Chloride (mg/L)
8	0.317	30.8	0.366	35.6
9	0.336	31.6	0.387	36.5
10	0.354	32.4	0.409	37.3
11	0.373	33.1	0.430	38.2
12	0.391	33.9	0.455	39.3
13	0.418	35.0	0.485	40.7
14	0.444	36.1	0.516	42.0
15	0.470	37.3	0.546	43.4
16	0.497	38.4	0.576	44.8
17	0.523	39.5	0.606	46.1
18	0.549	40.6	0.637	47.5
19	0.576	41.7	0.667	48.9
20	0.602	42.9	0.697	50.2

(1) RO Model shall assume the average Raw Water quality condition for all parameters other than temperature, as shown in Appendix 2, Attachment 2.

During Acceptance Testing, the boron and chloride concentrations in the combined permeate shall not exceed the concentrations set forth in Table A7-14 for the actual average temperature of Acceptance Test conditions for year 0. The Design-Builder shall confirm that the estimated future (for year 5) concentrations for boron and chloride will meet the combined permeate performance Acceptance Standards and Requirements stipulated in Table A7-13 as well as the RO system performance warranty provided.

In the event that the average boron and chloride concentrations in the feedwater during Acceptance Testing is not within 5% of the average Raw Water boron and chloride concentrations used in the preparation Table A7-14, the RO system model will be rerun for year zero (0) using the actual average boron and chloride concentrations in the feedwater during the Acceptance Test and the revised model output concentrations will be used as maximum average boron and chloride concentrations, which may not be exceeded during the Acceptance Test.

(iii) UV System

Monitoring of the UV disinfection system during Acceptance Testing shall confirm that the UV system is capable of continuously delivering, without interruption, a UV dose sufficient to meet CDPH requirements for 4-log inactivation of *Cryptosporidium* (with UV), shown in Table A7-

10a. Monitoring during Acceptance Testing shall also confirm that the UV lamps continuously achieve > 95% UV transmittance. Failure to meet these performance Acceptance Standards and Requirements at any time shall constitute an Acceptance Test failure and the Acceptance Test will be stopped until the condition is remedied. Once the condition is rectified, the Acceptance Test shall be restarted at time zero.

(iv) Post-Treatment Stabilization System

During Acceptance Testing of the RO product water post-treatment stabilization system, effective operation under the following three conditions must be demonstrated:

Condition 1: Calcium carbonate saturation with low hardness and alkalinity
Condition 2: Calcium carbonate saturation with moderate hardness and alkalinity
Condition 3: Orthophosphate treatment with low hardness and alkalinity

The specific sampling requirements and Acceptance Standards and Requirements for each of the three operating conditions listed above are shown in Table A7-15. Each of the three operating conditions must be continuously held within the requirements of Table A7-15 for a period of 72 hours during the Acceptance Test. If these requirements are not continuously met for a particular operating condition during the 72- hour test, the entire test for that operating condition must be repeated, with no Acceptance Test credit given for the 72-hour test conditions producing Off-Specification Water. If Unacceptable Water is produced at any time during Acceptance Testing of the Post-Treatment Stabilization System, the entire 16-day Acceptance Test shall be restarted at time zero.

After demonstrating effective performance of each of the three post-treatment stabilization conditions, the Owner shall set the post-treatment stabilization conditions for the remainder of the Acceptance Test.

Table A7-15. Sampling and Performance Acceptance Standards and Requirements for the RO Product Water Post-Treatment Stabilization System

Parameter [1]	Units	Condition 1	Condition 2	Condition 3	Sampling Frequency [2]	Allowable Error [3]
Calcium Hardness	mg/L as $CaCO_3$	40	100	40	(4)	±10%
Alkalinity	mg/L as $CaCO_3$	40	100	40	(4)	±10%
pH	pH units	8.7	7.9	8.0	(5)	±0.20
Turbidity	NTU	$\leq$ 0.5 95% of time $\leq$1.0 100% of time			(5)	-
Orthophosphate	mg/L as PO_4	-	-	1 to 3.5	(4)	±0.3

1-All parameters to be measured at a point after all chemicals have been added and thoroughly blended and a stable pH has been reached

2-Sampling frequency during post treatment Acceptance Testing

3-Allowable error in the average of measurements at the end of each day

4-Every 3 hours

5-Continuously monitored; values at 15-min intervals used for calculation of daily average or median as required.

(v) Final Disinfection / Finished Water Pumping System

The Design-Builder shall demonstrate compliance with the Acceptance Standards and Requirements for the final disinfection and Finished Water pumping system by performing all monitoring required by the Acceptance Test Plan and meeting the Acceptance Standards and Requirements provided in Table A7-16 at all times during Acceptance Testing. Failure to meet these Acceptance Standards and Requirements at any time shall constitute an Acceptance Test failure and the Acceptance Test will be stopped until the condition is remedied. Once the condition is rectified, the Acceptance Test shall be restarted at time zero.

At all times during Acceptance Testing, the Finished Water shall be in compliance with all Applicable Law and Additional Finished Water Quality Acceptance Standards and Requirements. As discussed in Subsection (D)(a)(ii) of this Section, production of Unacceptable Water or Off-Specification Water shall constitute failure of the Acceptance Test. Off-Specification water, which is still considered potable under Applicable Law, may be pumped into the distribution system. Unacceptable Water shall not be pumped into the distribution system, but shall be disposed of in accordance with the Acceptance Test Plan and Applicable Law.

Table A7-16. Performance Acceptance Standards and Requirements for the Final Disinfection / Finished Water Pumping System

Parameter	Performance Standard and Requirement
Finished Water residual chlorine concentration.	Maintain the Finished Water chlorine residual specified by the Owner ± 10%.
Finished Water pH	Maintain the Finished Water pH specified by the Owner ± 0.20 pH units.
Log inactivation of Giardia and viruses	CT inactivation credit to continuously provide > 1-log Giardia inactivation and > 4-log virus inactivation. Compliance shall be based on the daily minimum CT achieved (calculated in 15 minute intervals).
Water delivery to the Finished Water storage tank or distribution system tie-in.	Finished Water pumps shall provide a minimum of the rated capacity for the Acceptance Test to the Distribution System tie-in or storage tank with one pump out of service.

(vi) Waste Backwash and Recycle System

The Design-Builder shall demonstrate compliance with the following performance Acceptance Standards and Requirements for the waste backwash and recycle system at all times during Acceptance Testing:

- Recycled spent backwash water shall not exceed 8% of the Raw Water influent plant flow.
- Turbidity of recycled spent backwash water shall be less than 1.6 NTU at all times.

Failure to meet these performance Acceptance Standards and Requirements at any time shall constitute an Acceptance Test failure and the Acceptance Test will be stopped until the condition is remedied. Once the condition is rectified, the Acceptance Test shall be restarted at time zero.

(vii) Chemical Storage and Delivery System

The Design-Builder shall confirm that all chemical feed systems are able to feed the required chemical dose continuously, consistently and at all applicable locations, for the entire duration of Acceptance Testing. All chemical feed systems shall be operated within the equipment manufacturer's recommended operating envelope. The metered chemical dose shall always be monitored and recorded for an accurate record of chemical consumption.

Failure to meet these performance Acceptance Standards and Requirements at any time shall constitute an Acceptance Test failure and the Acceptance Test will be stopped until the condition is remedied. Once the condition is rectified, the Acceptance Test shall be restarted at time zero.

(E) Surge Protection System

In order to assess performance and acceptability of the Surge Protection System, the Design-Builder shall (1) propose a plan to test the Surge Protection System, (2) prepare a hydraulic transient analysis by modeling the Surge Protection System, and (3) test the System to evaluate surge protection performance and compare actual performance with the computer-modeled performance. The Surge Protection System shall be tested when delivering finished water to the distribution system and successful performance shall be a condition of passing the Acceptance Test. However, the Design-Builder may perform the Surge Protection System test outside of the 16-day Acceptance Test period, either before or after, if desired. The proposed date of testing shall be included in the Test Plan. The Surge Protection System Test Plan and hydraulic transient analysis shall be submitted to the Owner for review and acceptance at least forty-five (45) days prior to the proposed test date. Prior to testing, the Design-Builder shall have obtained the Owner's approval of the Surge Protection System Test Plan and schedule.

(a) Surge Protection System Test

When delivering water to the distribution system, the Design-Builder shall perform a full flow power failure test of the surge protection system. The surge protection system test shall demonstrate whether the surge protection system is able to limit the resulting transient pressures in a manner consistent with the design conditions that will be established in the final hydraulic transient analysis prepared by the Design-Builder.

(b) Surge Protection System Test Report

Following testing, the Design-Builder shall prepare a surge protection system test report that (i) compares the actual values of the pressure recorded during the surge protection system test to the values established in the hydraulic transient analysis prepared by the Design-Builder; (ii) discusses whether each piece of equipment functioned in a manner that is consistent with the final hydraulic transient analysis; and (iii) if the facility failed to meet the requirements of the surge protection system test, the repairs and modifications that need to be made. The surge protection system test report shall be signed and sealed by an Engineer licensed in California, and certified as true, complete and correct by an officer of the Design-Builder.

(c) Retesting the Surge Protection System

Within five Business Days of receiving the surge protection system test report, the Owner will deliver to the Design-Builder written notice setting forth the repairs and modifications that: (i) because of their material effect on the safe operation of the Project and associated pipelines, need to be completed prior to Acceptance (such repairs and modifications include, but are not limited to, any damage that presents a safety concern; visible damage to concrete structures, pipe anchors, pipe supports; pipeline and pipeline appurtenance leaks; any damage to surge suppression system components; damage to valves, valve actuators, and meters required to control or measure Finished Water deliveries or isolate the Finished Water pipeline; and damage to any field instruments that allow local automated control of the pump station, flow meter, and surge suppression system); and (ii) may be completed after Acceptance but prior to Final Completion. If the Owner's notice sets forth repairs or modifications which need to be made before Acceptance, the Design-Builder shall repeat the surge protection system test and comply with the requirements of the surge protection system test plan. The Design-Builder shall have no obligation to repeat the surge protection system test for modifications or repairs that the Owner's notice states may be completed after Acceptance but prior to Final Completion.

(d) Failure to Meet Surge Protection System Test

If any Project equipment, systems, pipelines, and/or ancillary facilities are damaged as a result of a failure by the Design-Build Improvements to meet the transient pressure requirements of the surge protection system test, the Design-Builder shall be responsible for paying for and making any necessary repairs to the Design-Build Improvements that were damaged as a result of the failure of the Design-Build Improvements to meet the transient pressure requirements of the surge protection system test.

(F) Acceptance Test Report

Upon completion of Acceptance Testing, the Design-Builder shall prepare the Acceptance Test Report, in accordance with the Acceptance Test Plan. The Acceptance Test Report shall include, but not be limited to, the following minimum requirements:

- All data obtained during the Acceptance Test.
- A chart comparing the actual values to the minimum performance Acceptance Standards and Requirements, and explanations for any failure to achieve such minimum Acceptance Standards and Requirements. The level of detail of such information shall be sufficient so that all performance metrics cited in the Acceptance Test Report can be independently calculated and verified.
- All data deemed to be outliers along with an explanation of why such data were judged to be outliers.
- All water quality laboratory reports prepared by or for the Design-Builder.
- An organized comparison of all SCADA data, laboratory analytical data, and Project local instrumentation readings and field measurements that is sufficiently detailed to show how the data were verified for accuracy and precision.
- Signed operator's daily logs.
- Normalized plots showing RO system performance for permeability, salt passage, differential pressure, permeate backpressure.
- Electronic form (MS Excel) of operating data for slant well pump station, pretreatment system, RO systems (including all associated pumps and ERDs), post-treatment stabilization system, solids handling, and Finished Water pumping system.
- All instrumentation and control settings (including PID loop control parameters) and any measurements, checks and settings that may be required by operating and maintenance personnel.
- Report of all spare parts used.
- Report of all equipment malfunctions and repairs.
- All calculations used or prepared by the Design-Builder shall be sufficiently documented so that they can be independently verified.
- The total Facility power consumption used to operate the Project including all facilities and ancillary facilities from the downstream of the slant well pump station through the Finished Water pump station.

- Applicable data, as agreed upon in the Acceptance Test Plan, in tabular form for the following systems:
  - (i) Seawater Intake System
  - (ii) Pretreatment System
  - (iii) Reverse Osmosis / Energy Recovery / Brine Discharge System
  - (iv) Post-Treatment Stabilization System
  - (v) Final Disinfection and Finished Water Pumping System
  - (vi) Waste Backwash and Recycle System.
- Whether or not and how often the Acceptance Test was aborted. If it was aborted, what were the causes and resolutions.
- Whether or not any portion of the Design-Build Improvements was shutdown during Acceptance Testing. If there were shutdowns, what were the causes and resolutions.

The Acceptance Test Report shall be signed and sealed by an Engineer licensed in California and certified as true, complete, and correct by an officer of the Design-Builder.

APPENDIX 7 – ATTACHMENT 1
MINIMUM WATER QUALITY MONITORING REQUIREMENTS DURING ACCEPTANCE TESTING

Minimum water quality monitoring requirements for Acceptance Testing, for each of the Project systems, is indicated in Tables A7-1 through A7-6 of this Attachment to Appendix 7 (Acceptance Test Procedures and Standards). During Acceptance Testing, the Design-Builder, at its own discretion, may sample at more locations or more frequently than set forth in these tables. The analytical results of all valid samples obtained by or on behalf of the Owner during the Acceptance Test shall be reported in the Acceptance Test Report.

The saline water matrices associated with ocean water desalination introduce challenges with respect to method detection limits and reporting limits. Analytical methods used during Acceptance Testing must provide detection limits and reporting limits that will provide meaningful results for assessing reverse osmosis system performance and compliance with all Acceptance Standards and Requirements discussed in this Appendix.

The laboratory selected by the Design-Builder to analyze samples during Acceptance Testing shall be experienced in analyzing ocean water matrix samples. The laboratory shall provide the Design-Builder and the Owner with references and contact information for a minimum of two clients for whom the Laboratory has analyzed ocean water matrix samples. The laboratory selected by the Design-Builder shall be subject to approval of CDPH and the Owner.

Analytical methods that shall be used during Acceptance Testing are provided in each of the minimum monitoring requirement tables included in this Attachment. The methods appropriate for the analysis of saline water, including raw water, RO feed water, and brine stream, are contained in the text entitled *Methods of Seawater Analysis* (Grasshoff, et al., 1999). For the analysis of low saline water, including first pass SWRO permeate, second pass BWRO permeate, combined RO permeate, and Finished Water, the methods shall be either EPA Methods for drinking water or methods contained in the most recent edition of *Standards Methods Online - Standard Methods for the Examination of Water and Wastewater*. The methods are defined in the minimum monitoring requirement tables below to ensure sufficiently low method detection limits (MDLs) for demonstrating successful treatment performance during Acceptance Testing. The Design-Builder may propose alternate analytical methods if deemed necessary, but shall be subject to CDPH and Owner approval. Nonetheless, all analytical methods used during acceptance testing shall be CDPH approved methods; appropriate for use on either saline water or non-saline water matrix where appropriate; and, where possible, shall have MDLs below CDPH's detection limits for the purpose of reporting (DLRs).

During the Acceptance Test, the Design-Builder shall allow Owner representatives to witness sampling activities and provide split samples to the Owner, if requested. The Owner shall: (1) make such representatives available in a manner that accommodates the Design-Builder's schedule for its sampling activities; (2) not unduly delay the Design-Builder's sampling activities; and (3) make prior arrangements and coordinate such sampling activities with the Design-Builder to assure the requested split samples can be reasonably obtained without an appreciable increase in effort or cost.

Table A7-1. Minimum Raw Water Quality Monitoring during Acceptance Testing [1]

Parameter	Analytical Method	Minimum Collection Frequency [3]	Units
Total Dissolved Solids (TDS)	SM 2540C	one grab per day	mg/L
Specific Conductance	SM 2510B	Continuous [4,5]	µS/cm
Alkalinity, total	Grasshoff, 1999 – Chapter 8	one grab per day	mg/L as $CaCO_3$
Ammonia	Grasshoff, 1999 – Chapter 10 (10.2.10)	three grabs per week	mg/L as N
Barium	EPA 200.8	three grabs per week	mg/L
Boron	Grasshoff, 1999 – Chapter 11 (11.2.7)	one grab per day	mg/L
Bromide	Grasshoff, 1999 – Chapter 11 (11.2.6)	three grabs per week	mg/L
Calcium	Grasshoff, 1999 – Chapter 11 (11.2.1)	one grab per day	mg/L
Chloride	EPA 300.0	one grab per day	mg/L
Chlorinity	Grasshoff, 1999 – Chapter 11 (11.2.4)	three grabs per week	g/kg and mg/L (based on seawater density)
Color	SM2120B	three grabs per week	color units
Dissolved Organic Carbon (DOC) [3]	TBD	three grabs per week	mg/L
Dissolved Oxygen (DO)	SM 4500-O G	three grabs per week	mg/L
E. coli	SM 9221 F	three grabs per week	MPN/100 mL
Hardness, total	SM 2340B	one grab per day	mg/L as $CaCO_3$
Iron, dissolved	Grasshoff, 1999 – Chapter 12 (12.2.1)	three grabs per week	mg/L
Iron, total	Grasshoff, 1999 – Chapter 12 (12.2.1)	three grabs per week	mg/L
Magnesium	Grasshoff, 1999 – Chapter 11 (11.2.2)	one grab per day	mg/L
Manganese, dissolved	Grasshoff, 1999 – Chapter 12 (12.2.2)	three grabs per week	mg/L

Parameter	Analytical Method	Minimum Collection Frequency [3]	Units
Manganese, total	Grasshoff, 1999 – Chapter 12 (12.2.2)	three grabs per week	mg/L
Nitrate	Grasshoff, 1999 – Chapter 10 (10.2.9)	three grabs per week	mg/L as N
pH	Grasshoff, 1999 – Chapter 7	Continuous [4,5]	pH units
Potassium	Grasshoff, 1999 – Chapter 11 (11.2.3)	three grabs per week	mg/L
Salinity	SM 2520	three grabs per week	PSS
Silica	EPA 200.8	three grabs per week	mg/L
Sodium	EPA 200.7	one grab per day	mg/L
Strontium	EPA 200.8	three grabs per week	mg/L
Sulfate	Grasshoff, 1999 – Chapter 11 (11.2.5)	three grabs per week	mg/L
Temperature	SM 2550	Continuous [4,5]	ºC
Total Coliform	SM 9221B	three grabs per week	MPN/100 mL
Total Organic Carbon (TOC) [6]	TBD	three grabs per week	mg/L
Total Suspended Solids (TSS)	SM 2540D	three grabs per week	mg/L
Turbidity	EPA 180.1	Continuous [4,5]	NTU
UV-254, filtered	SM 5910	one grab per day	cm^{-1}
Other Constituents Pursuant to Facility NPDES Permit [7]	As needed to comply with all Applicable Law and Governmental Approvals	As needed to comply with all Applicable Law and Governmental Approvals	
California Title 22 or other CDPH Raw Water monitoring requirements pursuant to Facility Drinking Water Permit [7]	As needed to comply with all Applicable Law and Governmental Approvals	As needed to comply with all Applicable Law and Governmental Approvals	

[1] All Raw Water samples shall be collected at the facility influent, after the feedwater equalization tanks but prior to any chemical addition and prior to the pretreatment filtration system, unless indicated otherwise in this Table, by footnote.

[3] Sample collection frequency shall be evenly spaced, as reasonable. Constituents sampled daily should have samples collected close to the same time each day. Constituents sampled multiple

times during the week, but not daily, should have samples collected at approximate even intervals throughout the week.

[4] For continuous monitoring, data storage and trending values shall be taken at intervals of 15 minutes or less.

[5] Automatic analyzers for pH, turbidity and ORP, total chlorine residual shall have grab samples analyzed three times per day (evenly spaced through the day) for instrument confirmation.

[6] Samples should be collected daily during algal bloom conditions.

[7] Raw Water samples shall be collected at the facility influent unless an alternate or additional location(s) is required by Governmental Bodies.

Table A7-2. Minimum Water Quality Monitoring for the Pretreatment Filtration System during Acceptance Testing

Parameter	Analytical Method	Sampling Location	Minimum Collection Frequency [1]	Units
Pressure Filters				
Turbidity	SM 2130B or EPA 180.1	Individual Filter Effluent (IFE) and Combined Filter Effluent (CFE)	Continuous [2,3]	NTU
Total Coliform	SM 9221B	CFE	three grabs per week	MPN/100 mL
E. coli	SM 9221 F	CFE	three grabs per week	MPN/100 mL
Color	SM2120B	CFE	three grabs per week	Color units
SDI	TBD	CFE [4]	one grab per day	min^{-1}
pH	Grasshoff, 1999 – Chapter 7	CFE, upstream of sulfuric acid feed	Continuous [2,3]	pH units
Iron, total	Grasshoff, 1999 – Chapter 12 (12.2.1)	CFE	three grabs per week	mg/L
Manganese, total	Grasshoff, 1999 – Chapter 12 (12.2.2)	CFE	three grabs per week	mg/L
Total Chlorine Residual	Amperometric Titration (SM 4500-Cl D or SM 4500-Cl E, as appropriate)	CFE, upstream of bisulfite feed	Continuous [2,3]	mg/L as Cl_2
Total Organic Carbon (TOC)	TBD	CFE, upstream of bisulfite and sulfuric acid feed	three grabs per week	mg/L

Parameter	Analytical Method	Sampling Location	Minimum Collection Frequency [1]	Units
Dissolved Organic Carbon (DOC)	TBD	CFE, upstream of bisulfite and sulfuric acid feed	three grabs per week	mg/L
Oxidation-Reduction Potential (ORP)	SM 2580	CFE, downstream of bisulfite feed and complete mixing	Continuous [2,3]	millivolts
Cartridge Filters				
Turbidity	SM 2130B or EPA 180.1	Cartridge filter effluent, upstream of high pressure RO pumps and ERD	Continuous	NTU
Total Chlorine Residual	Amperometric Titration (SM 4500-Cl D or SM 4500-Cl E, as appropriate)	Cartridge filter effluent, upstream of high pressure RO pumps and ERD	Continuous [2,3]	mg/L as Cl_2
SDI	TBD	Cartridge filter effluent [4]	Every four hours	min^{-1}
Total Coliform	SM 9221B	Cartridge filter effluent, upstream of high pressure RO pumps and ERD	three grabs per week	MPN/100 mL
E. coli	SM 9221 F	Cartridge filter effluent, upstream of high pressure RO pumps and ERD	three grabs per week	MPN/100 mL

[1] Sample collection frequency shall be evenly spaced, as reasonable. Constituents sampled daily should have samples collected close to the same time each day. Constituents sampled multiple times during the week, but not daily, should have samples collected at approximate even intervals throughout the week.

[2] For continuous monitoring, data storage and trending values shall be taken at intervals of 15 minutes or less.

[3] Automatic analyzers for pH, Turbidity and ORP, total chlorine residual shall have grab samples analyzed three times per day (evenly spaced through the day) for instrument confirmation.

[4] Downstream of each cartridge filter bank, feeding either the high pressure RO pumps or and ERD.

Table A7-3. Minimum Water Quality Monitoring for the Reverse Osmosis System during Acceptance Testing

Parameter	Analytical Method	Minimum Collection Frequency	Units
Sampling Location = First Pass RO Feedwater			
Alkalinity, total	Grasshoff, 1999 – Chapter 8	one grab per day	mg/L as $CaCO_3$
Boron	Grasshoff, 1999 – Chapter 11 (11.2.7)	one grab per day	mg/L
Bromide	Grasshoff, 1999 – Chapter 11 (11.2.6)	one grab per day	mg/L
Chloride	EPA 300.0	one grab per day	mg/L
Chlorinity	Grasshoff, 1999 – Chapter 11 (11.2.4)	three grabs per week	g/kg and mg/L (based on seawater density)
pH	Grasshoff, 1999 – Chapter 7	Continuous	pH units
Sodium	EPA 200.7	one grab per day	mg/L
Specific Conductance	SM 2510B	Continuous	µS/cm
Temperature	SM 2550	Continuous	ºC
Total Dissolved Solids (TDS)	SM 2540C	one grab per day	mg/L
Turbidity	EPA 180.1	Continuous	NTU
Other Constituents [x]	TBD	TBD	
Sampling Location = First Pass RO Permeate (prior to second pass chemical addition)			
Alkalinity, total	SM 2320B	one grab per day	mg/L as $CaCO_3$
Boron	EPA 200.7	one grab per day	mg/L
Bromide	EPA 300.0	one grab per day	mg/L
Calcium	EPA 200.7	one grab per day	mg/L
Chloride	EPA 300.0	one grab per day	mg/L
Magnesium	EPA 200.7	one grab per day	mg/L
pH	EPA 150.1	Continuous	pH units
Sodium	EPA 200.7	one grab per day	mg/L
Specific Conductance	SM 2510B	Continuous	µS/cm
Temperature	SM 2550	Continuous	ºC
Turbidity	EPA 180.1	Continuous	NTU
Other Constituents [x]	TBD	TBD	
Sampling Location = Second Pass RO Feedwater (after second pass chemical addition)			

Parameter	Analytical Method	Minimum Collection Frequency	Units
pH	EPA 150.1	Continuous	pH units
Specific Conductance	SM 2510B	Continuous	µS/cm
Temperature	SM 2550	Continuous	ºC
Other Constituents [1]	TBD	TBD	
Sampling Location = Second Pass RO Permeate			
Alkalinity, Total	SM 2320B	one grab per day	mg/L as $CaCO_3$
Boron	EPA 200.7	one grab per day	mg/L
Bromide	EPA 300.0	one grab per day	mg/L
Calcium	EPA 200.7	one grab per day	mg/L
Chloride	EPA 300.0	one grab per day	mg/L
Magnesium	EPA 200.7	one grab per day	mg/L
pH	EPA 150.1	Continuous	pH units
Sodium	EPA 200.7	one grab per day	mg/L
Specific Conductance	SM 2510B	Continuous	µS/cm
Temperature	SM 2550	Continuous	ºC
Turbidity	EPA 180.1	Continuous	NTU
Other Constituents [1]	TBD	TBD	
Sampling Location - Combined RO Permeate			
Alkalinity, total	SM 2320B	one grab per day	mg/L as $CaCO_3$
Boron	EPA 200.7	one grab per day	mg/L
Bromide	EPA 300.0	one grab per day	mg/L
Calcium	EPA 200.7	one grab per day	mg/L
Chloride	EPA 300.0	one grab per day	mg/L
Magnesium	EPA 200.7	one grab per day	mg/L
pH	EPA 150.1	Continuous	pH units
Sodium	EPA 200.7	one grab per day	mg/L
Specific Conductance	SM 2510B	Continuous	µS/cm
Temperature	SM 2550	Continuous	ºC
Turbidity	EPA 180.1	Continuous	NTU
Total Dissolved Solids (TDS)	SM 2540C	one grab per day	mg/L
Total Hardness	SM 2340B	one grab per day	mg/L as $CaCO_3$
Total Organic Carbon (TOC)	SM 5310C	one grab per day	mg/L
Sampling Location - Combined RO Concentrate			
Total Dissolved Solids	SM 2540C	one grab per day	mg/L
Chloride	EPA 300.0	one grab per day	mg/L

Parameter	Analytical Method	Minimum Collection Frequency	Units
Chlorinity	Grasshoff, 1999 – Chapter 11 (11.2.4)	three grabs per week	g/kg
Bromide	Grasshoff, 1999 – Chapter 11 (11.2.6)	three grabs per week	mg/L
Boron	Grasshoff, 1999 – Chapter 11 (11.2.7)	three grabs per week	mg/L
Dissolved Oxygen	SM 4500-O G	one grab per day	mg/L
Salinity	SM 2520	one grab per day	PSS
Specific Conductance	SM 2510B	Continuous	µS/cm
Turbidity	EPA 180.1	Continuous	NTU
Other Constituents Pursuant to Facility NPDES Permit and the Brine Discharge permit	TBD	As needed to comply with all Applicable Law and Governmental Approvals	

[1] Per requirements of Membrane Manufacturer's Warranty Conditions.

Table A7-4. Minimum Water Quality Monitoring for the Post-Treatment Stabilization System during Acceptance Testing

Parameter	Analytical Method	Sampling Location [1]	Minimum Collection Frequency	Units
pH	EPA 150.1	post-stabilization effluent	Continuous	pH units
pH	EPA 150.1	post-stabilization effluent (after phosphate or chlorine addition)	Continuous	pH units
Alkalinity, total	SM2320B	post-stabilization effluent	every 4 hours	mg/L as $CaCO_3$
Total Hardness	SM2340B	post-stabilization effluent	every 4 hours	mg/L as $CaCO_3$
Orthophosphate	SM4500 P-E	post-stabilization effluent (after phosphate) [2]	one grab per day	mg/L as PO_4
Calcium	EPA 200.7	post-stabilization effluent	twice per day	mg/L
LSI	SM2330	post-stabilization effluent	every 4 hours	–
Magnesium	EPA 200.7	post-stabilization effluent	every 4 hours	mg/L
CCPP	SM2330	post-stabilization effluent	every 4 hours	mg/L
Temperature	SM2550	post-stabilization effluent	Continuous	ºC

Parameter	Analytical Method	Sampling Location [1]	Minimum Collection Frequency	Units
TDS	SM2540C	post-stabilization effluent	one grab per day	mg/L
Specific Conductance	SM 2510B	post-stabilization effluent	Continuous	µS/cm
Turbidity	EPA 180.1	post-stabilization effluent	Continuous	NTU

[1] Measured before phosphate or chlorine addition, unless indicated otherwise by a separate footnote.

[2] Sampling required only if phosphate is added for corrosion control.

Table A7-5. Minimum Water Quality Monitoring for the Final Disinfection System and Finished Water during Acceptance Testing [1]

Parameter	Analytical Method	Minimum Collection Frequency	Units	Additional Finished Water Quality Standard [2]
General and Inorganic				
Aluminum, total [3]	EPA 200.8	weekly grab	mg/L	
Ammonia	EPA 350.1	weekly grab	mg/L as N	
Boron (mg/L)	EPA 200.7	one grab per day	mg/L	See Table A7-7
Bromide (mg/L)	EPA 300.0	one grab per day	mg/L	See Table A7-7
Chloride (mg/L)	EPA 300.0	one grab per day	mg/L	See Table A7-7
Copper, total	EPA 200.8	weekly grab	µg/L	
Dissolved Oxygen	SM 4500-O G	weekly grab	mg/L	
Fluoride	EPA 300.0	weekly grab	mg/L	
Iron, total (mg/L)	EPA 200.7	one grab per day	mg/L	See Table A7-7
Lead, total	EPA 200.8	weekly grab	µg/L	
Manganese, total (mg/L)	EPA 200.8	one grab per day	mg/L	See Table A7-7
Nitrate	EPA 300.0	weekly grab	mg/L as N	
Sodium (mg/L)	EPA 200.7	one grab per day	mg/L	See Table A7-7
Specific Conductance	SM 2510B	Continuous	µS/cm	
Temperature	SM 2550	Continuous	ºC	
Total Dissolved Solids (mg/L)	SM 2540C	one grab per day	mg/L	See Table A7-7
Total Organic Carbon (TOC)	SM 5310C	one grab per day	mg/L	
Turbidity (NTU)	EPA 180.1	Continuous	NTU	See Table A7-7
Product Water Stabilization				

Parameter	Analytical Method	Minimum Collection Frequency	Units	Additional Finished Water Quality Standard [2]
Hardness, total	SM 2340B	every 6 hours	mg/L as $CaCO_3$	See Table A7-7
pH	EPA 150.1	Continuous	pH units	See Table A7-7
Alkalinity, total	SM 2320B	every 6 hours	mg/L as $CaCO_3$	See Table A7-7
Langelier Saturation Index (LSI)	SM 2330	Calculated daily	–	
Calcium Carbonate Precipitation Potential (CCPP)	SM 2330	Calculated daily	mg/L	
Orthophosphate	SM 4500P-E	Calculated daily	mg/L as PO_4	See Table A7-7
Disinfection and Disinfection Byproducts				
Total Chlorine Residual	Amperometric Titration (SM 4500-C1 D or SM 4500-CI E, as appropriate)	Continuous	mg/L as Cl_2	See Table A7-7
Trihalomethanes, total	EPA 551.1	one grab per week	µg/L	See Table A7-7
Haloacetic Acids, total of 5	SM 6251B	one grab per week	µg/L	See Table A7-7
Total Nitrosamines	SM 6450	one grab per week	µg/L	See Table A7-7
Bromate	EPA 317	one grab per week	µg/L	See Table A7-7
Total Coliform	SM 9221B	weekly grab	MPN/100 mL	
E. coli	SM 9221 F	weekly grab	MPN/100 mL	
California Title 22 or other CDPH Finished Water monitoring requirements pursuant to Facility Drinking Water Permit	As needed to comply with all Applicable Law and Governmental Approvals	As needed to comply with all Applicable Law and Governmental Approvals		

[1] All Finished Water samples shall be collected at the Clearwell effluent, after the last point of chemical addition and complete mixing, unless indicated otherwise in this Table by footnote.

[2] Additional Finished Water Quality Acceptance Standards and Requirements are provided in Table A7-7 for the indicated constituents. The Design-Builder shall demonstrate compliance with all Applicable Law regulatory standards as well as the Additional Finished Water Quality Acceptance Standards and Requirements throughout Acceptance Testing. In most cases, the

Additional Finished Water Quality Acceptance Standards and Requirements are more stringent than Applicable Law.

[3] Analyze only if aluminum salts are added during pretreatment.

Table A7-6. Minimum Water Quality Monitoring for the Filter Backwash System and Recycle Streams during Acceptance Testing

Parameter	Analytical Method	Sampling Location	Minimum Collection Frequency	Units
Turbidity	SM 2130B or EPA 180.1	Spent backwash decant stream	Continuous during recycle	NTU
Total Suspended Solids (TSS)	SM 2540D	Spent backwash decant stream	one grab per day during recycle	mg/L
Total Suspended Solids (TSS)	SM 2540D	Settled solids stream	one grab per blowdown	mg/L
Percent Solids	TBD	Settled solids stream	one grab per blowdown	%

APPENDIX 7 – ATTACHMENT 2
MINIMUM SYSTEM MONITORING REQUIREMENTS DURING ACCEPTANCE TESTING

Minimum system monitoring requirements for Acceptance Testing, for each of the Project systems, is indicated in this Attachment. During Acceptance Testing, the Design-Builder, at its own discretion, may monitor more locations and parameters or more frequently than set forth in this attachment. The monitoring results of parameters by or on behalf of the Owner during the Acceptance Test shall be reported in the Acceptance Test Report.

During the Acceptance Test, the Design-Builder shall allow Owner representatives to witness monitoring activities and provide additional measurements to the Owner, if requested. The Owner shall: (1) make such representatives available in a manner that accommodates the Design-Builder's schedule; and (2) not unduly delay the Design-Builder's monitoring activities.

Minimum monitoring requirements are discussed for the following Project systems in this Attachment:

a) Seawater Intake System
b) Pretreatment Filtration System
c) Reverse Osmosis / Energy Recovery / Brine Discharge System
d) UV System
e) Post-treatment Stabilization System
f) Final Disinfection / Finished Water Pumping System
g) Waste Backwash and Recycle System
h) Chemical Storage and Delivery System

At a minimum, the monitoring plans for these Systems shall include: chemical consumption, water quality throughout the Design-Build Improvements, all process and waste stream flows, and pressures at relevant locations throughout the treatment train. Minimum monitoring requirements are discussed in the subsections below. The Design-Builder shall be responsible for ensuring the monitoring plan and all associated tracking forms are complete for ensuring successful operation and performance of the Project throughout Acceptance Testing.

Minimum water quality monitoring requirements for each of the Project systems is provided in Tables A7-1 through A7-6, found in Attachment 1 to this Appendix.

(a) Seawater Intake System

The slant wells and Raw Water pumps shall have been operated a minimum of 4 weeks, prior to the RIPPT to ensure the pipeline is effectively free of silt and sand.

Monitoring of the seawater intake system during Acceptance Testing shall include, but not be limited to, the following:

- Raw Water quality characteristics including the minimum sampling requirements indicated in Table A7-1 (found in Attachment 1).

- Flow, continuously monitored.
- If applicable and relevant, chlorine addition frequency, dosage (mg/L), and daily use (lbs/day).

The minimum Raw Water quality monitoring requirements for Acceptance Testing are set forth in Table A7-1, found in Attachment 1. The Design-Builder, at its discretion, may sample the Raw Water at more locations or more frequently than described in Table A7-1. The analytical results of all valid samples obtained by or on behalf of the Owner during the Acceptance Test shall be reported in the Acceptance Test Report.

(b) Pretreatment Filtration System

Monitoring of the pretreatment filtration system—both the media pressure filters and the cartridge filters—during Acceptance Testing shall include but not be limited to the following:

- Water quality characteristics including the minimum requirements indicated in Table A7-2 (see Attachment 1).
- Average filter surface loading rate (gpm/sf) for the pressure filter, reported daily and for the entire Acceptance Test, calculated and tabulated by filter.
- Operational criteria for deciding backwash frequency.
- Filter backwash volume, per backwash and per day (MGD), reported daily and for the entire Acceptance Test.
- Filter backwash frequency (on a number of backwashes per day basis) daily and for the entire Acceptance Test, tabulated by filter.
- Continuous differential pressure increase (feet), for each filter, between startup and backwash.
- Run times between backwashes for the media filters, daily and average for the entire Acceptance Test, tabulated by filter.
- Antiscalant, sulfuric acid, and sodium bisulfite dosage (mg/L), daily usage (lbs/day) and average for the entire Acceptance Test.
- Chlorine residual concentration at the pressure filter effluent and cartridge filter effluent measured continuously but tabulated as daily averages.
- Frequency and duration of any and all detectable chlorine residual concentration measurements (above the detection limit), at the cartridge filter effluent, tabulated over the entire Acceptance Test.
- Number of cartridge filter vessels on-line and off-line each day, and average over the entire Acceptance Test.
- Hydraulic loading rate for each cartridge filter vessel, daily and average over the entire Acceptance Test.
- Differential pressure across each cartridge filter vessel (psig), measured continuously.
- Cartridge filter replacement frequency, per filter, over the entire Acceptance Test.

(c) Reverse Osmosis / Energy Recovery / Brine Discharge System

Monitoring of the RO, Energy Recovery, and concentrate discharge systems during Acceptance Testing shall include but not be limited to the following:

- SWRO and BWRO feedwater, permeate and concentrate water quality characteristics including the minimum monitoring requirements indicated in Table A7-3, found in Attachment 1.
- RO feedwater, permeate, and concentrate flow (MGD)—per train and total per pass—monitored continuously, averaged daily, and averaged over the duration of the Acceptance Test.
- Concentrate discharge total and average flow (MGD), and flow duration, to brine storage pond and/or brine discharge pipeline.
- SWRO and BWRO feedwater pressure for each RO train (psig), monitored continuously and averaged daily, for the duration of the Acceptance Test
- SWRO feed water temperature (ºC), monitored continuously plus daily minimum, maximum and average, and average for the duration of the Acceptance Test.
- SWRO and BWRO concentrate pressure (psig) for each RO train, monitored continuously and averaged daily, for the duration of the Acceptance Test.
- Combined concentrate pressure (psig), monitored continuously, averaged daily, and averaged over the duration of the Acceptance Test.
- Pressure of concentrate exiting the energy recovery system (psig) monitored continuously, averaged daily, and averaged over the duration of the Acceptance Test.
- SWRO and BWRO permeate pressure for each RO train (psig), monitored continuously, averaged daily, and averaged over the duration of the Acceptance Test.
- Combined permeate pressure (psig), monitored continuously, averaged daily, and averaged over the duration of the Acceptance Test.
- Recovery each day (%), calculated per train, per pass/stage, for the total RO system, and the total facility— averaged daily, and averaged over the duration of the Acceptance Test, and trended over the entire Acceptance Test.
- Actual and normalized differential pressure (pressure drop) across each RO train (psig), calculated at 4-hour intervals and averaged over the duration of the Acceptance Test. All such normalized data shall be trended.
- Normalized membrane permeability (gfd/psig), calculated at 4-hour intervals and averaged over the duration of the Acceptance Test. All such normalized data shall be trended.
- Correlation between TDS and conductivity, for both the plant influent and combined RO permeate, over the entire Acceptance Test.
- Correlation between chloride concentration (measured by EPA method) and chlorinity (measured by Grasshoff method) and between Salinity and TDS, for the plant influent and combined RO concentrate, over the entire Acceptance Test.
- Actual and normalized salt passage (%), calculated at 4-hour intervals and averaged over the duration of the Acceptance Test. All such normalized data shall be trended.
- SWRO and BWRO feed pump power consumption (kWh/kgal Product Water).
- ERD bank individual and total system recovered power (kWh/kgal Product Water).
- Average daily power consumption of each pumping component of the RO system (excluding the Finished Water pump station) (kWh/kgal of Product Water).
- Number of pumps in operation and operational hours of each pump, calculated at 4-hour intervals and average for the duration of the Acceptance Test.

- Other membrane data and normalized trends pursuant to applicable membrane manufacturer's warranty conditions and other guidelines. All such normalized data shall be trended over the entire Acceptance Test period.

(d) UV System

Monitoring of the UV disinfection system during Acceptance Testing shall include but not be limited to the following:

- Electricity Utilization for each UV reactor (kWh/kgal).
- Flow through each UV reactor, monitored continuously and averaged daily over the duration of the Acceptance Test.
- UV transmittance for each UV reactor, monitored continuously and averaged daily over the duration of the Acceptance Test.

(e) Post-Treatment Stabilization System

Monitoring of the post-treatment stabilization system during Acceptance Testing shall include but not be limited to the following:

- Water quality characteristics including the minimum sampling requirements indicated in Table A7-4 (found in Attachment 1) and Table A7-15 (found in Section (D)(b)(iv) of this Appendix).
- Where applicable and relevant, chemical feed concentration, chemical dosage (mg/L), and daily usage (lbs/day) for orthophosphate, carbon dioxide, hydrated lime, and/or sodium hydroxide
- Flow rate through each train or contactor, measured continuously and averaged daily over the duration of Acceptance Testing.

(f) Final Disinfection / Finished Water Pumping System

The Acceptance Test shall demonstrate that the Product Water storage and pumping system is capable of delivering, from the Finished Water pump station to the distribution system tie-in location, an average daily flow of the rated capacity, with one pump in standby, at the TDH utilized in the final design for the period of time required by the Acceptance Test Plan.

Monitoring of the final disinfection and finished water pumping system during Acceptance Testing shall include but not be limited to the following:

- Water quality characteristics including the minimum sampling requirements indicated in Table A7-5 (provided in Attachment 1).
- Daily average, maximum and minimum chlorine dosage (mg/L), daily usage (lbs/day) and average usage for the entire Acceptance Test.
- Influent temperature (ºC), measured continuously and averaged daily over the entire Acceptance Test period.
- Minimum, maximum and average flow rate through the clearwell.
- Minimum, maximum and average disinfection credit through the clearwell, calculated daily and over the entire Acceptance Test period.

(g) Waste Backwash and Recycle System

All waste streams, including but not limited to spent filter backwash solids and lime sludge, must be managed on-site as there is no means of direct discharge or disposal, as described in Appendix 2. Acceptance Testing of the waste backwash and recycle system shall demonstrate effective operation of all recycle pumps, waste settling and storage basins, and associated monitoring equipment and controls.

Monitoring of the filter backwash system and other recycle streams during Acceptance Testing shall include but not be limited to the following:

- Water quality characteristics including the minimum requirements indicated in Table A7-6 (provided in Attachment 1).
- Recycle rate (gpm), recycle frequency, recycle duration, and percent recovery for the spent backwash water.
- Lime sludge production (lbs/day) and waste stream flow.
- If applicable and relevant, chlorine and/or polymer dosage (mg/L) and usage rate (lbs/day), calculated daily and average over the entire Acceptance Test.

(h) Chemical Storage and Delivery System

For each chemical used and stored on-site, the following minimum information regarding chemical consumption shall be recorded by the Design-Builder throughout the Acceptance Test:

- Chemical name, concentration and grade (as delivered).
- Daily minimum, maximum and average dosing rate, mg/L.
- Chemical consumption (lbs/day), recorded daily and averaged over the duration of the Acceptance Test.
- All changes in dosing rate.
- Solution concentration (as dosed).
- Day tank and bulk storage tank levels, deliveries, and changes in inventory amounts;
- Chemical dosing information shall be computed as a daily average dose based on actual consumption and compared with dosing set points in the Acceptance Test Report to confirm the proper functionality of the chemical addition systems. Separate chemical consumption values shall be reported for each chemical used for pretreatment, RO treatment, post-treatment stabilization, and final disinfection.
- SCADA records demonstrating the SCADA interface operates correctly to control all chemical feed systems, and to monitor and record chemical consumption.

APPENDIX 7 – ATTACHMENT 3
MAXIMUM ELECTRICITY UTILIZATION

The Maximum Electricity Utilization (MEU) represents the maximum amount of electricity in kilowatt-hours (kW-hr) that shall not be exceeded by the Project (including the UV disinfection system) per thousand gallons (kgal) of Finished Water produced during the Acceptance Test.

MEU shall include all the power used to operate the Project including all facilities and ancillary facilities, from downstream of the slant well pump station through the Finished Water pump station.

MEU shall equal the kWh/kgal Plant amount of power consumption, adjusted for the weighted average temperature and salinity values for the duration of the Acceptance Test, as determined pursuant to Tables A7-9a and A7-9b herein.

For the purposes of this Acceptance Test, the MEU shall be selected from Table A7-9a (6.4 mgd plant flowrate) or Table A7-9b (9.6 mgd plant flowrate) based on a temperature and salinity, which shall have been adjusted for the conditions of the Acceptance Test. The adjusted temperature (T_{avg}) and the adjusted salinity (C_{avg}) shall be determined as described below:

STEP 1: The adjusted temperature shall be the weighted average influent water temperature (T_{avg}) for the Acceptance Test and shall be determined as follows:

$$T_{avg} = \frac{1}{V_T} \sum_{i=1}^{N} (T_i V_i) \qquad (1)$$

Where

N = the number of 24 hour periods in the Acceptance Test.

T_i = the RO feedwater water temperature measured at the discharge of the High Pressure RO pumps at the end of each 24 hour period in the Acceptance Test, expressed in degrees Celsius.

V_i = the volume of Finished Water produced during each 24 hour period during the Acceptance Test, expressed in kgal.

V_T = the total volume of Finished Water produced during the Acceptance Test, expressed in kgal.

To find the row for selecting the MEU for the Acceptance Test in Tables A7-9a (6.4 mgd plant flowrate) or A7-9b (9.6 mgd plant flowrate) of this Attachment, the adjusted temperature (T_{avg}) determined in equation (1) shall be rounded down to the closest temperature value listed in Table A7-9 of this Attachment, which is below T_{avg}.

STEP 2: The adjusted salinity shall be the weighted average influent salinity (C_{avg}) for the Acceptance Test and shall be determined as follows:

$$C_{avg} = \frac{1}{V_T} \sum_{i=1}^{N} (C_i V_i) \qquad (2)$$

Where

N = the number of 24 hour periods in the Acceptance Test.

C_i = the plant feedwater water salinity measured at the end of each 24 hour period in the Acceptance Test pursuant to Table A7-9a (6.4 mgd plant flowrate) or Table A7-9b (9.6 mgd plant flowrate), expressed in ppt.

V_i = the volume of Finished Water produced during each 24 hour period during the Acceptance Test, expressed in kgal.

V_T = the total volume of Finished Water produced during the Acceptance Test, expressed in kgal.

The adjusted MEU for the Acceptance Test shall be determined by linearly interpolation, based on the adjusted salinity (C_{avg}), between the two MEU values in the row selected in STEP 1, which most closely correspond to the adjusted salinity (C_{avg}).

Table A7-9a. Maximum Electricity Utilization for All Acceptance Test Finished Water Output Levels, for a Plant Design Flowrate of 6.4 mgd *(Values Provided in Design-Build Agreement – Appendix 2 and Proposal Form 17)*[(1)]

C_{avg} (Salinity in ppt)	24 ppt	28 ppt	32.2 ppt	33.6 ppt	34.6 ppt	38ppt
T_{avg} Feedwater Temperature (in °C)	Plant kWh/kgal	Plant kWh/kgal	Plant kWh/kgal	Plant kWh/kgal	Plant kWh/kgal	Plant kWh/kgal
8	10.9839	11.6871	12.4271	12.6731	12.8586	13.4890
9	10.8999	11.6184	12.3728	12.6249	12.8033	13.4121
10	10.8168	11.5497	12.3195	12.5757	12.7490	13.3353
11	10.7338	11.4810	12.2662	12.5276	12.6936	13.2574
12	10.6508	11.4124	12.2119	12.4790	12.6383	13.1805
13	10.5698	11.3468	12.1627	12.4343	12.6044	13.1795
14	10.4878	11.2812	12.1124	12.3902	12.5696	13.1795
15	10.4068	11.2145	12.0632	12.3461	12.5347	13.1784
16	10.3259	11.1489	12. 0130	12.3021	12.5009	13.1784
17	10.2449	11.0833	11.9638	12.2570	12.4661	13.1774
18	10.1629	11.0177	11.9136	12.2129	12.4322	13.1764

[(1)] These MEUs include all the power used to operate the Project including all facilities, including ancillary facilities, from downstream of the slant well pump station through the finished water pump station.

Table A7-9b. Maximum Electricity Utilization for All Acceptance Test Finished Water Output Levels, for a Plant Design Flowrate of 9.6 mgd *(Values Provided in Design-Build Agreement – Appendix 2 and Proposal Form 17)*[(1)]

C_{avg} (Salinity in ppt) / T_{avg} Feedwater Temperature (in °C)	24 ppt Plant kWh/kgal	28 ppt Plant kWh/kgal	32.2 ppt Plant kWh/kgal	33.6 ppt Plant kWh/kgal	34.6 ppt Plant kWh/kgal	38ppt Plant kWh/kgal
8	10.4601	11.1643	11.9033	12.1493	12.3349	12.9663
9	10.3761	11.0956	11.8500	12.1012	12.2805	12.8884
10	10.2931	11.0259	11.7957	12.0530	12.2252	12.8115
11	10.2100	10.9573	11.7424	12.0038	12.1698	12.7346
12	10.1270	10.8886	11.6891	11.9560	12.1145	12.6567
13	10.0460	10.8230	11.6389	11.9105	12.0807	12.6567
14	9.9651	10.7574	11.5897	11.8664	12.0458	12.6557
15	9.8841	10.6918	11.5395	11.8224	12.0110	12.6547
16	9.8021	10.6252	11.4892	11.7783	11.9771	12.6547
17	9.7211	10.5596	11.4400	11.7332	11.9423	12.6536
18	9.6401	10.4940	11.3898	11.6891	11.9085	12.6526

[(1)] These MEUs include all the power used to operate the Project including all facilities, including ancillary facilities, from downstream of the slant well pump station through the finished water pump station.

Appendix 8

Design-Build Alternatives

Appendix 8

Design-Build Alternatives

1. POST TREATMENT ALTERNATIVE WITH LIME SLURRY "CAL-FLO"

a. Scope:

This alternative includes deletion of the dry lime storage and feed system including silo, mixing tanks, saturators, and feed pumps included in the base proposal.

For the Cal-Flo lime slurry alternative to dry hydrated lime system, the Design-Builder drawings were developed for a 2 tank system. Note, 2 tank system provides sufficient storage based upon max flow-avg dose condition. Additional tank required to meet storage requirement for avg flow-max dose condition.

b. P&IDs

5000-28306-I36B

5000-28306-I46

c. Mechanical

5000-28306-M11

d. Amount of Deduct:

i. [$1,500,000] for 9.6 MGD capacity;

ii. [$1,000,000] for 6.4 MGD capacity

[Note: The Owner has requested enhancements to the Design-Builder's proposal on Cal-Flo. Such requested enhancements are being reviewed by the Design-Builder and the final reduction amount will be agreed upon prior to contract execution.]

e. Owner Decision Deadline:

i. February 28, 2014

f. Design and Construction Requirements for Cal-Flo Lime Slurry

	8.0 mgd Finished Water Flow Rate	**11.2 mgd Finished Water Flow Rate**
Chemical	Lime (Calcium Hydroxide, $Ca(OH)_2$)	
Form	Liquid	
Purity	30 %	
Specific Gravity	1.17	
Delivery Form	Bulk Delivery	
Delivery Quantity (gal)	5,000 gallons	
Application Point -	Composite Permeate Pipe	

	8.0 mgd Finished Water Flow Rate	11.2 mgd Finished Water Flow Rate
Flow Basis - Composite Permeate		
Maximum (mgd)	8.0	11.2
Average (mgd)	6.4	9.6
Minimum (mgd)	3.2	3.2
Dosage - Composite Permeate		
Maximum (mg/L as 100% Ca(OH)2)	74	74
Average (mg/L as 100% Ca(OH)2)	28.7	28.7
Minimum (mg/L as 100% Ca(OH)2)	28.7	28.7
Usage - Composite Permeate		
Maximum (lb/day as 100% Ca(OH)2)	4,937	6,912
Average (lb/day as 100% Ca(OH)2)	1,532	2,298
Minimum (lb/day as 100% Ca(OH)2)	766	766
Max Flow-Avg Dose (lb/day as 100% Ca(OH)2)	1,915	2,681
Avg Flow-Max Dose (lb/day as 100% Ca(OH)2)	3,950	5,925
Maximum (gpd as 30% Delivered Product)	1,687	2,361
Average (gpd as 30% Delivered Product)	523	785
Minimum (gpd as 30% Delivered Product)	262	262
Max Flow-Avg Dose (gpd as 30% Delivered Product)	654	916
Avg Flow-Max Dose (gpd as 30% Delivered Product)	1,349	2,024
Bulk Storage Tanks		
Total Number of Tanks	2	2
Volume of Each Tank (gal)	20,000	20,000
Total Storage Volume (gal)	40,000	40,000
Storage Time at Maximum Usage Rate (days)	23.7	16.9
Storage Time at Average Usage Rate (days)	76.4	51.0
Storage Time at Minimum Usage Rate (days)	152.9	152.9
Storage Time at Max Flow-Avg Dose Usage Rate (days)	61.1	43.7
Storage Time at Avg Flow-Max Dose Usage Rate (days)	29.6	19.8
Tank Mixers		

	8.0 mgd Finished Water Flow Rate	**11.2 mgd Finished Water Flow Rate**
Type	Vertical, Flange Mounted	Vertical, Flange Mounted
Total Number of Mixers	2	2
Motor Horsepower (HP)	10	10
Motor Speed (rpm)	1,750	1,750
Motor Electrical Requirements (Volt/Phase/Hertz)	480/3/60	480/3/60
Motor Type	TEFC	TEFC
Bulk Storage Tank Transfer Pump		
Type	Centrifugal	Centrifugal
Total Number of Transfer Pumps	2 (One Active/One Shelf Spare)	2 (One Active/One Shelf Spare)
Flow (gph)	150	150
Minimum Total Dynamic Head (ft)	35	35
Motor Horsepower (HP)	7.5	7.5
Motor Speed (rpm)	1,800	1,800
Motor Electrical Requirements (Volt/Phase/Hertz)	480/3/60	480/3/60
Motor Type	TEFC	TEFC
Metering Pumps		
Type	Tubular Diaphragm	Tubular Diaphragm
Number of Pumps	2 (One Active/One Standby)	2 (One Active/One Standby)
Maximum Capacity (gph)	77.3	108.2
Minimum Capacity (gph)	12.0	12.0
Method of Control	Primary Control - Flow Paced Secondary Control - Alkalinity	Primary Control - Flow Paced Secondary Control - Alkalinity

2. UV DISINFECTION SYSTEM NOT CONSTRUCTED

a. Scope of Alternative:

A UV disinfection system is included in the design. Based on the outcome of 24 months of Raw Water quality sampling, and CDPH review, the Owner may elect to not construct the UV disinfection system.

In the even that CAW elects to exercise this deduct, the piping would be installed in the same manner but without the flow meters, isolation valves and UV systems, straight piping spools would be provided where these devices would be installed in the future. The main MCC would be provided with spaces for future breakers and the UPS system and local controls panel would be deleted as would the SCADA screen for UPS. Conduit and wire between the MCC and UV system would also be deleted.

b. Amount of Deduct:

$312,500 for both 6.4 MGD and 9.6 MGD capacity

c. Owner Decision Deadline:

February 4, 2016 following 24 months of Raw Water sampling, analysis, and CDPH review. A decision to proceed by this date still date allows for the needed time to complete the purchase of the UV system, prepare and approve submittals and release for fabrication no later than May 9th 2016, which is the latest this equipment could be released for fabrication without impacting overall project start up.

3. ALTERNATIVE MATERIALS OF CONSTRUCTION

a. Generator Enclosure Manufacturer

i. Scope

A highly corrosion resistant custom electrical generator enclosure was required in Appendix 2. The Design-Builder has offered an alternative generator enclosure for consideration by the Owner.

The Pritchard Brown enclosure identified in Appendix 2 is known to be high quality and corrosion resistant to marine atmosphere.

In their alternative, the Design-Builder has identified that the generator is listed as having a "weatherproof sound attenuated (75 dB(A) @ 23 ft)aluminum enclosure with salt resistant coating."

ii. Amount of Deduct

The Design-Builder has offered a $40,000 deduct for acceptance of the alternative generator enclosure.

iii. Owner Decision Deadline

February 28, 2014

b. HDPE vs FRP Piping Alternative

i. Scope:

Under this option all above ground FRP pipe would be replaced with HDPE in the following process areas:

(1) Pretreatment Filter Gallery
(2) Filtered Water Pump Station and Tanks
(3) Cartridge Filters
(4) Reclaimed Water Pump Station and Basin
(5) Backwash Supply Pump Station
(6) Post Treatment Area
(7) Finished Water Pump Station and Tanks
(8) Brine Pump Station and Basin

ii. Amount of Deduct:

$300,000

iii. Owner Decision Deadline

February 28, 2014

4. CALCITE CONTACTOR SYSTEM

a. Amount of Adder: $1,259,924.46

b. Owner Decision Deadline: February 28, 2014

c. Scope

i. The following section describes the Design and Construction Requirements if the Owner elects to require a calcite contactor system to replace the hydrated lime system identified in Section 11 of Appendix 2.

ii. Calcite contactors:

- Minimum empty bed contact time: 20 minutes
- Turbidity must be ≤ 0.15 NTU for 95% of the time and ≤ 0.5 at all times.
- Turbidity cannot exceed 0.25 NTU when limestone is being added to the calcite contactors.
- There must be at least one standby calcite contactor.
- CO_2 addition is required before the calcite contactors.
- Caustic soda and CO_2 addition must be provided after the calcite contactors

iii. CO_2 dosing system:

- The PID process variable for CO_2 addition after the calcite contactors is pH.
- CO_2 needs to be added so chemical reactions are completed and pH has stabilized before the pH measurement location that provides process control.
- Minimum number of CO_2 storage tanks: 1
- Minimum storage capacity: 30 days
- Minimum number of vaporizers: 2
- Minimum number of vapor heaters: 2

iv. Caustic soda dosing system:

- The PID process variable for caustic soda addition is pH.
- Caustic soda needs to be added so chemical reactions are completed and pH has stabilized before the pH measurement location that provides process control.
- Storage and Feed Requirements: See Chemical section.

v. Tables 2-22 through 2-24 identify the Design and Construction Requirements and the Design-Builder's means and methodology for meeting the Design and Construction Requirements.

Table 2-22. Calcite Contactor System

Parameter	Units	Design and Construction Requirements	Means and Methodology
Basis of Flow			
Maximum flow	mgd	11.2	This capacity must be provided for post-stabilization treatment process to enable the Owner to produce a stable finished water product with all installed reverse osmosis units in operation. Providing a capacity of 9.6 mgd will limit the Owner's calcium hardness and total alkalinity operating range when "catching up" to annual production goals.
Average flow	mgd	9.6	Capacity which corresponds to desired annual average production rate of 10,671 afy.
Minimum flow	mgd	3.2	Capacity which corresponds to reverse osmosis system minimum production rate of 3.2 mgd.
Calcium Carbonate Dose			
Application Point	Composite Reverse Osmosis Permeate as it Passes Through the Calcite Contactor System. Calcite Contactor System is Downstream of UV Disinfection and Primary Carbon Dioxide Application Point and Upstream of Secondary Carbon Dioxide and Sodium Hydroxide Application Points.		
Maximum calcium carbonate dose	mg/L as $Ca(CO)_3$	100.0	
Average calcium carbonate dose	mg/L as $Ca(CO)_3$	38.5	Based upon relevant CDM Smith experience (i.e. Santa Cruz finished water coupon testing) a minimum alkalinity of 30 mg/L as calcium carbonate was sufficient to prevent the occurrence of red water events. As such, the minimum water quality requirements identified in Table 11-1 were assumed to be appropriate for average operating conditions.

Parameter	Units	Design and Construction Requirements	Means and Methodology
Minimum calcium carbonate dose	mg/L as $Ca(CO)_3$	38.5	A reduction of the minimum calcium carbonate dosage indicated in the RFP [40 mg/L as $Ca(CO)_3$] was required to allow the Owner to produce finished water with a calcium hardness of 40 mg/L as calcium carbonate. This reduction was necessitated by the presence of calcium in the reverse osmosis permeate.
Calcium Carbonate Consumption Rate			
Maximum flow-Maximum dose	lb/day as $Ca(CO)_3$	9,341	
Average flow-Average dose	lb/day as $Ca(CO)_3$	3,082	
Minimum flow-Minimum dose	lb/day as $Ca(CO)_3$	1,027	
Maximum flow-Average dose	lb/day as $Ca(CO)_3$	3,596	
Average flow-Maximum dose	lb/day as $Ca(CO)_3$	8,006	
Calcite Contactors			
Number of Calcite Contactors	Number	18 (17 Active and 1 Standby)	Two additional contactors (total of 20) will be required for 12.8 mgd operation.
Type of Contactor	Type	Upflow/Gravity	
Contactor Diameter	Ft	12	
Contactor Bed Depth	Ft	11.5	
Upflow Rate for N Units in Service at Maximum Flow Rate	Gpm/ft2	3.7	Upflow rate limited to 4.0 gpm/ft2 with N contactors in service in order to comply with turbidity requirements identified in RFP.
Upflow Rate for N-1 Units in Service at Maximum Flow Rate	Gpm/ft2	4.0	Upflow rate limited to 4.5 gpm/ft2 with N-1 contactors in service in order to comply with turbidity requirements identified in RFP.
Empty Bed Contact Time for N Units in Service at Maximum Flow Rate	Minutes	22.1	

Parameter	Units	Design and Construction Requirements	Means and Methodology
Empty Bed Contact Time for N-1 Units in Service at Maximum Flow Rate	Minutes	20.4	
Calcite Replenishment Frequency at Maximum Flow-Average Dose Consumption Rate	Days	693	
Calcite Replenishment Frequency at Average Flow-Maximum Dose Consumption Rate	Days	311	
Turbidity	NTU	≤ 0.15 for 95% of the time and ≤ 0.5 at all times. Turbidity cannot exceed 0.25 NTU when limestone is being added to the calcite contactors.	Each contactor includes a "contactor to waste" connection to allow the removal of fine particulates produced by the calcite replenishment process. This feature, in addition to the conservative upflow rates, will ensure compliance with turbidity requirements.
Number of standby calcite contactors		1 (minimum)	Compliance with 20 minute minimum empty bed contact time requirement with N-1 contactors in service confirms compliance with standby contactor requirement.
To facilitate the dissolution of calcium carbonate in the calcite contactor process, carbon dioxide is added upstream of the contactors.			
To provide the ability to adjust the pH of the finished water, sodium hydroxide and carbon dioxide is added downstream of the contactors.			
Personnel Access		Stairs and walking platform; no ladders	Stairs to be provided to access a platform with handrails to allow access to all contactors. Platform is approximately 27 feet off the ground.

Parameter	Units	Design and Construction Requirements	Means and Methodology
Supply and Discharge Piping		Supply and Discharge Piping is not to be located under structural slab	FRP piping located above grade. Drain piping located below slab.
Flow Distribution		Flow is to be equally distributed to all in-service units	The inlet to each contactor will be equipped with a propeller style flow meter and butterfly valves. It is anticipated that the operators will monitor the flow meter into each contactor and manually adjust the valves as necessary to equalize the flow between all contactors.
Monitoring of Contactor Effluent Quality		The ability to sample and monitor the effluent quality of each contactor shall be provided	The quality of the effluent from each individual contactor will be monitored through the collection and analysis of discrete water quality samples. It is anticipated that a manual sample valve will be located on the contactor effluent piping (upstream of the valve that would isolate the contactor from the composite effluent header and upstream of the valve that would discharge the contactor effluent to the drain). The quality of the composite effluent will be monitored through both online instrumentation and through the collection and analysis of discrete water quality samples. It is anticipated that two manual sample valves will be located on the composite contactor effluent piping. One sample valve will be located immediately downstream of all contactor units (i.e. upstream of any additional chemical injection locations) and one sample valve will be located downstream of all post-treatment chemical injection

Parameter	Units	Design and Construction Requirements	Means and Methodology
			locations (i.e. downstream of the sodium hydroxide, carbon dioxide, sodium hypochlorite, corrosion inhibitor, etc. and upstream of the treated water tanks).
Monitoring of Calcite Bed Depth		The ability to monitor calcite bed depth shall be provided.	The depth of calcite in each contactor will be measured by an interface level analyzer (reference EchoSmart Interface level analyzer as offered by Entech Design Inc.). The device will be installed in each contactor through a flanged port at the top of the contactor. This device will provide a continuous measurement of the depth of calcite in the contactor. Please note, the EchoSmart device can include an integrated turbidity sensor if it is desired. The installation of an interface level analyzer with an integrated turbidity sensor would be recommended to provide a continuous measurement of effluent turbidity from each contactor. Doing so would provide CAW the information necessary to determine if and when to divert the contactor effluent to waste and when it is acceptable to return the contactor to service.
Hydraulic Coordination with Downstream Processes		Calcite contactors shall not diminish the usable volume of downstream finished water storage tanks	The elevation of the contactor effluent weirs, the composite contactor effluent pipe size and layout, and the elevation of the inlets to the treated water tanks will be designed such that the treated water tanks provide the usable volume required.

Parameter	Units	Design and Construction Requirements	Means and Methodology
Removal of insoluble from contactors		Provisions to remove accumulated insoluble residuals from each contactor shall be provided	Product data sheets for NSF 60 certified calcite products indicate the product is 95% calcium carbonate and contains 2% acid insolubles. As such, the accumulation of residuals will be minimal. It is anticipated that the removal of accumulated residuals will occur when the calcite is replenished. This will ensure the calcite supply in the contactor will be at a minimum during this process, thereby greatly reducing the efforts associated with calcite removal. When the calcite supply in a contactor reaches a level that no longer provides the desired level of treatment (to be determined based upon the results of discrete sampling and analysis events on individual contactor units, however, it is anticipated that this level will be on the order of several feet) the contactor will be removed from service. The operators will then drain the liquid from the contactor. Once drained, the operators will open the access hatch on the contactor and manually remove the remaining calcite and accumulated grit. This also provides the operators the opportunity to inspect the internal components of the contactor.
Seismic Design		Design of contactors shall incorporate seismic criteria	The calcite contactor system will be designed to meet seismic requirements. Flexible connectors are provided at pipe connections to contactors.

Table 2-23 Carbon Dioxide Storage and Feed System

Parameter	Units	Design and Construction Requirements	Means and Methodology
Basis of Flow			
Maximum flow	mgd	11.2	This capacity must be provided for post-stabilization treatment process to enable the Owner to produce a stable finished water product with all installed reverse osmosis units in operation. Providing a capacity of 9.6 mgd will limit the Owner's calcium hardness and total alkalinity operating range when "catching up" to annual production goals.
Average flow	mgd	9.6	Capacity which corresponds to desired annual average production rate of 10,671 afy.
Minimum flow	mgd	3.2	Capacity which corresponds to reverse osmosis system minimum production rate of 3.2 mgd.
Carbon Dioxide Dose – Primary Application Point			
Primary Application Point		Composite Reverse Osmosis Permeate Downstream of UV Disinfection and Upstream of Calcite Contactor System	
Maximum carbon dioxide dose – Primary Application Point	mg/L as CO_2	46.9	Dosage determined by water quality modeling. Model designed to dissolve 100 mg/L of calcium carbonate in the calcite contactor system.

Parameter	Units	Design and Construction Requirements	Means and Methodology
Average carbon dioxide dose – Primary Application Point	mg/L as CO_2	16.4	Based upon relevant CDM Smith experience (i.e. Santa Cruz finished water coupon testing) a minimum alkalinity of 30 mg/L as calcium carbonate was sufficient to prevent the occurrence of red water events. As such, the minimum water quality requirements identified in Table 11-1 were assumed to be appropriate for average operating conditions.
Minimum carbon dioxide dose – Primary Application Point	mg/L as CO_2	16.4	Dosage determined by water quality modeling. Model designed to dissolve 38.5 mg/L of calcium carbonate in the calcite contactor system.
Carbon Dioxide Dose – Secondary Application Point			
Secondary Application Point		Composite Reverse Osmosis Permeate Downstream of the Calcite Contactor System	
Maximum carbon dioxide dose – Secondary Application Point	mg/L as CO_2	4.3	Dosage determined by water quality modeling. Model designed to comply with all water quality requirements identified in Table 11-1 at calcium hardness and total alkalinity contents of 100 mg/L as calcium carbonate each.
Average carbon dioxide dose – Secondary Application Point	mg/L as CO_2	0.1	Based upon relevant CDM Smith experience (i.e. Santa Cruz finished water coupon testing) a minimum alkalinity of 30 mg/L as calcium carbonate was sufficient to prevent the occurrence of red water events. As such, the minimum water quality requirements identified in Table 11-1 were assumed to be appropriate for average operating conditions.

Parameter	Units	Design and Construction Requirements	Means and Methodology
Minimum carbon dioxide dose – Secondary Application Point	mg/L as CO_2	0.1	Dosage determined by water quality modeling. Model designed to comply with all water quality requirements identified in Table 11-1 at calcium hardness and total alkalinity contents of 40 mg/L as calcium carbonate each.
Carbon Dioxide Consumption Rate – Primary Application Point			
Maximum flow-Maximum dose	lb/hr as CO_2	182.5	
Average flow-Average dose	lb/hr as CO_2	54.7	
Minimum flow-Minimum dose	lb/hr as CO_2	18.2	
Maximum flow-Average dose	lb/hr as CO_2	63.8	
Average flow-Maximum dose	lb/hr as CO_2	156.5	
Carbon Dioxide Consumption Rate – Secondary Application Point			
Maximum flow-Maximum dose	lb/hr as CO_2	16.7	
Average flow-Average dose	lb/hr as CO_2	0.3	
Minimum flow-Minimum dose	lb/hr as CO_2	0.1	
Maximum flow-Average dose	lb/hr as CO_2	0.4	

Parameter	Units	Design and Construction Requirements	Means and Methodology
Average flow-Maximum dose	lb/hr as CO_2	14.3	
Carbon Dioxide Consumption Rate – Total			
Maximum flow-Maximum dose	lb/hr as CO_2	199.3	
Average flow-Average dose	lb/hr as CO_2	55.0	
Minimum flow-Minimum dose	lb/hr as CO_2	18.3	
Maximum flow-Average dose	lb/hr as CO_2	64.2	
Average flow-Maximum dose	lb/hr as CO_2	170.8	
Bulk Storage Tank			
Number of Tanks	Number	1 (1 Active)	
Capacity of Tank	Tons	77	Bulk storage tank sized to provide no less than 31 days of storage at maximum flow-average dose consumption rate or average flow-maximum dose consumption rate, whichever was larger.
Storage Time at Maximum flow-Average dose Consumption Rate	Days	100	
Storage Time at Average flow-Maximum dose Consumption Rate	Days	38	

Parameter	Units	Design and Construction Requirements	Means and Methodology
Materials of Construction		Steel Construction; Urethane Insulation; Aluminum Shell; Ancillary Systems (Refrigeration System, Vaporizer System, Vapor Heater System) located within Cabinet	
Refrigeration System			
Number of Refrigeration Units	Number	1 (1 Active)	
Vaporizer System			
Number of Vaporizer Units	Number	2 (1 Active and 1 Standby)	
Capacity of Vaporizer Unit (Each)	Lb/hr as CO_2	219	Sized to allow the Owner to operate within the full range of production rates and calcium hardness/total alkalinity values required by the RFP. Each vaporizer is sized to vaporize 110% of the maximum usage rate.
Vapor Heater System			
Number of Vapor Heater Units	Number	2 (1 Active and 1 Standby)	
Capacity of Vapor Heater Unit (Each)	Lb/hr as CO_2	219	Sized to allow the Owner to operate within the full range of production rates and calcium hardness/total alkalinity values required by the RFP. Each vapor heater is sized to heat 110% of the maximum usage rate.
Pressure Solution Feed Panel – Primary Application Point			
Number of Pressure Solution Feed Panels	Number	1 (1 Active)	Single panel will include redundant control valves (one automatic and one manual)

Parameter	Units	Design and Construction Requirements	Means and Methodology
Maximum Capacity	Lb/hr as CO_2	201	Sized to allow the Owner to operate within the full range of production rates and calcium hardness/total alkalinity values required by the RFP. The pressure solution feed panel is sized to deliver 110% of the maximum usage rate.
Minimum Capacity	Lb/hr as CO_2	18	Same as above.
Pressure Solution Feed Panel – Secondary Application Point			
Number of Pressure Solution Feed Panels	Number	1 (1 Active)	Single panel will include redundant control valves (one automatic and one manual)
Maximum Capacity	Lb/hr as CO_2	18.5	Sized to allow the Owner to operate within the full range of production rates and calcium hardness/total alkalinity values required by the RFP. The pressure solution feed panel is sized to deliver 110% of the maximum usage rate.
Minimum Capacity	Lb/hr as CO_2	0.1	Same as above.
Carrier Water Pumps			
Number of Carrier Water Pumps	Number	2 (1 Active and 1 Standby)	
Type of Carrier Water Pumps	Type	Centrifugal	
Maximum Carrier Water Pump Capacity (Each)	Gpm of Reverse Osmosis Permeate	219	Carrier water pump capacity dictated by maximum capacity of the pressure solution feed panel.
Minimum Discharge Pressure	Psi	65	Based on 55 psi for diffuser assembly and 10 psi for piping/system losses.
Materials of Construction		Stainless Steel	
Motor Size (Each)	HP	15	

Parameter	Units	Design and Construction Requirements	Means and Methodology
Drive Type (Each)	Type	Constant Speed	
Additional Features (Means and Methodology)		The carbon dioxide system, specifically the carbon dioxide control valve inside the pressure solution feed panel, is designed to be controlled based on the flow rate (primary control variable) and trimmed on pH of the product water downstream (secondary control variable) using a PID feedback control loop.	
		The post-stabilization process, including the physical location of all chemical application points and all control devices (i.e. pH instruments, alkalinity instruments, etc.) is designed such that all chemical reactions will be complete prior to measurement to ensure consistent, accurate, and reliable process control.	

Table 2-24 Sodium Hydroxide Storage and Feed System

Parameter	Units	Design and Construction Requirements	Means and Methodology
Basis of Flow			
Maximum flow	mgd	11.2	This capacity must be provided for post-stabilization treatment process to enable the Owner to produce a stable finished water product with all installed reverse osmosis units in operation. Providing a capacity of 9.6 mgd will limit the Owner's calcium hardness and total alkalinity operating range when "catching up" to annual production goals.
Average flow	mgd	9.6	Capacity which corresponds to desired annual average production rate of 10,671 afy.
Minimum flow	mgd	3.2	Capacity which corresponds to reverse osmosis system minimum production rate of 3.2 mgd.
Sodium Hydroxide Dose			
Application Point		Composite Reverse Osmosis Permeate Downstream of Calcite Contactor System	
Maximum Sodium Hydroxide Dose	mg/L as NaOH	5	

Parameter	Units	Design and Construction Requirements	Means and Methodology
Average Sodium Hydroxide Dose	mg/L as NaOH	3	
Minimum Sodium Hydroxide Dose	mg/L as NaOH	0.1	A reduction of the minimum sodium hydroxide dosage indicated in the RFP (2 mg/L as NaOH) was required to allow the Owner to produce finished water with calcium hardness and total alkalinity values of 40 mg/L as calcium carbonate while complying with the other finished water quality requirements.
Sodium Hydroxide Consumption Rate			
Maximum flow-Maximum dose	gal/day as 50% NaOH	80	
Average flow-Average dose	gal/day as 50% NaOH	41	
Minimum flow-Minimum dose	gal/day as 50% NaOH	0.5	
Maximum flow-Average dose	gal/day as 50% NaOH	48	
Average flow-Maximum dose	gal/day as 50% NaOH	69	
Bulk Storage Tanks			
Number of Tanks	Number	1 (Active)	
Capacity of Tank	Gallons	5,200	
Storage Time at Maximum flow-Average dose Consumption Rate	Days	108	Presented storage time accounts for all process demands.

Parameter	Units	Design and Construction Requirements	Means and Methodology
Storage Time at Average flow-Maximum dose Consumption Rate	Days	75	Presented storage time accounts for all process demands.
Materials of Construction		Steel Construction	
Metering Pumps			
Number of Metering Pumps	Number	2 (1 Active and 1 Standby)	
Maximum Capacity	gal/hr as 50% NaOH	3.7	Sized to allow the Owner to operate within the full range of production rates and calcium hardness/total alkalinity values required by the RFP. Each metering pump is sized to deliver 110% of the maximum usage rate.
Minimum Capacity	gal/hr as 50% NaOH	0.02	Same as above.
Maximum Line Pressure Sodium Hydroxide Metering Pumps must Pump Into	Psi	10	Pressure requirement based upon finished water storage tank dimensions and piping/equipment configuration.
Additional Features (Means and Methodology)			The sodium hydroxide system, specifically the sodium hydroxide metering pumps, is designed to be controlled based on a PID feedback control loop using pH as the control variable.
			The post-stabilization process, including the physical location of all chemical application points and all control devices (i.e. pH instruments, alkalinity instruments, etc.) is designed such that all chemical reactions will be complete prior to measurement to ensure consistent, accurate, and reliable process control.

Appendix 9

Operation and Maintenance-Related Deliverables

Appendix 9

Operation and Maintenance-Related Deliverables

The following table lists the Operation and Maintenance-Related Deliverables that the Design-Builder is required to provide to the Owner.

O&M RELATED DELIVERABLE	**REFERENCE LOCATION**
1. Electronic Record Drawings	Appendix 4, item 8 (pg 4-4)
2. O&M Manual (hard copy)	Appendix 4, Section 4.7.B (pg 4-32)
3. Electronic Project Files CD	Appendix 4, item 10 (pg 4-4)
4. Equipment Maintenance Data Sheets	Appendix 4, item 13 (pg 4-5)
5. Warranties & Service Contracts	
a. General Information	DB Agreement, Section 3.18
b. RO Equipment	Appendix 2, item 9
c. UV Equipment	Appendix 2, item 13
d. On-Site Hypo Equipment	Appendix 2, item 21.b
e. High Pressure RO Feed Pump Warranty	Appendix 2, item

Appendix 10

Key Personnel and Approved Subcontractors

Appendix 10

Key Personnel and Approved Subcontractors

1. Key Personnel

a. Paul Meyerhofer - Project Manager and Design Principal

b. Chad Brown - Construction Principal

c. Curtis Kiefer - Process Design Lead

d. Kenneth Klinko - Process Design

e. Doug Brown - Facilities Engineer

f. Richard Weber - Civil/Survey Engineer

g. Thomas Warriner - HVAC/Energy/Sustainability Engineer

h. Chuen-Shiow Chen - Structural Engineer

i. Brad Fransen - Electrical/Solar Design

j. Michael Kleames - Geotechnical/Seismic Engineer

k. Charles Davis - Architect

l. Greg Wetterau - Permitting Support

m. Michael Zafer - Lead Engineer, Commissioning Manager

n. Kenneth Vassar - Superintendent

o. Joe Leslie - Safety Officer

p. Jack Taylor - Design-Build QA/QC

q. Dan Hutton - Commissioning - Startup and Testing

r. Randall Redmann - Procurement/Local &WMDVBE Outreach

2. Approved Subcontractors

a. CDM Smith, Inc. - Design Firm

b. H20 Innovation USA, Inc. - ROEM

c. Whitson and Associates, Inc. - Survey/Civil

d. Pacific Crest Engineering, Inc. - Geotechnical

e. RosTek Associates, Inc. - Seawater Desalination Technical Advisor

f. Infilco Degremont, Inc. - Seawater Process Design Advisor

g. JDH Corrosion Consultants, Inc. - Corrosion

h. Joni L. Janecki & Associates, Inc. - Landscape Architecture

i. Oona Johnson Landscape Architecture - Landscape Architecture

j. Wilson, Ihrig & Associates, Inc. - Acoustic/Vibration

k. Denise Duffy & Associates, Inc. - Environmental/Permitting

l. EOA, Inc. - Environmental/Permitting

Appendix 11

Insurance Requirements

Appendix 11

Insurance Requirements

I. DESIGN-BUILDER INSURANCE REQUIREMENTS.

A. Insurance Limits and Coverage. At no expense to the Owner, the Design-Builder shall obtain and keep in force during the term of this Design-Build Agreement the following minimum insurance limits and coverage (or greater where required by Applicable Law). The insurance coverage limits stated below are minimum coverage requirements, not limitations of liability, and shall not be construed in any way as the Owner's acceptance of the responsibility of the Design-Builder.

1. Commercial General liability:

$1,000,000 per occurrence Combined Single Limits

$1,000,000 General Aggregate

$1,000,000 Products and Completed Operations Aggregate

CGL ISO 1996 or later Occurrence form including Premises and Operations Coverage, Products and Completed Operations, Coverage for Independent Contractors, Personal Injury Coverage and Blanket Contractual Liability, and Contractors Protective Liability if the Design/Builder subcontracts to another all or any portion of the Design-Build Work. Completed operations shall be maintained for a period of five (5) years following Final Completion for any construction, renovation, repair and or maintenance service.

2. Workers' Compensation

Applicable Federal or State Requirements: Statutory Minimum

Employer's Liability:

Each Accident	$1,000,000
Each Employee – Disease	$1,000,000
Policy Limit – Disease	$1,000,000

Other States insurance.

The Workers' Compensation policy shall also include U.S. Longshoreman and Harbors Workers' Compensation Act Coverage, if any Design-Build Work shall be done over or within 100 feet of any body of water, or otherwise at the sole discretion of the Owner. It shall provide maritime (Jones Act) coverage if a boat or vessel of any type is used.

3. Automobile Liability - (including owned, hired, borrowed and non-ownership liability)

Bodily Injury and Property Damage $1,000,000 each accident Combined Single Limits

4. Umbrella Liability

$50,000,000 each occurrence and annual aggregate in excess of Employer’s Liability, General Liability and Automotive Liability (no more restrictive than underlying insurance)

5. Professional Liability

Professional Liability or Errors and Omissions insurance acceptable to the Owner covering the Design-Builder’s liabilities for loss due to error, omission, negligence, mistakes, or failure to take appropriate action in the performance of business or professional duties of their employees in the amount of at least $10,000,000 per claim and in the aggregate shall be procured prior to the commencement of the design work during the procurement phase to be maintained and retroactive to this date during the Design-Build Agreement term and for a period of at least five (5) years after completion of the Design-Build Agreement evidenced either by annual renewal of the policy for five (5) years or by endorsement or addition of an Extended Reporting (or Discovery) Period for at least five (5) years following the policy expiration date. Policy shall be endorsed to provide contingent bodily injury and property damage liability coverage.

6. Environmental Impairment Liability (EIL) or Pollution Liability insurance

Covering losses caused by pollution conditions that arise from the operations of Design-Builder described in this Design-Build Agreement. This insurance shall apply to bodily injury; property damage, including loss of use of damaged property or of property that has not been physically injured; cleanup costs; and defense, including costs and expenses incurred in the investigation, defense, or settlement of claims. The policy of insurance affording these required coverages shall be written in an amount of at least $5,000,000 per claim with an annual aggregate of at least $5,000,000.

7. Builders Risk Insurance

The Owner will carry "All Risk" Builders Risk Insurance subject to deductibles, terms and conditions as stated in the policy and below with Design-Builder as an additional insured. It is the obligation and responsibility of the Design-Builder to make appropriate claim to the insurance company for all losses claimed under the policy.

Such insurance shall cover the full value of the cost of replacement to the Owner, less applicable deductibles, of all completed portions of the Design-Build Work to be performed throughout the entire time of construction. The Owner will furnish to the Design-Builder evidence of the insurance coverage provided.

Such insurance shall not cover damage to or loss of machinery, tools, equipment, or other property furnished by the Design-Builder whether or not used by the Design-Builder in carrying out the terms of the Design-Build Agreement unless such machinery, tools, equipment or other property are specifically intended for permanent incorporation into the Design-Build Work and are included in an approved application for payment.

B. Satisfaction of Limits. The minimum liability limits required by this Appendix 11 may be satisfied through the combination of the primary General Liability, Employers' Liability, and Automotive Liability limits with an Umbrella Liability policy (with coverage no more restrictive than the underlying insurance) providing excess limits at least equal to or greater than the combined primary limits.

C. Additional Insureds. All Commercial General Liability including completed operations-products liability coverage, Automobile liability and Pollution Liability insurance shall designate the Owner, its parent and affiliates, their respective directors, officers, employees and agents, Owner's Representative, and [INSERT ANY ADDITIONAL] as Additional Insureds.

D. Other Requirements. All insurance required by this Appendix 11, except for Workers' Compensation and Professional Liability, shall be primary and non-contributory, and is required to respond and pay prior to any other insurance or self-insurance available to the Owner. In addition to the liability limits available, such insurance, except for Workers' Compensation and Professional Liability, will pay on behalf of or will indemnify the Owner for defense costs. Any other coverage available to the Owner applies on a contingent and excess basis. All such insurance shall include appropriate clauses pursuant to which the insurance companies shall waive their rights of subrogation against the Owner.

E. Certificates of Insurance. Design-Builder and its Subcontractors shall furnish, prior to the start of the Design-Build Work, certificates or adequate proof of the foregoing insurance including, if specifically requested by the Owner, copies of endorsements naming the Owner and other required Additional Insureds. Current certificates of insurance shall be provided prior to the commencement of the Design-Build Work and shall be maintained until completion of the Design-Build Agreement. Such certificates shall evidence that the Owner is included as Additional Insured, except for workers compensation and professional liability. The Design-Builder shall notify the Owner in writing, at least thirty (30) days prior to cancellation of or a material change in a policy. Such cancellation or material alteration shall not relieve the Design-Builder of its continuing obligation to maintain insurance coverage in accordance with this Design-Build Agreement.

F. Carrier Rating. Carriers providing coverage will be rated by A.M. Best with at least an A-rating and a financial size category of at least Class VII. Carriers shall be licensed in state(s) where the Design-Build Work shall be performed. The Design-Builder may, however, request that the Owner approve a Professional Liability carrier that is not licensed in the state(s) where the Design-Build Work shall be performed, which approval will not be unreasonably withheld. Any such approval by Owner must be in writing.

G. Failure to Procure. If the Design-Builder shall fail to procure and maintain said insurance, the Owner, upon written notice, may, but shall not be required to, procure and maintain same, but at the expense of the Design-Builder. In the alternative, the Owner may declare a default hereunder and, unless such default is timely cured, terminate the Design-Build

Agreement. Unless and until the default is cured, neither the Design-Builder nor its servants, employees or agents will be allowed to enter upon the Owner's premises.

II. SUBCONTRACTOR INSURANCE REQUIREMENTS.

The Design-Builder shall require each Subcontractor to obtain and keep in force the coverages required of the Design-Builder. The Design-Builder may, however, in its discretion, allow a Subcontractor to secure lower insurance limits than the limits required of the Design-Builder. The Design-Builder may also request in writing that the Owner approve the waiver of certain coverages for a specific Subcontractor, which approval will not be unreasonably withheld by the Owner. Any such approval by the Owner must be in writing.

Appendix 12

Allowances

[NOTE: Appendix under review.]

Appendix 12

Schedule of Cash Allowances[2]

A. REVISE PIPING AT PRESSURE FILTERS

The Fixed Design-Build Price includes an Allowance of **$815,808.09** for below ground piping between the pressure filters. The Owner requested the piping be arranged differently because of concern with long term operation, maintenance, and access concerns. Part of the cost for the revised layout was a custom-designed building instead of a pre-engineered building to support above ground piping. The Owner intends to work with the Design-Builder during preliminary design to further improve the piping layout and reduce the cost of the change. The Design-Builder's reasonable costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses is included in this allowance.

Owner Decision Deadline: February 28, 2014

B. REVISE PIPING AND CONCRETE TRENCHES AT RO BUILDING

The Fixed Design-Build Price includes an Allowance of **$317,056.18** for a different arrangement of the concrete trenches located in the RO Building because of the Owner's concern with long term operation, maintenance, and access concerns. The Owner intends to work with the Design-Builder during preliminary design to further improve the piping and trench design to improve access while also reducing the cost of the change. The Design-Builder's reasonable costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses is included in this allowance.

Owner Decision Deadline: February 28, 2014

C. ELIMINATE SEPTIC SYSTEM AND PROVIDE SANITARY SEWER AND LIFT STATION

The Fixed Design-Build Price includes an Allowance of **$233,402.24** for the Design-Builder to provide sanitary sewer and lift station to serve both the water treatment plant and the Landfill sanitary disposal needs instead of the Design-Builder's proposal of a septic system and leach field for water treatment plant sanitary waste disposal. The scope of the work shall be within the boundary of the Project Site. The lift station is to be provided with duplex pumps, supplied with standby electrical power, and alarms are to be conveyed to the water treatment plant control system. The Owner intends to work with the Design-Builder during preliminary design to further improve the piping and trench design to improve access while also reducing the cost of the change. The Design-Builder's reasonable costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses is included in this allowance.

Owner Decision Deadline: February 28, 2014

[2] Note that the Project Allowances are not included in the Construction Component Price and therefore not subject to escalation in accordance with Section 5.1(C) of the Design-Build Agreement.

D. Earthwork – Testing
Asphalt Concrete Paving - Testing
Cast-in-Place Concrete –Testing

The Fixed Design-Build Price includes an Allowance of **$100,000** for providing the services of an independent testing laboratory to perform testing for concrete, soils, asphalt, structural steel bolting and welding, and steel tank painting inspection as specified in the Design-Build Agreement. Approval by the Owner of the independent testing laboratory is required before commencement of work at the Project Site.

During the course of the work, the independent testing laboratory shall perform for the Design-Builder and Owner such tests as are required to verify conformance to the requirements of the specifications. Such tests are not intended to provide the Design-Builder with information required by it for proper execution of the Design-Build Work, and their performance shall not relieve the Design-Builder of the necessity to perform tests for that purpose.

E. RPR Special Equipment and Supplies

In addition to the RPR field trailer, equipment and supplies included as temporary facilities pursuant to the Design and Construction Requirements of Appendix 2, the Fixed Design-Build Price includes an Allowance of **$50,000** for special equipment and supplies. These equipment and supplies may include, but are not limited to: computer, printer, fax, scanner, telephone, digital camera and office supplies. The Allowance shall also be used to pay on a monthly basis the telephone usage bills for telephone lines designated for RPR use. The costs reimbursed shall be for the actual cost incurred and shall not include any Design-Builder markups. All purchases for RPR equipment and supplies shall be approved by the Owner. If the actual cost of the equipment, supplies and telephone bills are greater than or less than allowance amount, a Change Order will be processed to account for the difference.

F. Security

The Fixed Design-Build Price includes an Allowance of **$10,000** for providing background checks for the Design-Builder’s key employees including Subcontractors.

The Owner will require that key employees of the Design-Builder working on the Project site to have a background checks completed. The Design-Builder shall conduct a background check on each of its key employees prior to the employee performing any function or activity under the Design-Build Agreement involving any Design-Build Work at the Project Site. The background check conducted by the Design-Builder shall consist of a check of at least the following: previous employers and dates of employment; education; driving record; criminal history (State and federal); references and credit history. Prior to commencing work, Design-Builder shall provide proof to the Owner that the requirements of this paragraph have been met. Design-Builder shall make available to the Owner, upon request, the documentation and results of the background check with respect to any employee of Design-Builder performing any function under the Design-Build Agreement involving any Design-Build Work at the Project Site.

G. Water Quality Analyses during Startup, Commissioning, and Acceptance Testing

An external laboratory shall be selected, mutually acceptable to Owner and Design-Builder, to perform water quality analyses during startup, commissioning, run-in, and Acceptance Testing. The Fixed Design-Build Price includes an Allowance of **$50,000** for shipping and analysis fees. The costs reimbursed shall be for the actual cost incurred and shall not include any Design-Builder markups.

H. Miscellaneous

a. **Elective Landscaping Features- $75,000**
b. **Elective Exterior Architecture Features: $75,000**
c. **Elective Interior Architecture Features: $50,000**
d. **Computer/Telephones, etc - $50,000**

Appendix 13

Payment Procedures and Drawdown Schedule

Appendix 13

PAYMENT PROCEDURES AND DRAWDOWN SCHEDULE

13.1 PURPOSE

This Appendix sets forth the requirements for the development of a detailed Progress Payment Schedule for the Design-Build Period and sets forth the drawdown schedule that establishes the estimated monthly payments during the Design-Build Period.

13.2 PAYMENT PROCEDURES

A. Generally. The Design-Builder shall be entitled to submit Requisitions and receive from Owner the payments that will be set forth in the Progress Payment Schedule developed in accordance with this Appendix 13 subject to the conditions to payment set forth in the Design-Build Agreement. The estimated drawdown schedule set forth in this Appendix and the Progress Payment Schedule developed by the Design-Builder and approved by Owner shall serve as the basis for progress payments and will be incorporated into a detailed Progress Payment Schedule acceptable to the Owner in accordance with this Appendix.

On or about the date established in the Design-Build Agreement for submission of each application for progress payment (but not more often than once a month), the Design-Builder shall submit to Owner for review an application for payment ("Application") filled out and signed by the Design-Builder covering the Design-Build Work completed as of the date indicated on the Application and accompanied by supporting documentation as required by the Design-Build Agreement. If payment is requested on the basis of materials and equipment not incorporated in the Design-Build Work but delivered and suitably stored at the Project Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect Owner's interest therein, all of which will be satisfactory to Owner.

Beginning with the second Application for Payment, each Application shall include an affidavit of Design-Builder stating that all previous progress payments received on account of the Design-Build Work have been applied on account to discharge Design-Builder's legitimate obligations associated with prior Applications for Payment.

The amount of retainage with respect to progress payments will be as stipulated in subsection 5.2(D) of the Design-Build Agreement (Retainage).

B. Procedure. Progress payments shall be made by the Owner to the Design-Builder according to the following procedure:

1. Owner will, within twenty days of receipt of each Application for payment, either indicate in writing its acceptance of the Application and state that the Application is being processed for payment, or return the Application to the Design-Builder indicating in writing its

reasons for refusing to accept the Application. Not more than ten days after accepting such Application the amount will become due and when due will be paid by the Owner to the Design-Builder.

2. If the Owner should fail to pay the Design-Builder at the time the payment of any amount becomes due, then the Design-Builder may, at any time thereafter, upon serving written notice that he will stop the Design-Build Work within seven days after receipt of the notice by the Owner, and after such seven day period, stop the Design-Build Work until payment of the amount owing has been received. Written notice shall be deemed to have been duly served if sent by certified mail to the last known business address of the Owner.

3. Payments due but unpaid shall bear interest at the rate specified in the Design-Build Agreement.

4. No Progress Payment nor any partial or entire use or occupancy of the Project by the Owner shall constitute an acceptance of any Design-Build Work not in accordance with the Design-Build Agreement.

13.3 PROGRESS PAYMENT SCHEDULE AND PROGRESS PAYMENTS

A. Generally.

Within 30 days following the Contract Date, the Design-Builder shall prepare and submit for approval by the Owner an interim Progress Payment Schedule to assist the Owner, Owner Engineer and the Contract Administrator in evaluating Design-Builder Requisitions for progress payments to be paid on a percent complete basis during the first 180 days of the Design-Build Period in accordance with the Design-Build Agreement. The interim Progress Payment Schedule shall be based upon the interim schedule prepared by the Design-Builder pursuant to Appendix 4. The Design-Builder shall not receive payments for any Design-Build Work completed during the first 180 days of the Design-Build Period unless Owner has approved the interim Progress Payment Schedule and the Requisition for such work contains a copy of the final interim schedule that has been established and updated in accordance with Appendix 4 and shows the progress made by the Design-Builder for the period covered by such Requisition.

Within 30 days following acceptance of the Design-Builder's master schedule by the Owner in accordance with Appendix 4, the Design-Builder shall prepare and submit for approval by the Owner a final Progress Payment Schedule to assist the Owner, the Owner Engineer, and the Contract Administrator in evaluating Design-Builder Requisitions for progress payments to be paid on a percent complete basis in accordance with the Design-Build Agreement. The final Progress Payment Schedule shall be based upon the master schedule prepared by the Design-Builder pursuant to Appendix 4 and shall become the basis for Owner's consideration of partial payments to be made to the Design-Builder following the first 180 days of the Design-Build Period. The Design-Builder shall not receive payments for any invoices for any Design-Build Work completed following the first 180 days of the Design-Build Period unless Owner has approved the final Progress Payment Schedule and the Requisition for such work contains a copy of the final master schedule that has been established and updated in accordance with Appendix 4 and shows the progress made by the Design-Builder for the period covered by the Requisition.

The Progress Payment Schedules prepared by the Design-Builder shall be consistent with the requirements set forth in Attachment 13A to this Appendix. The detailed Progress Payment Schedule prepared by the Design-Builder shall also be consistent with Table 13-1 in all respects and in no event shall there be any change to the percentages set forth in Table 13-1. Upon the request of Owner, City Engineer or Contract Administrator, the Design-Builder shall support all values with data that substantiates the correctness of any information contained in the Progress Payment Schedule submitted by the Design-Builder. After review and comment by Owner, Owner Engineer and the Contract Administrator, the Design-Builder shall revise and resubmit the Progress Payment Schedules as necessary until a detailed Progress Payment Schedule is approved by Owner. The Design-Builder shall resubmit subsequent revised Progress Payment Schedules in the same manner, upon request by Owner for necessary changes.

Each Requisition for payment shall be signed and certified by the Design-Build Manager and the Engineer-of-Record, and the Design-Builder shall provide all supporting information in accordance with subsection 5.2(B) of the Design-Build Agreement. The Design-Builder shall not submit any Requisition for payments on a percent complete basis prior to approval by Owner of the interim or final Progress Payment Schedule, as applicable.

B. Partial Utilization

Prior to Substantial Completion of all the Design-Build Work, Owner may use or occupy any substantially completed part of the Construction which (i) has specifically been identified in the Design-Build Agreement, or (ii) Owner and Design-Builder agree constitute a separately functioning and usable part of the Construction that can be used by Owner for its intended purpose without significant interference with Design/ Builder's performance of the remainder of the Design-Build Improvements, subject to the following:

1. Owner at any time may request Design-Builder in writing to permit Owner to use or occupy any such part of the Construction which Owner believes to be ready for its intended use and substantially complete. If Design-Builder agrees that such part of the Design-Build Work is substantially complete, Design-Builder will certify to Owner that such part of the Design-Build Improvements is substantially complete and request Owner to issue a certificate of Substantial Completion for that part of the Construction. Design-Builder at any time may notify Owner in writing that Design-Builder considers any such part of the Design-Build Work ready for its intended use and substantially complete and request Owner to issue a certificate of Substantial Completion for that part of the Design-Build Work. Within a reasonable time after either such request, Owner and Design-Builder shall make an inspection of that part of the Design-Build Work to determine its status of completion. If Owner does not consider that part of the Design-Build Work to be substantially complete, Owner will notify Design-Builder in writing giving the reasons therefore. If Owner considers that part of the Design-Build Work to be substantially complete, the provisions of paragraph 13.5 will apply with respect to certification of Substantial Completion of that part of the Design-Build Work and the division of responsibility in respect thereof and access thereto.

2. No use or occupancy of part of the Design-Build Improvements will be accomplished prior to compliance with the requirements of paragraph 13.10 regarding property insurance.

3. Owner may at any time submit a written request to Design-Builder to permit Owner to take over operation of any such part of the Construction although it is not substantially complete. Owner and Design-Builder shall make an inspection of that part of the Construction to determine its status of completion and will prepare a list of the items remaining to be completed or corrected thereon before final payment. If Design-Builder does not object in writing to Owner that such part of the Construction is not ready for separate operation by Owner, Owner will finalize the list of items to be completed or corrected and will deliver such list to Design-Builder together with a written division of responsibilities pending final payment between Owner and Design-Builder with respect to security, operation, safety, maintenance, utilities, insurance, warranties and guarantees for that part of the Construction which will become binding upon Owner and Design-Builder at the time when Owner takes over such operation. During such operation and prior to substantial completion of such part of the Construction, Owner shall allow Design-Builder reasonable access to complete or correct items on said list and to complete other related Construction.

C. Final Inspection

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

13.4 CERTAIN LIMITATIONS ASSOCIATED WITH PROGRESS PAYMENTS

The Design-Builder's detailed Progress Payment Schedule shall be in sufficient detail to indicate further breakdown of items on the schedule into equipment, systems, subsystems, building structures and other discrete elements.

The Design-Builder shall submit a schedule of values representing a detailed subdivision of the lump sum Contract amount. This subdivision, when approved by the Engineer, will become the basis for computing the Design-Builder's monthly progress payments. If practical, the schedule of values shall be developed by assigning a cost value to the appropriate activities contained in the preliminary progress schedule. If activities, or other line items, in the schedule of values contain costs associated with material, labor or subcontracts these costs are to be identified separately by listing the activity multiple times and identifying material, labor, and subcontract with a suffix M, L, and S respectively. Cost values for activities representing materials/equipment only shall be assigned to the activity representing delivery of such material/equipment to the Project Site.

In addition to the cost of material, labor and subcontracts, the following costs are to be identified separately in the schedule of values accompanied by such supporting documentation as required by the Owner to substantiate the amounts listed.

1. Mobilization - To include actual cost to setup temporary facilities at the Project Site.

2. Bonds, Insurance - To reflect premiums paid, or to be paid, for Bonds and insurance required to be provided per the Design-Build Agreement. Additional insurance coverage or bonds purchased optionally shall be considered general overhead and apportioned to construction activity costs.

3. Job Site Overhead - To reflect the cost of maintaining the temporary facilities at the Project Site including the cost of direct field supervision. This value, when approved, will be paid in equal monthly increments based on the number of months between mobilization and final completion.

4. Demobilization - To reflect the cost of removing the temporary facilities and final site cleanup.

5. Permits - To include fees required to obtain any permits including inspection fees associated with such permits. The Design-Builder's detailed Progress Payment Schedule shall also include a breakdown of all design and permitting submittals and for obtaining significant Governmental Approvals. Governmental Approval applications shall be complete, as determined by the applicable Governmental Body, in order for the Design-Builder to receive payment for the corresponding progress payment associated with the submittal of the Governmental Approval application.

The cost of home office overhead, profit, financing, contingencies, etc. are to be apportioned to the construction activities in the schedule of values based on the percentage that each construction activity cost represents when compared to the subtotal of all construction activity costs. This subtotal is excluding mobilization, demobilization, Project Site overhead, permits, home office overhead, profit, financing, contingencies, etc. The total of all items in the schedule of values shall equal the Contract Price.

Payments shall be made on account of equipment or unit of materials delivered and suitably stored at the Project Site for subsequent incorporation into the Design-Build Work. If approved in advance by Owner, Requisitions may also be submitted for materials and equipment suitably stored off the Project Site at a location acceptable to Owner, subject to any requirements imposed by the Insurance Requirements. The Design-Builder shall not be entitled to payment for materials and equipment that are not stored properly, either at the Project Site or off the Project Site, in accordance with the Contract Standards so as to protect such materials and equipment from damaging environmental elements (e.g., dust intrusion into rotating equipment). All material and equipment storage locations, either at the Project Site or off the Project Site, shall be subject to inspection by Owner and its representatives during normal business hours.

In no event shall the cumulative Design-Build Price payments in any month exceed the cumulative Value of Work completed by the end of that month.,

13.5 QUARTERLY PROGRESS PAYMENT ESTIMATES

The Design-Builder shall provide Owner with a good faith calendar quarterly estimate of payments of the Design-Build Price throughout the Design-Build Period. The first such estimate shall be submitted to Owner with the initial submittal of the detailed Progress Payment Schedule required pursuant to Section 13.3 of this Appendix.

13.6 DRAWDOWN SCHEDULE

The Design-Builder shall also submit to the Owner, for approval, a Cash Flow Schedule. The Cash Flow Schedule shall show the amounts of money by months which will be required to reimburse the Design-Builder for Work performed during each month of the Contract Times. The sum of all the monthly cash requirements shall equal the Contract Price. The monthly cash requirements shall be proportioned based on the CPM Schedule. The initial cash flow schedule shall depict monthly cash requirements based on the early start dates of the CPM Schedule as well as the monthly cash requirements based on late start dates of the CPM Schedule. The approved cash flow schedule will be developed by the Owner and will reflect the Design-Builder's schedule performance as of the date of approval. This process of approving cash flow schedules will occur with each required schedule update.

The approved Cash Flow Schedule will be used by the Owner to program funds for progress payments to the Design-Builder. Monthly payments will be made to the Design-Builder in accordance with the Design-Build Agreement.

Table 13-1 sets forth the estimated monthly payment that the Design-Builder is subject to in its submittal of Requisitions as set forth in Section 6.2 of the Design-Build Agreement. The percentages set forth in Table 13-1 are percentages of the total Fixed Design-Build Price, as set forth in subsection 5.1(B) of the Design-Build Agreement.

Table 13-1
FIXED DESIGN-BUILD PRICE
DRAWDOWN SCHEDULE FOR 9.6 MGD FACILITY

Month	Cumulative Percentage of the Fixed Design-Build Price for 9.6 mgd facility	Cumulative Drawdown
1	0.05%	$43,492
2	0.51%	$443,621
3	0.77%	$669,781
4	0.98%	$852,449
5	1.30%	$1,130,799
6	1.51%	$1,313,467
7	1.82%	$1,583,119
8	2.45%	$2,131,121
9	2.91%	$2,531,250
10	2.92%	$2,539,949
11	2.93%	$2,548,647
12	2.94%	$2,557,346
13	2.95%	$2,566,044
14	2.96%	$2,574,743
15	2.97%	$2,583,441
16	4.02%	$3,496,779
17	4.84%	$4,210,052
18	5.93%	$5,158,183
19	7.15%	$6,219,395
20	8.36%	$7,271,908

Month	Cumulative Percentage of the Fixed Design-Build Price for 9.6 mgd facility	Cumulative Drawdown
21	9.19%	$7,993,880
22	10.10%	$8,785,439
23	11.40%	$9,916,238
24	12.54%	$10,907,862
25	13.20%	$11,481,960
26	14.76%	$12,838,919
27	16.44%	$14,300,259
28	19.90%	$17,309,924
29	23.76%	$20,667,528
30	26.40%	$22,963,920
31	29.30%	$25,486,472
32	33.86%	$29,452,967
33	43.82%	$38,116,627
34	50.79%	$44,179,450
35	57.32%	$49,859,541
36	65.38%	$56,870,495
37	76.23%	$66,308,318
38	85.93%	$74,745,819
39	91.18%	$79,312,508
40	93.33%	$81,182,676
41	95.00%	$82,635,317
42	97.51%	$84,818,629
43	98.17%	$85,392,727

Month	Cumulative Percentage of the Fixed Design-Build Price for 9.6 mgd facility	Cumulative Drawdown
44	99.18%	$86,271,271
45	99.54%	$86,584,416
46	99.71%	$86,732,289
47	99.82%	$86,827,972
Total	100.00%	$86,984,545

Table 13-2
FIXED DESIGN-BUILD PRICE
DRAWDOWN SCHEDULE FOR 6.4 MGD FACILITY

Month	Cumulative Percentage of the Fixed Design-Build Price for 6.4 mgd facility	Cumulative Drawdown
1	0.05%	$39,901
2	0.55%	$438,913
3	0.84%	$670,339
4	1.07%	$853,885
5	1.42%	$1,133,193
6	1.65%	$1,316,738
7	1.98%	$1,580,085
8	2.67%	$2,130,721
9	3.17%	$2,529,733
10	3.18%	$2,537,713
11	3.19%	$2,545,693
12	3.20%	$2,553,673
13	3.21%	$2,561,654
14	3.22%	$2,569,634
15	3.24%	$2,585,594
16	4.02%	$3,208,052
17	4.84%	$3,862,431
18	5.93%	$4,732,276
19	7.15%	$5,705,864
20	8.36%	$6,671,471

Month	Cumulative Percentage of the Fixed Design-Build Price for 6.4 mgd facility	Cumulative Drawdown
21	9.19%	$7,333,830
22	10.10%	$8,060,031
23	11.40%	$9,097,461
24	12.54%	$10,007,207
25	13.20%	$10,533,902
26	14.76%	$11,778,818
27	16.44%	$13,119,497
28	19.90%	$15,880,656
29	23.76%	$18,961,024
30	26.40%	$21,067,805
31	31.30%	$24,978,117
32	35.86%	$28,617,101
33	43.82%	$34,969,364
34	50.79%	$40,531,583
35	57.32%	$45,742,673
36	65.38%	$52,174,737
37	76.23%	$60,833,286
38	85.93%	$68,574,108
39	91.18%	$72,763,728
40	93.33%	$74,479,477
41	95.00%	$75,812,176
42	97.51%	$77,815,213
43	98.71%	$78,772,841

Month	Cumulative Percentage of the Fixed Design-Build Price for 6.4 mgd facility	Cumulative Drawdown
44	99.18%	$79,147,911
45	99.54%	$79,435,200
46	99.71%	$79,570,864
47	99.82%	$79,658,646
Total	100.00%	$79,802,290

Attachment 13A
Progress Payment Schedule Requirements

13A.1 FORM AND CONTENT OF PROGRESS PAYMENT SCHEDULE

A. The Design-Builder’s standard forms and computer printout will be considered for approval by Owner upon the Design-Builder’s request. The Progress Payment Schedule shall identify:

1. Project name and location.

2. Name and address of Design-Builder.

3. Owner name.

4. Date of submission.

B. The Schedule of Values will serve as the basis for progress payments. Design-Builder's Schedule of Values, as described in Section 13.4 of this Appendix will be acceptable to Owner as to form and substance if it provides a reasonable allocation of the Fixed Design-Build Price to component parts of the work.

C. Each line item shall be identified with the number and title of the respective major section of the Technical Specifications. Line items or indicated groups of line items shall match the construction activities’ breakdown in the Design-Builder’s interim schedule or master schedule, as applicable. The cash loaded schedules shall be used as the basis of the Progress Payment Schedule and therefore the basis of payment.

D. For each major line item, the Progress Payment Schedule shall list sub-values of major products or operations under the item.

E. Each item shall include a directly proportional amount of the Design-Builder’s overhead and profit.

F. For items on which partial payments will be requested for properly stored materials, the value shall be broken down into:

1. The cost of the materials and equipment to be incorporated into the Design- Build Work, delivered and unloaded, with taxes paid. Invoices shall be required for materials and equipment to be incorporated into the Design-Build Work, upon request by Owner, Owner’s Representative or the Contract Administrator.

2. The total installed value.

G. The specific requirements and procedures for submitting progress payments to Owner will be discussed at the initial conference.

13A.2 SCHEDULE OF PROPERTY UNIT VALUES

A. In addition to the Schedule of Values, Design-Builder shall provide a breakdown of the construction cost by property units in accordance with the list of property units identified in the Attachment to this specification section. The detailed arrangement for submittal of the construction cost by property units shall be discussed at the initial conference.

Appendix 14

Cost Substantiation

[NOTE: Appendix under review.]

Appendix 14

Cost Substantiation

Design-Builder Hourly Labor Rates

Construction Manager	$132
Assistant Construction Manager	$116
Procurement Manager	$104
Field QC Manager	$97
Health and Safety Manager	$85
Senior Project Engineer	$74
Project Engineer	$61
Project Administrator	$37
Project Scheduler	$111
Start-Up/Commissioning Manager	$113
Project Superintendent	$106
Mechanical Superintendent	$84
Electrical Project Manager	$114
Electrical Project Engineer	$73
Electrical Superintendent	$99
Laborer Foremen	$60

Notes:

1. Hourly rates are burdened but do not include allowable mark-up.
2. The above list is to be used as a guideline and is not intended to fully represent every possible labor category.
3. Rates are for construction staff only and do not include design staff.
4. Labor Rates reflect current 2013 costs and are subject to escalation at the time of delay.

Design-Builder Designer Hourly Labor Rates

[Note: CDM to include.]

Design-Builder Construction Equipment

1. Equipment rates shall be established by using the most current version of the CALTRANS Labor Surcharge and Equipment Rental Rate Book.
2. In the instance a piece of equipment is not included in the CALTRANS Labor Surcharge and Equipment Rental Rate Book; the Design Builder shall provide documentation to substantiate actual cost.

Design-Builder General Conditions

1. The following items would fall under General Conditions for the project:
    a. field trailers
    b. storage containers

c. temporary utility costs(usage and equipment rental)
d. trash service
e. portable bathrooms and hand washing stations
f. telephone/internet service
g. electricity
h. water
i. office supplies
j. copier service/rental
k. shipping/postage
l. office furnishings
m. computers
n. trailer cleaning service
o. staff housing
p. staff travel expenses
q. jobsite security
r. maintenance costs
s. SWPPP - monitoring, inspections, repairs
t. Site Restoration due to weather impacts

Notes:

1. The above list is to be used as a guideline and is not intended to fully represent every possible item.
2. Rates for items will be determined at the time of delay and based on actual costs.

Subcontractor Labor Rates

1. Labor Categories will be similar to those of Design-Builder.
2. Labor Rates will be determined and substantiated at the time of the delay.

Subcontractor Construction Equipment

1. Equipment rates shall be established by using the most current version of the CALTRANS Labor Surcharge and Equipment Rental Rate Book.

2. In the instance a piece of equipment is not included in the CALTRANS Labor Surcharge and Equipment Rental Rate Book; the Design Builder shall provide documentation to substantiate actual cost.

Subcontractor General Conditions

1. General Condition items will be similar to those of Design-Builder.
2. Rates for items will be determined at the time of delay and based on actual costs.

Other Potential Items

1. Warranty Extension costs for the delay period
2. Financing on retention
3. Operations & Maintenance costs associated with storage of process equipment or other project improvements to maintain them in a safe and warrantable condition
4. Extended bond and Insurance Costs
5. Letter of Credit costs
6. Escalation of materials not yet procured at the time of delay(may apply to longer delays)
7. Offsite Storage costs assessed by manufacturers if they are unable to deliver products as originally scheduled.
8. Demobilization/Remobilization costs (if an extended delay is anticipated)

Appendix 15

RESTRICTED PERSONS

Appendix 15

RESTRICTED PERSONS

The following firms are Restricted Persons as defined in the Design-Build Agreement:

- RBF Consulting
- Trussell Technologies
- URS Corporation
- Kris Helms Consulting
- Separation Processes, Inc.

Appendix 16

WMDVBE Utilization Plan

Appendix 16

WMDVBE Utilization Plan

Commitment to Subcontracting with WMDVBEs

CDM Smith understands the importance of utilizing women-, minority- and disabled veteran-owned business enterprises (WMDVBE) for this project. CAW is a leader in its commitment to diversity and has a record of exceeding the goals of General Order 156 as defined by the California Public Utilities Commission (CPUC). CDM Smith will be a partner with CAW in building and sustaining their effective Supplier Diversity Program by achieving the WMDVBE goals set for this project. We will identify and extend subcontracting opportunities to CPUC-certified WMDVBEs firms, and we will monitor and report our progress towards the combined WMDBVE goal of 21.5 percent of the fixed DB price. CDM Smith will solicit and award contracts to certified WMDVBE business concerns to the maximum extent practicable for this contract.

CDM Smith has considered the type of work to be accomplished during the life of the contract, the technical capability of companies necessary to accomplish the goals of the project, and the availability of local, capable subcontractors experienced in providing services required for the project.

While CDM Smith has not entered into contracts for major portions of the construction work at the time of proposal submission, we have identified several high dollar construction and supply services as priorities for WMDVBE awards. We have solicited and received proposals from several WMDVBE business concerns in these focus areas. This approach allows CDM Smith to assure competition, while maintaining our commitment to WMDVBE utilization. These high-value focus areas include, but are not limited to, structural steel pre-engineered buildings, concrete, earthwork, yard piping, and below-ground mechanical.

CDM Smith has requested proposals from the following potential subcontractors:

Potential Contractor	Local	County	WMDVBE
Affordable Roofing & Solar		Santa Clara	WBE
American Door & Gate	✓	Monterey	WBE
Appian Engineering Inc.		Santa Clara	MWBE
Benchmark Steel, Inc.	✓	San Benito	MBE
Bereman Carpets	✓	Monterey	WBE
Bush Landscaping		Santa	MWBE

Potential Contractor	Local	County	WMD VBE
		Clara	
Diamond Fence Company Inc.	✓	Santa Clara	WBE
ETIC Engineering		Contra Costa	WMBE
KPR Consulting Inc		Orange	MBE, WBE
Mahan and Sons, Inc.		Santa Clara	MWBE
Maskell Pipe & Supply, Inc.		San Bernardino	MBE, WBE
No Fault Asphalt		San Mateo	WBE
R&W Concrete		San Mateo	WBE
Yama-Matsu Landscaping, Inc.		Santa Clara	MWBE

Sources of WMDVBE Subcontractors

CDM Smith maintains a comprehensive program to promote use of minority-, women- and disabled veteran-owned business enterprises in different areas of project performance. CDM Smith actively seeks new small business sources for the supply of goods and services under prime contracts and support small businesses through teaming and partnering in our pursuit and execution of contracts. We encourage firms to submit their qualifications for incorporation into our vendor/subcontractor database, which serves as a primary reference for development of source lists. This database contains service profiles of firms that we use to prepare source lists, categorized by work type (e.g., surveyor) and geographic area. In addition, source lists are further categorized into minority-, women-, and disabled veteran-owned business enterprises to make certain that adequate listings are maintained in these areas.

Additional automated data base sources to be used will include:

- Central Contractor Registration (CCR): http://www.ccr.gov
- Veterans: www.vetbiz.gov
- Department of Defense Office of Small Business Programs: https://www.acq.osd.mil/osbp

Approach to Contracting

As demonstrated above, we have already started our outreach process to women-, minority-, and disabled veteran-owned businesses for the MPWSP Desalination Infrastructure Project. Our activities to date have included:

- Identification of contacts with minority and small business trade associations
- Ongoing attendance at small and minority business procurement conference and trade fairs
- Advertisement of informational brief in local publications about the project such as the local contracting publications and other applicable publications to promote business opportunities
- Request of sources from the CPUC Supplier Clearinghouse website available at http://www.suppliernetwork.net on the Internet

Upon section, we will conduct the following additional outreach activities to maximize participation by WMDVBE businesses and contractors:

- Meet with CAW Staff to outline additional WMDVBE contractors that are used on other similar civil and mechanical work packages for other CAW and local agency projects
- Run addition advertisements of informational brief in local publications about the project such as the local contracting publications and other applicable publications to promote business opportunities
- Prepare an informational flyer to be sent out to identified potential bidders
- Hold outreach and informational sessions to address WMDVBE contractor concerns, questions and needs, such as a contractor “meet and greet”
- Creating a project based website to serve as information resource for vendors to receive information on upcoming events, bids and project status
- Work directly with WMDVBE companies to assist them in obtaining bonding and insurance
- Tailor insurance requirements to the subcontractor to align with the value of their work product

Once the project is underway, we will invite all identified women-, minority-, and disabled veteran-owned firms to a series of outreach and informational sessions where we will explain what work is available to bid and detail the processes by which those bids will be awarded.

Administration of WMDVBE Subcontracting Program

The following employee will administer the subcontracting program.

NAME: Randall Redmann

ADDRESS: 9220 Cleveland Avenue, Suite 100, Rancho Cucamonga, CA 91730

(Onsite during construction)

TELEPHONE: 909-579-3500

FAX: 909-980-5185

EMAIL: redmannrh@cdmsmith.com

Mr. Redmann's responsibilities will include:

- Developing and maintaining bidder's lists of MBE, WBE, and DVBE concerns from all
- possible sources
- Ensuring that procurement packages are structured to permit the WMDVBE community to participate to the maximum extent possible
- Assuring inclusion of the WMDVBE business community in all solicitations for products or services, which they are capable of providing
- Reviewing solicitations to remove statements, clauses, etc., which may tend to restrict or prohibit the WMDVBE business community participation
- Ensuring the establishment and maintenance of records of solicitations and subcontract award activity
- Monitoring attainment of proposed goals.
- Preparing and submitting required periodic subcontracting reports
- Ensuring ongoing project staff awareness of the WMDVBE business subcontracting program for the contract
- Providing WMDVBE training for procurement, project management, and senior technical staff
- Advising the Project Manager, and other senior managers of compliance with goals and any required changes in procurement procedures
- Supporting the Project Manager in outreach
- to WMDVBEs
- Overseeing advertisements for small business opportunities on websites and in print media

Monitoring and Reporting the WMDVBE Plan

CDM Smith will monitor and report to CAW the continued implementation of the WMDVBE Utilization Plan throughout performance of this DB agreement. CDM Smith will provide quarterly updates showing all contracts and opportunities, bidders list and percent of work that has been designated for WMDVBE entities.

Appendix 17

Local Resources Utilization Plan

Appendix 17

Local Resources Utilization Plan

Commitment to Utilizing Local Resources

CDM Smith understands that a minimum of 50 percent of our total construction workforce (as measured in labor work hours) for this project, with the exception of specialty subcontractor items, must be comprised of residents of Monterey, San Benito, and Santa Cruz counties. CDM Smith supports this imperative, and it is consistent with our standard practice. We have developed procurement strategies to satisfy this goal to the maximum extent practicable. We are committed to the values of the region and to the local economy. Maximizing the positive economic impacts of this project throughout Monterey, Santa Cruz and San Benito counties, while delivering a technically sound product, is a priority. Our team has already completed three design-build treatment plant projects in the Monterey Bay area (Sand City, Santa Cruz, and Pebble Beach). We are excited to continue some of our existing partnerships formed through these projects and also develop new ones.

Our commitment to the local economy is best evidenced by our work on the Stockton Delta Water Supply Project, a recently completed $175 million design-build WTP and conveyance project where 67 percent of the available subcontracted work was let to local subcontractors and 74 percent of the workforce was made up of local craft workers. For the Sand City desalination plant, 76 percent of available subcontracts were let to local subcontractors and more than 83 percent of the workforce was local to the area, all in the same three counties in which our efforts will be concentrated during this project.

We will engage local subcontractors, craft laborers, and local suppliers to the maximum extent possible. We anticipate that will result in local labor force that is much higher than the required 50 percent, and may be as high as 80 percent. Not only will this provide opportunities for local labor, it will also help to stimulate the local economy by keeping project money in the local area.

Approach to Engaging Local Union Craft Labor

As a signatory union contractor, CDM Smith fully understands and will comply with the requirements of the prevailing wage laws to achieve compliance. Because we are signatory with the carpenters, laborers, and electricians unions, we will make requests and conduct hiring from local union halls, providing us with access to local workers from the surrounding counties of Santa Cruz, San Benito, and Monterey. We will specifically draw from the following union halls: Carpenters Local 605, Laborers Local 297, and IBEW Local 234.

For trades for which we are not signatory, we will hire locally by advertising in local publications, and outreach to local job placement agencies such as CalWORKs , Office for Employment Training (OET), Seaside One Stop Career Center, and King City One Stop Career Center.

Approach to Engaging Local Subcontractors

CDM Smith has considered the type of work to be accomplished during the life of the contract, the technical capability of companies necessary to accomplish the goals of the project, and the availability of local, qualified subcontractors experienced in providing services required for the project. While CDM Smith has not entered into contracts for major portions of the construction work at the time of proposal submission, we have identified several high dollar construction and supply services as priorities for local contractors. We have solicited and received proposals from several local business concerns in these focus areas. These high-value focus areas include, but are not limited to, structural steel pre-engineered buildings, concrete, earthwork, yard piping, and below-ground mechanical piping.

Subcontractors will be selected based on their successful track record in meeting schedule, quality, safety, and cost, as well as their commitment to providing skilled resources. Based on our extensive work in California and work in the area on three recent construction projects, we have developed a selective network of qualified subcontractors who are interested in competing for work on this project, provided in Section 2.0 Project Team Information, A. General Project Team Information, Division of Work. Because CDM Smith is a union signatory contractor, our subcontractors must also be union signatories, and will therefore be required to reach out to local unions and employ locally-based craft laborers. As part of the subcontract agreements, CDM Smith will require our subcontractors to maintain the same commitment to local utilization as required by the DB Agreement.

Maximizing Local Businesses and Contractors

We have already started our outreach process in preparing for this proposal by reaching out to local contractors from our past projects in the area. Additionally, we advertised in local papers and requested recommendations from local union and trade organizations. We will continue this effort after contract award by inviting local businesses to a series of outreach and informational sessions where we will explain what work is available to bid and detail the processes by which those bids will be awarded.

- To solicit additional interest and maximize participation by local businesses and contractors, we will expand our outreach campaign to include:
- Identifying additional contacts with local business and trade associations
- Additional advertising in applicable local newspapers and publications to promote business opportunities including office and administrative support positions
- Attending additional small business procurement conference and trade fairs
- Requesting additional sources from the CPUC Supplier Clearinghouse website available at http://www.suppliernetwork.net on the Internet
- Preparing an informational flyer to be sent out to identified potential bidders
- Holding outreach and informational sessions to address subcontractor concerns and needs, such as a contractor “meet and greet.”

- Creating a project-based website to serve as information resource for vendors to receive information on upcoming events, bids and project status
- Providing quarterly updates showing all contracts and opportunities, bidders list and percent of work that has been designated for local entities
- Working directly with local business enterprises to assist subcontractors in obtaining bonding and insurance
- Tailoring insurance requirements to the subcontractor to align with the value of their work product

Administration of Local Resource Subcontracting Program

The following employee will administer the subcontracting program.

NAME: Randall Redmann

ADDRESS: 9220 Cleveland Avenue, Suite 100, Rancho Cucamonga, CA 91730

(Onsite during construction)

TELEPHONE: 909-579-3500

FAX: 909-980-5185

EMAIL:redmannrh@cdmsmith.com

Mr. Redmann's responsibilities will include:

- Developing and maintaining bidder's lists of local subcontractors from all possible sources
- Ensuring that procurement packages are structured to permit local subcontractors to participate to the maximum extent possible
- Reviewing solicitations to remove statements, clauses, etc., which may tend to restrict or prohibit the use of local resources
- Ensuring the establishment and maintenance of records of solicitations and subcontract award activity
- Monitoring attainment of proposed goals
- Preparing and submitting required periodic subcontracting reports
- Ensuring ongoing project staff awareness of the local resource business subcontracting program for the contract
- Advising the project manager and other senior managers of compliance with goals and any required changes in procurement procedures
- Supporting the project manager in outreach to local businesses

- Overseeing advertisements for local business opportunities on websites and in print media

Monitoring and Reporting the Local Resources Plan

CDM Smith will monitor and report to CAW the continued implementation of the Local Resources Utilization Plan throughout performance of this D/B agreement. CDM Smith will provide quarterly updates showing all contracts and opportunities, bidders list and percent of work that has been completed by the local labor force.

Appendix 18

Construction Component Price Escalator

Appendix 18

Construction Component Price Escalator

Index	Percent of the Construction Component Price
WPU 057303 #2 Diesel Fuel	1.04%
WPU10 Metals and Metal Products	14.97%
WPU07290197 Rubber and Plastics	12.47%
WPU10170674 Steel Pipe and Tube, Stainless Steel	33.81%
Handy Whitman Index	37.71%