STATE OF CALIFORNIA
APPLICATION
FOR
DOMESTIC WATER SUPPLY PERMIT AMENDMENT
FROM

Applicant: Sacramento County Water Agency
(Enter the name of legal owner, person(s) or organization)

Address: 827 7th Street, Room 301

System Name: Laguna Vineyard

System Number: 3410029

TO: Dave Lancaster, District Engineer
California Department of Public Health
Division of Drinking Water & Environmental Management
Field Operations Branch, Sacramento District
P.O Box 997377
Sacramento, CA 95899-7377

Pursuant and subject to the requirements of the California Health and Safety Code, Division 104, Part 12, Chapter 4 (California Safe Drinking Water Act), Article 7, Section 116550, relating to changes requiring an amended permit, application is hereby made to amend an existing water supply permit to divert its Central Valley Project (CVP) supplies and State Water Resources Control Board (SWRCB) Appropriative Water Right at the Freeport Regional Water Project (FRWP) intake, located on the Sacramento River near the town of Freeport. The Sacramento River supply will be transported from the FRWP intake via the FRWP pipelines to the Vineyard Surface Water Treatment Plant (VSWTP). The VSWTP is currently under construction and will not be completed until late 2011. The addition of the VSWTP to the Laguna System permit will be done under a separate permit amendment.

I ~~(We)~~ declare under penalty of perjury that the statements on this application and on the accompanying attachments are correct to my (our) knowledge and that I (we) are acting under authority and direction of the responsible legal entity under whose name this application is made.

Signed By: [signature]

Print Name: FORREST W. WILLIAMS JR

Title: SENIOR CIVIL ENGINEER, REGIONAL PROJECTS

Address: 827 7TH STREET, SUITE 301
SACRAMENTO, CA 95830

Telephone: (916) 874-4082

Dated: FEBRUARY 9, 2010

DDWEM 08/2007

Department of Water Resources
Keith DeVore, Director

Including service to the cities of
Elk Grove and Rancho Cordova

SACRAMENTO COUNTY
WATER AGENCY

February 10, 2010

Gus Peterson, Sanitary Engineer
California Department of Public Health
Division of Drinking Water & Environmental Management
Field Operations Branch, Sacramento District
P.O Box 997377
Sacramento, CA 95899-7377

Subject: Sacramento County Water Agency – Permit Amendment Application for Laguna Vineyard (3410029).

Dear Mr. Peterson:

Attached please find the application for an amended drinking water permit for the Laguna Vineyard system.

This application is the first of two that together will incorporate a new surface water source and an associated conventional treatment plant into the Laguna Vineyard system. The permit amendment will be done in two phases.

Phase I: Freeport Regional Water Authority Facilities and New Surface Water Source

This application includes all Freeport Regional Water Authority (FRWA) raw water related facilities (raw water intake/pumping facilities and raw water conveyance facilities and related structures/appurtenances) and the Sacramento County Water Agency's new surface water source. The Vineyard Surface Water Treatment Plant (VSWTP) will not be completed until late 2011, so this permit amendment will not allow the Sacramento County Water Agency (SCWA) to serve water to the general public. However, the East Bay Municipal Utility District (EBMUD) facilities will be ready to accept EBMUD's portion of surface water through the FRWA facilities in 2010 and EBMUD is amending its water supply permit to add the FRWA raw water facilities. SCWA, as the FRWA system operator, will operate the FRWA raw water facilities to deliver water to the Folsom South canal for the EBMUD's ultimate use outside of Sacramento County for the benefit of EBMUD. The addition of the VSWTP to the Laguna Vineyard permit will be done in Phase II.

Phase II: Vineyard Surface Water Treatment Plant Facilities

A second permit application for the Vineyard Surface Water Treatment Plant (VSWTP) and associated facilities (Vineyard WTP, CT Tank, Clearwell and Treated Water Pump Station) and required reports (engineering report, operations plan, data sheets) will be submitted to you under a separate permit amendment at a later date.

If you have any questions or need additional information, please feel free to contact me at (916) 874-4682 or email me at williamsf@saccounty.net.

Sincerely,

Forrest W. Williams Jr., P.E.
Senior Civil Engineer, Regional Projects

Attachments:
- Application form
- Hard copy of engineering report dated October 9, 2009
- CD containing report and all appendices

cc: File
Amy de la Salle
Dave Underwood
Vicki Butler
Sarah Grant
Kerry Schmitz

WATER SUPPLY PERMIT AMENDMENT

NO. XX-XX-XX-XXX-XXX

AND

ENGINEERING REPORT

For the Freeport Raw Water Diversion and Conveyance Facilities

In the Matter of Permit No. __________

Amendment

From

Sacramento County Water Agency

Serving the Laguna Vineyard Water System

Public Water System No. 3410029

Sacramento County

SUBMITTED OCTOBER 9, 2009

Prepared by

Sacramento County Water Agency, Starr Consulting, CH2MHill

Kennedy Jenks/Brown Caldwell

California Department of Public Health

Division of Drinking Water and Environmental Management

Drinking Water Field Operations Branch

Sacramento District

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SECTION 1 – INTRODUCTION AND DESCRIPTION OF SCWA SYSTEM

1.1 PURPOSE OF REPORT

The Sacramento County Water Agency (SCWA) Laguna Vineyard water system requires a permit amendment due to the following changes: addition of a new source and installation of 185 million gallon per day (mgd) raw water diversion and raw water conveyance facilities. This report serves as the finding for a "thorough investigation" required by the California Health and Safety Code, Section 116535 for issuing an amendment to SCWA's water supply permit.

This report is organized in three parts to allow a portion of the report (Section 2) to be duplicated in two permit amendment applications, one from East Bay Municipal Utility District (EBMUD) and the other from SCWA. Facilities investigated herein are either shared between two agencies or wholly owned by SCWA.

- Introduction and description of the existing SCWA drinking water system (Section 1)
- Investigative Findings of the joint (EBMUD and SCWA) proposed facilities (Section 2)
- Investigative Findings of the SCWA facilities (Section 3)

1.2 BACKGROUND INFORMATION

The Sacramento County Water Agency (SCWA) operates the Laguna Vineyard water system under Water Supply Permit No. 01-09-06-PER-016 (August 10, 2006) and its amendment No. 01-09-07-PER-001 (January 17, 2007). The current permit superseded the water system permit issued in 1988. This report will be part of the second (third, if Big Horn amendment is approved first) amendment to Water Supply Permit No. 01-09-06-PER-016.

This amendment pertains only to the new source and conveyance facilities. Other changes to the Laguna Vineyard water system are being handled separately. The new surface water treatment plant, which will treat and deliver the new surface water to the Laguna Vineyard system, will also be addressed under a separate permit amendment.

The Laguna Vineyard water system, which historically relied on groundwater wells, currently supplements its supply with treated surface water from an intertie with the City of Sacramento (City). Upon entering into a Central Valley Project (CVP) water supply contract with the U.S. Bureau of Reclamation in 1999, SCWA began diverting its permanent supply through the City's facilities. The City treats this water and conveys it to the Laguna Vineyard water system. The physical capacity of the intertie and City facilities cannot accommodate the projected amount of surface water needed for the Laguna Vineyard water system. Thus, the new intake and conveyance facilities are being constructed.

1.3 SYSTEM OWNERSHIP

SCWA continues to own and operate the Laguna Vineyard water system (as described in the current permit and its amendments) as part of the larger *Zone 40* system. The new intake and conveyance pipeline will be owned by the Freeport Regional Water Authority (FRWA). FRWA was created in 2002 by SCWA and East Bay Municipal Utility District (EBMUD) through a joint powers agreement, which allowed for the design and construction of the intake and pipeline (commonly called the Freeport Regional Water Project (FRWP)). The functions of FRWA will ultimately be carried out by SCWA and EBMUD staff functioning as "FRWA". In accordance with several agreements, listed below, SCWA will be responsible for the operation and maintenance of the FRWP facilities while both EBMUD and SCWA will fulfill administrative duties. The agreements listed below, attached for reference only, describe the current and agreed to duties of each party:

- the Second Amended JPA (Appendix 1-A),
- the Operations and Maintenance Agreement (Appendix 1-B) and
- the Delivery Agreement (Appendix 1-C).

Since EBMUD and SCWA will take water through the FRWP facilities, both agencies are seeking amendments from their respective DPH offices to add the new source and water transmission facilities to their existing water system permits.

1.4 SYSTEM DESCRIPTION AND AREA SERVED

The Laguna Vineyard water system, which is located in the southern part of Zone 40, is comprised of four independent, interconnected service areas, shown in Figure1:

- Laguna,
- Vineyard,
- Country Creek Estates, and
- Grantline-99.

Figure 1 - SCWA's Laguna Vineyard Service Area

The FRWP facilities will have no effect on the Laguna Vineyard water system at this time. The system will continue to have 30 active groundwater wells, purchased treated water from the City of Sacramento, 8 standby sources, 3 inactive sources and 9 groundwater treatment facilities as reported in the 2008 annual report and SCWA source status list. SCWA has a combined source and storage capacity of 79.8 MG as reported in the 2006 Permit Amendment. 42,500 service connections serve an estimated population of 140,250 in 4 service areas. One interconnection associated with the City of Sacramento treated water purchase was reported in the 2008 annual report to the Department.

1.5 ENFORCEMENT HISTORY

There have been no enforcement incidents by DPH during the period since the last permit amendment (January 2007).

1.6 PROPOSED FACILITIES AND CAPACITY

The facilities proposed herein are part of a regional project to divert and convey Sacramento River water to Sacramento County and to EBMUD via the Mokelumne Aqueducts. The subject of this amendment is the new water source and conveyance facilities:

- the Sacramento River intake structure and pumping plant,
- 13.2 miles of 84" diameter welded steel transmission pipeline from the intake facilities to the bifurcation point, and
- 1.3 mile 66" diameter extension pipeline and an energy dissipating flow control structure at the flow dissipation structure (inlet) of the Vineyard Surface Water Treatment Plant.

Figure 2 –*Proposed FRWA facilities*, below, shows the proposed facilities as well as EBMUD's 3.9 mile extension pipeline. The facilities and their associated communications / control system are investigated in Section 2 and 3 of this document.

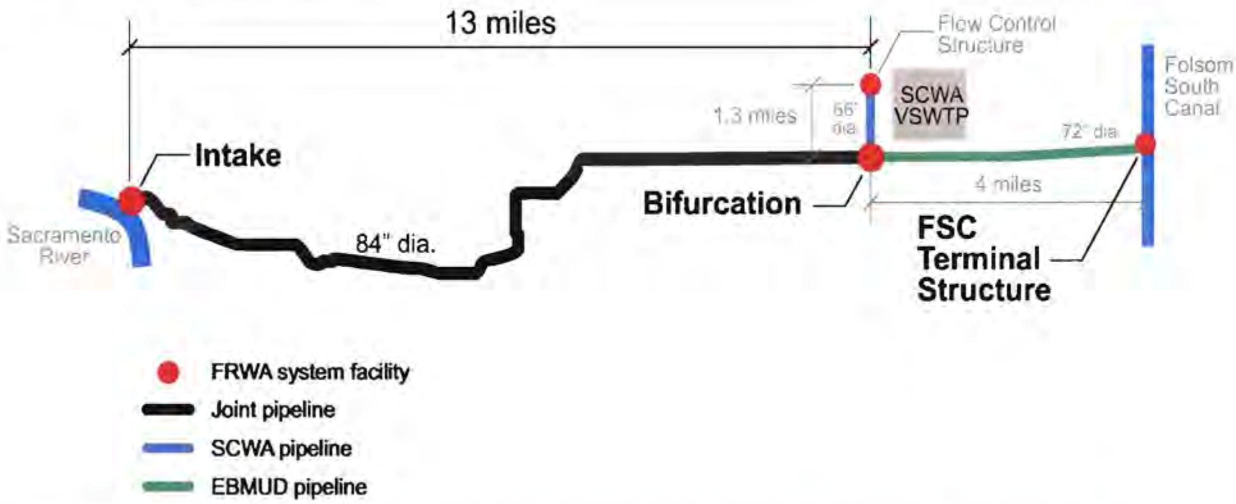

Figure 2 - FRWA Facilities: Intake, Pipeline, Bifurcation (Surge Control Structure), Terminal Weir Structure, Flow Control at SCWA

The proposed permitted flow rate is 185 mgd measured at the intake and the capacities of the 84 inch and 66 inch pipeline are consistent with the Environmental Impact Report/Environmental Impact Statement.

1.7 ENVIRONMENTAL REVIEW

The Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the FRWP was available for public review from Aug. 8, 2003 through Dec. 15, 2003. FRWA published a Final EIR, including responses to comments, in March 2004. (Jones and Stokes Associates 2003) (State Clearinghouse number 2002032132). A Supplemental Mitigated Negative Declaration for the project was completed in March 2006, which describes additional project features and proposed mitigation measures that occurred after the certification of the EIR. The adjustments include a surge tank facility near the intersection of Gerber and Vineyard Road to control transient pressures in the conveyance system and discharge of water to local drainages during drainage of the pipelines.

1.8 SOURCES OF INFORMATION

Information for this report was obtained from SCWA staff working under Dave Underwood and Forrest Williams, consultants working on the planning and design projects including CH2MHill, Kennedy Jenks and Brown and Caldwell, the City of Sacramento Department of Utilities and from FRWA design and construction files. Attached appendices were the substantial source of this report's information.

The environmental document (EIR/EIS) is posted at the following link until at least September 2009: http://freeportproject.org/nodes/project/environmental.php

1.9.1 SOURCE OF WATER SUPPLY

This amendment will add the Sacramento River as the new source of surface water for SCWA. This water will be diverted at Freeport Bend, River Mile 47.2. SCWA's source water from the Sacramento River is comprised of the following contracts:

SOURCES OF SCWA WATER SUPPLY	Acre-Feet per Year	Million Gallons per Day
SWRCB granted appropriative water right Permit 21209 (Appendix 1-G),	71,000	63
Central Valley Project (CVP) water supply contract No. 6-07-20-W1372 (Appendix 1-E),	15,000	13
CVP water supply contract, No. 14-06-200-5198A (Appendix 1-F) (Appendix 1-H), assigned to SCWA by the Sacramento Municipal Utility District (SMUD)	30,000	27
TOTAL	116,000	103

The maximum amount of water to be diverted at this location based on the sum of the above contracts (and additional water rights reasonably foreseeable in the near future) is up to 118 mgd. This total includes an additional 15 mgd of remediated water that may be made available to SCWA for diversion off of the Sacramento River in the future - above the 103 mdg summarized above. This amount is in excess of the JPA (Appendix 1-A) 85 mgd-dedicated capacity allowed SCWA in the FRWA pipeline, however the agencies may agree to allot some of their dedicated capacity to one another as addressed in the FRWA Joint Powers Agreement.

The entitlements listed above reflect best case scenarios and may be impacted by factors including dry-year cut-backs implemented by the Bureau of Reclamation. The average annual yield of SCWA's 6-07-20 W1371 and part of 14-06-200-5198A CVP contracts together is approximately 38,200 acre-feet (34.1 mgd) and the water right yield is approximately 21,700 acre-feet (19.4 mgd). Together these surface water sources will yield a long term average of 59,900 acre-feet annually (53.5 mgd). The table below summarizes the historical low yields of the entitlements for ten-year and 25-years periods:

TABLE 1 SUMMARY OF LOWEST SURFACE WATER YIELDS (CVP AND WATER RIGHT)

Lowest annual acre-foot yields in ten-year periods		**Lowest annual acre-foot yields in 25-year periods**	
1981 - 1990	50,500 acre-ft (45 mgd)	1966 - 1990	41,800 acre-ft (37 mgd)
1971 - 1980	41,800 acre-ft (37 mgd)	1941 - 1965	45,800 acre-ft (41 mgd)
1961 - 1970	46,300 acre-ft (41 mgd)		
1951 - 1960	58,900 acre-ft (53 mgd)		
1941 - 1950	45,800 acre-ft (41 mgd)		
1931 - 1940	46,000 acre-ft (41 mgd)		
1923 - 1930	46,000 acre-ft (41 mgd)		

This new source is adequate to supply the system even in low-flow years based on the ability for SCWA to make up surface water shortfalls with groundwater. SCWA implements a "conjunctive use" water supply program that seeks to comply with the sustainable groundwater yield limitations set by the Sacramento area Water Forum Agreement, which was signed in 2000. To meet this commitment over the long term SCWA supplements its groundwater supply with surface water. During wet years SCWA will use more surface water and allow the groundwater aquifer to recover. In dry years, SCWA will use more groundwater.

This new surface water supply will serve projected demands over the next twenty years when combined with the groundwater available under the Water Forum Agreement. While a reliability analysis for the Laguna Vineyard system is not available separately, the larger Zone 41 area has been analyzed for the period of interest in the 2005 Urban Water Management Plan (UWMP) [1]. This is an appropriate analysis for this engineering report since the surface water plant will be fulfilling the needs of the whole Zone 41 area.

[1] 2005 Zone 41 Urban Water Management Plan, MWH, 2005, Section 5, Water Reliability Figure 5-2

Figure 3 below, from the UWMP, presents the conjunctive use program. The figure indicates the annual amount of groundwater that will be used on average (the lower solid line at 40.9 TAF = 36.5 mgd) and the maximum and minimum groundwater that could be expected (small vertical bars extending above and below the solid line) from dry to wet years, respectively. This figure also indicates the construction of large increments of surface water capacity with the abrupt changes in groundwater use over time. The areas above the average groundwater use line are the amount of surface water and recycled water necessary to meet total water demand. In approximately 2010 the figure shows that average groundwater yield is 36.5 mgd while projected demand will be about 46 mgd, which requires about 10 mgd in surface and/or recycled water. Just before 2020, when the first phase of Vineyard Surface Water Treatment Plant will be fully utilized the difference between annual demand and annual ground water yield will be approximately 52 TAF (46 mgd) of surface and/or recycled water. Finally in 2030, between 38 and 83 mgd of water is anticipated to be needed in addition to available groundwater. In conclusion, the capacity of the FRWA intake (85 mgd dedicated to SCWA) is adequate to satisfy projected need in a low surface water yielding year.

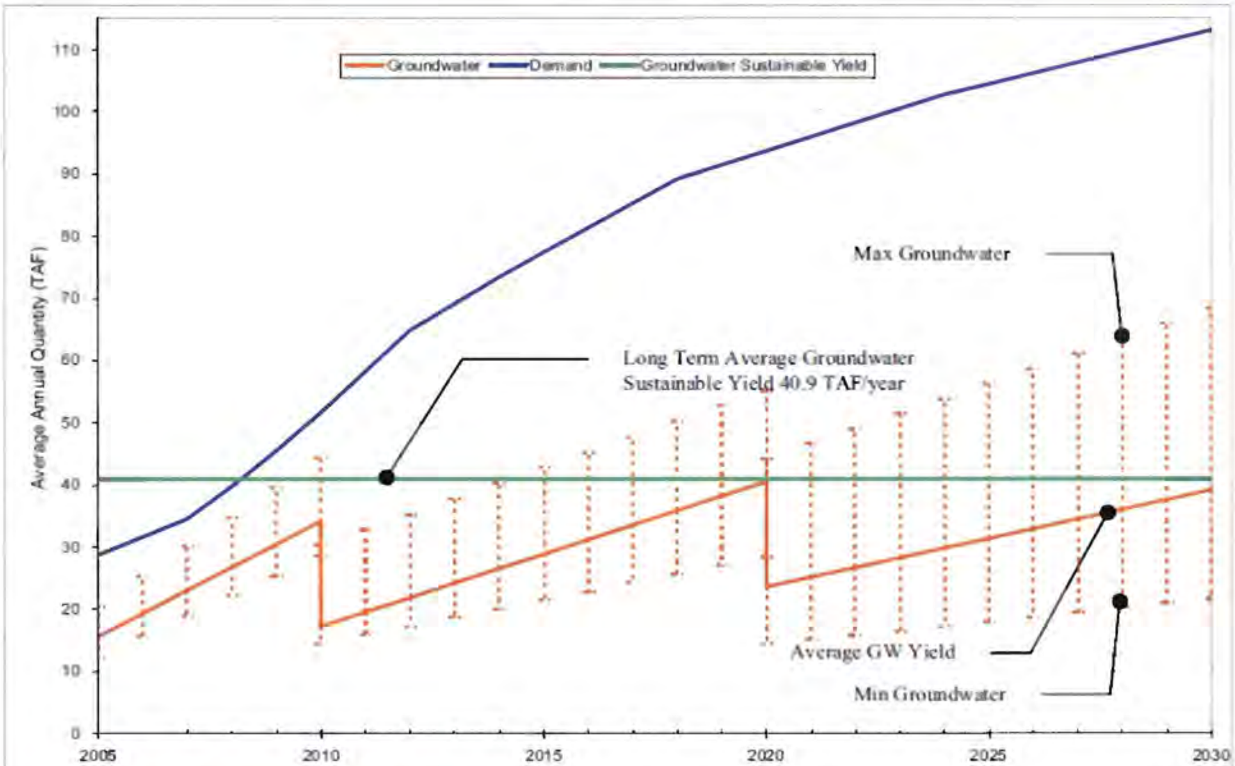

Figure 3 - Projected Zone 41 Water Supply and Demand

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SECTION 2 - INVESTIGATION FINDINGS OF JOINT FACILITIES

This section contains investigative findings for the Freeport Regional Water Project (FRWP) new source and facilities shared by EBMUD and SCWA. Investigative findings for the other FRWP facilities owned by each individual agency can be found in Section 3.

2.1 SOURCE WATER QUALITY

In order to assess the new water source, the Sacramento River (at river mile 47.2) and the appropriateness of planned treatment, the quality of the source must be characterized. The reports below include this analysis.

The following water quality discussion is based on these documents: 2007 Water Quality Sampling Report (WQSR) (Appendix 2-A) and the Watershed Sanitary Survey 2005 Update (Appendix 2-B). Potential contaminating activities were documented in the DWSAP (Appendix 2-C) and the Watershed Sanitary Survey 2005 Update. Provided below are summaries of both the water quality as well as the source water vulnerabilities to contamination.

2.1.1 WATER QUALITY

The 2007 Water Quality Sampling Report documents a two-year sampling study of the proposed Freeport Diversion on the Sacramento River, conducted by the FRWA. The Water Quality Sampling Plan (WQSP), upon which the 2007 report is based, was reviewed and deemed compliant with requirements of the targeted permitting programs by DPH. The study was designed to support the raw water quality evaluation conducted in 2005 as part of the Preliminary Design Report[2], collect information to meet regulatory requirements, and identify periods of potentially degraded source water quality. **Table 2** summarizes the key data findings of the WQSP study and provided below is a summary of the presence and detection of inorganics, turbidity, taste and odor compounds, organic constituents, disinfection by-product precursors, and microbials.

It should be noted that during preparation of this Engineering Report, it was discovered that some data for mercury, bromide, total coliform and *Escherichia coli* (*E. coli*) reported in the 2007 WQSR are incorrect. The correct data were confirmed and used in this Engineering Report.

[2] Sacramento County Water Agency Zone 40 Central Surface Water Treatment Plant Preliminary Design Report; Technical Memorandum Number 2 – Raw Water Quality Evaluation, May 17, 2005

TABLE 2 - SUMMARY OF SELECTED WATER QUALITY CONSTITUENTS FOR THE FRWA 2005-2007 WQSP

Constituent	MCL	Range	Average
Temperature (°C)	None	7 - 22	15
pH (units)	6-9	6.7 – 7.9	7.44
Bicarbonate Alkalinity (mg/L)	None	24 - 72	53.4
Aluminum (mg/L)	1.0 / 0.2 [1]	0.36 – 3.6	1.14
Iron (mg/L)	0.3	0.34 - 2	0.98
Manganese (mg/L)	0.05	0.019 – 0.064	0.032
Turbidity (NTU)	0.3 / 5 [1]	3 – 29	11.2
Geosmin (ng/L)	None	1.3 - 32	6.9
MIB (ng/L)	None	<1 – 7.9	4.5
TOC (mg/L)	2 [2]	1.5 – 3.6	2.2
DOC (mg/L)	None	1.4 – 3.1	2.1
SUVA (L/mg-m)	None	1.94 – 3.06	2.6
Total Coliform (MPN/100 mL)	None	330 — 10,000	1700 / 1400 [3]
E. coli (MPN/100 mL)	None [4]	3 - 460	42 / 11 [3]
Giardia (cysts/L)	None	0 – 0.09	0.011
Cryptosporidium (oocysts/L)	0.075 [5]	0 – 0.18	0.018

[1] – Primary and secondary MCLs for aluminum and turbidity
[2] – TOC > 2 mg/L triggers a treatment technology requirement for enhanced coagulation
[3] – Data represents average and median values based on samples collected for LT2ESWTR
[4] – *E. coli* does not have an MCL, but a level above 200 MPN/100 mL is used to trigger additional log reduction for *Giardia* and viruses
[5] – *Cryptosporidium* has variable action levels above 0.075 oocysts/L

INORGANICS

A full suite of metals, minerals, and general compounds was sampled as part of the FRWA WQSP. The results were generally consistent with historical data collected at Freeport, and reported in the Preliminary Design Report[3]. Temperature was found to range from 7 to 22 degrees Celsius (°C), with an average of 15°C. This is almost identical to the historical range and average (8-22°C, 15°C). pH was detected at the same levels as historically, ranging from 6.7 – 7.9 units, with an average of 7.44 units. The historical review of hardness and alkalinity showed levels generally below 60 mg/L and this is consistent in the WQSP data.

The only variability was in the levels and types of detectable metals. Historical data showed that the majority of metals were detected below the DPH reporting limits. Only arsenic, cadmium and chromium were found above detection limits, but these were all less than one-half their respective Maximum Contaminant Levels (MCLs). The WQSP data resulted in the detected of more metals, generally at very low levels. However, of interest were the detections of aluminum, iron, and manganese.

[3] A water quality evaluation of the source was previously conducted as part of the Preliminary Design Report for SCWA's proposed water treatment plant. The 2007 WQSR results are comparable to results from this historical report: *Technical Memorandum Number 2 – Raw Water Quality Evaluation – from the Vineyard Treatment Plant Preliminary Design Report.*

Aluminum was found at levels ranging from 0.36 to 3.6 milligrams per liter (mg/L), with an average value of 1.14 mg/L. All data was above the secondary MCL of 0.2 mg/L and the average was above the primary MCL of 1.0 mg/L. This constituent is easily removed through conventional filtration and treated water levels are expected to be well below the MCLs.

Iron was detected in all samples, ranging from 0.34 to 2 mg/L, with an average of 0.98 mg/L. All samples were greater than the primary MCL of 0.3 mg/L. Manganese was detected in all samples as well, ranging from 0.019 to 0.064 mg/L, with an average of 0.032 mg/L. The majority of samples were below the primary MCL of 0.05 mg/L. These constituents can be effectively removed through conventional filtration and treated water levels are expected to be below the MCLs.

TURBIDITY

The turbidity was sampled monthly in coordination with the protozoa sampling. Turbidity ranged from 3 – 29 nephelometric turbidity units (NTU), with an average of 11.2 NTU. This is within the range of historical data, 1 – 140 NTU with an average of 23 NTU. The levels of turbidity are easily managed through the conventional filtration processes.

TASTE AND ODOR

Geosmin and 2-Methylisoborneol (MIB) were sampled to determine the potential for taste and odor episodes related to these constituents. Historically they were only found at levels below 5 nanograms per liter (ng/L) indicating a lower potential for impacting the taste and odor of the source water. The data from the WQSP has similar results, but with some peaks. Geosmin was detected from 1.3 to 32 ng/L, with an average of 6.9 ng/L. This constituent peaked in the spring. MIB was detected from <1 to 7.9 ng/L, with an average of 4.5 ng/L. This constituent peaked in the summer. It appears that under certain hydrologic and environmental conditions, there is the potential for elevated levels of geosmin and MIB that may cause mild taste and odor episodes.

ORGANICS

A review of historical water quality data in the Preliminary Design Report[4] showed very infrequent and low level detects of a small number of organic compounds. All were well below the MCLs or Notification Levels. The WQSP had the same results. Only two samples had positive results for organics. The April 2006 sample was positive for seven organic compounds. **Table 3** provides a summary of the data result for that sample, compared to the MCL. In addition, dichloromethane was detected in October 2006 at 0.0033 mg/L, below the primary MCL of 0.005 mg/L. Although organic compounds are intermittently detected in the source water, all the levels are well below regulatory thresholds and are not expected to be of concern in the treated water.

[4] *Technical Memorandum Number 2 – Raw Water Quality Evaluation – from the Vineyard Treatment Plant Preliminary Design Report*

TABLE 3 - SUMMARY OF APRIL 2006 DETECTABLE ORGANICS

Constituent	Detected Value, mg/L	MCL, mg/L
Ethylbenzene	0.0061	0.3
Toluene	0.021	0.15
Xylene	0.046	1.75
1,2,4-trimethylbenzene	0.012	0.33 [1]
1,3,5-trimethylbenzene	0.0031	0.33 [1]
Napthalene	0.0005	0.017 [1]
n-Propylbenzene	0.0013	0.26 [1]

[1] These are DPH Notification Levels

DISINFECTION BY-PRODUCT PRECURSORS

Organic carbon and bromide are detectable in the source water. Total organic carbon (TOC) was detected from 1.5 to 3.6 mg/L, with an average of 2.2 mg/L. This compares well with the historical data showing a range of 0.7 to 5 mg/L, with an average of 2.3 mg/L. Conventional filtration will be able to remove the TOC, and enhanced coagulation will be operated to achieve about 35 percent reduction. Calculated specific ultraviolet light absorbance (SUVA) ranged from 1.94 to 3.06 liters per milligram meter (L/mg-m), and averaged 2.6 L/mg-m. This is lower than the historical range, showing that the source water quality carbon characterization can change based on hydrologic and environmental conditions. Historically, bromide was sampled with a detection limit of 13 µg/L resulting in no detectable levels. The WQSP used a lower reporting limit and found bromide ranging from 5.6 to 21 µg/L, with an average of 11 µg/L. (note: 13 mg/L reported for April 2005 in the FRWA WQSR is incorrect; the lab verified that the result is 13 µg/L). Bromide is a precursor for formation of bromate in ozonation disinfection process. The low level of bromide in the Sacramento River is not expected to be a treatment issue for EBMUD. Water delivered to EBMUD will go to its terminal reservoirs, where Sacramento River water will mix with high quality Pardee water and local runoff. EBMUD's Sobrante and USL WTPs are equipped with ozonation for taste and odor control, but treated water bromate has never exceeded MCL. Since ozone is not proposed for use at this time for SCWA facilities, this is less significant.

MICROBIALS

In the WQSP the source water was sampled monthly for total coliform, *E. coli*, *Giardia*, and *Cryptosporidium*. Total coliform values ranged from 330 to 10,000 most probable number per 100 milliliters (MPN/100 mL), with an average of 1700 MPN/100 mL. Of more interest are the *E. coli* values which ranged from 3 to 460 MPN/100 mL, with an average of 42 MPN/100 mL and a median value of 11 MPN/100 mL. Only one sample was above the 200 MPN/100 mL average threshold set by DPH for implementing additional log action for *Giardia* and viruses. Ninety-one percent of *E. coli* samples were less than 100 MPN/100 mL and 87 percent of values were less than 50 MPN/100 mL. Again, water delivered to EBMUD will be mixed with high quality terminal reservoirs water, prior to treatment.

Giardia was confirmed to be detected in only three samples, with an overall average of 0.011 cysts per liter (cysts/L). This is lower than the historical data, which averaged 0.046 cysts/L. *Cryptosporidium* was presumptively detected in four samples, with an overall average of 0.018 oocysts per liter (oocysts/L).

This is similar to the historical data, which averaged 0.010 oocysts/L, and well below the regulatory threshold of 0.075 oocysts/L.

Coliform was also monitored during five targeted winter storm events. As consistent with historical data, levels were higher during targeted storm events than typical conditions. Total coliform ranged from 820 to 11,000 MPN/100 mL, with an average of 4,600 MPN/100 mL and a median of 2,400 MPN/100 mL. *E. coli* ranged from 17 to 150 MPN/100 mL, with an average of 96 MPN/100 mL and a median of 100 MPN/100 mL. All samples were still below the 200 MPN/100 mL average threshold set by DPH for implementing additional log action for *Giardia* and viruses.

In conclusion, the study supports that the source water will be treatable with conventional filtration and disinfection. The appropriate level of treatment will be 3/4-log reduction of *Giardia* and virus and source water monitoring for *Cryptosporidium* has resulted in a Bin 1 classification for the Sacramento River source, with no additional action required at this time. Bin classification calculation can be found in the table attached as **Appendix 2-D**.

2.1.2 VULNERABILITY TO CONTAMINATION

Figure 4 - Urban Runoff and Other Discharges to Sacramento River

Assessment of water source vulnerability is based on the *Sacramento River Watershed Sanitary Surveys* (1995-2006), and is quantified in the *DWSAP* (Drinking Water Source Assessment and Protection) forms (Appendix 2-B). In summary, there have been very few contaminants detected in the water supply, generally bacteria and a few volatile organic compounds (VOCs). The VOCs were found periodically at trace levels. The source is considered most vulnerable to the following activities which might possibly contribute to those levels of detected constituents:

- recreation, both body contact and non-body contact activities on the Sacramento River,
- public access throughout the watershed including on levee roads and within the Sacramento River corridor making it possible for individuals to illegally dump materials,
- storm drain discharge points carrying urban runoff (URO) into the Sacramento and American rivers (see **figure 3,** below, for a map showing the locations of these and other discharges), and
- permitted discharges from NPDES facilities, including treated groundwater from Aerojet into the American River, heating and cooling waters from the State Printing and Heating Plants, and untreated flows the City of Sacramento's Combined Sewer System.

There are some activities located in close proximity to the drinking water source that are not associated with any detected contaminants but may be of concern including:

- a leaking underground storage tank located at the historic Tosco Refining Co. located on the east shore of the Sacramento River, which is undergoing remediation and the
- Nimbus Fish Hatchery's permitted waste discharge of treated wastewaters into the American River, upstream of the confluence with the Sacramento River.

These findings support watershed protection activities, which are assessed every five years in the Watershed Sanitary Survey and participated in by a group of water agencies beyond the users of the Freeport project. The City of West Sacramento, City of Sacramento, Carmichael Water District, and FRWA meet periodically to implement protection recommendations. The particular protection activities change with time based on current risks to the water source.

This group also participates in a spill notification program which seeks to cooperatively train potential dischargers, such as wastewater collection and treatment facilities, and water systems to be able to rapidly communicate information (spill details) that will allow facilities to make timely decisions to shut down intakes if appropriate. The nature of a spill notification program is such that regular meetings and trainings are necessary to keep awareness up, update contact names and to identify successes and shortcomings. FRWA is actively joining the notification tree and participated in spill training in June 2009.

Beyond the studies of the Sacramento River and the spill notification program mentioned above, additional contamination vulnerabilities were identified during the design process and were addressed by implementing operational rules at the new intake to protect source water quality. Design engineers developed methods to calculate the potential amount of effluent that could be diverted from a nearby, but downstream, wastewater discharge. Designers also identified the potential to divert urban storm water runoff from a nearby river discharge. Both situations and their operational solutions are summarized in Section 2.3 Operation and Maintenance. Please refer to Figure 3, above, for the relative locations of these two potential contaminant sources.

2.2 RAW WATER DIVERSION AND CONVEYANCE FACILITIES

The FRWP raw water diversion and conveyance joint facilities divert water from the Sacramento River at Freeport Bend to the bifurcation structure and consist of the following components:

- Intake – the Sacramento River intake structure and pumping plant.
- Joint Pipeline –the 84" diameter welded steel transmission pipeline from the intake facilities to the bifurcation point.
- Bifurcation Facility –the isolation valves to EBMUD's Extension Pipeline and to the SCWA Extension Pipeline
- Flow Control Station – the flow control sleeve valves and appurtenant facilities at the delivery point to the VSWTP on the SCWA Extension Pipeline.

- A communications system between FRWP facilities, EBMUD, USBR, and Sacramento Regional County Sanitation District's (SRCSD's) ACC-9, consisting of a primary fiber optic system between FRWP facilities with a radio telemetry backup. A radio telemetry system is the primary communication link for ACC-9 and USBR, and the backup link for EBMUD.

2.2.1 RAW WATER INTAKE

The raw water Intake and pumping Facility is located on the Sacramento River at the Freeport Bend. Water is diverted from the river through fish screens and pumped into the raw water pipeline. This is the only pump station serving the joint pipeline. The major processes and systems at the Intake Facility are shown on figure 4 and each of the indicated systems and processes, as well as control and communication system, is described in the next seven sections.

Figure 5 - Major Intake Systems Locations Shown on an Aerial Construction Photograph of Intake Site

2.2.1.1 FISH SCREENS

The fish screens protect juvenile fish from entrainment or possible screen impingement and are designed to meet current regulatory agency (National Oceanic and Atmospheric Administration Fisheries, California Department of Fish and Game, and U.S. Fish and Wildlife Service) fish screen criteria for salmon fry, steelhead fry and Delta smelt. Flow through the fish screens is limited to the rate that results in an approach velocity of 0.2 feet per second. The screens are comprised of the following four panel types:

- Fish screen panels – Slotted screen panels that allow water to pass, but prevent passage of fish and anything else larger than the slot width (about 1.75 mm).

- Blank panels – Solid panels of similar shape and size as the fish screen panels that prevent passage of water.
- Perforated baffle plates – Panels the same size as the fish screen panels that are perforated with many circular holes. These panels are used to facilitate uniform flow across the fish screen panels.
- Bulkheads – Heavy duty panels used to dewater the forebay chambers.

2.2.1.2 SEDIMENT CONTROL SYSTEM

A system of water jets, chain and flight and other design elements work together to remove grit from the intake to settling basins.

- Sediment Collection - There are four longitudinal collectors, two cross collectors and four adjustable speed sediment transfer pumps (315 gallons per minute design flow rate). The longitudinal collectors move the sediment in the forebay to the cross collectors. The cross collectors move the sediment to the sediment transfer pumps where the sediment is pumped out of the structure to the on-site sediment settling basins. There are two sediment transfer pumps in each sump, and the system is designed to run with just one pump.

- Jetting Systems – There are two sediment jets at each vertical pump suction bell and a series of water jet nozzles installed in each screen bay, immediately behind the fish screen. The suction bell jetting pipes are intended to stir up sediment that accumulates under the pump bell while the pump is inactive. The screen bay jetting system flushes sediment that falls between the fish screen and the sediment collectors into the path of the sediment collectors.

- Sediment transfer pumps discharge collected sediment to the sediment settling basins. The sediment will settle in the basin and the water will be returned to the forebays. The following facilities are provided for basin operations:

- Sediment settling basins – three concrete and shotcrete lined trapezoidal basins, each with a ramp to access the basin bottom for cleaning and maintenance.

- Basin inlets – seven electrically actuated, plug valve inlets to each basin. Inlet use will be rotated to encourage uniform sediment distribution around the full areal extent of the basins.

- Basin outlet structures – a water/sediment level control structure in each settling basin. Each outlet structure has two return flow pumps that return the decanted water, that spills into the structure over an adjustable weir gate, to the pump forebays.

2.2.1.3 MAIN RAW WATER PUMPS

Eight identical vertical turbine raw water pumps, described in the Pump Station Data Sheet **(Appendix 2-E),** are driven by four adjustable frequency drives (AFD) to generate flows between 15 and 185 mgd. The pumps are arranged in pairs such that one pump may be driven by the AFD while the other is powered across-the-line. This arrangement minimizes the number of AFDs required.

Each pump is rated for a nominal capacity of 26.4 mgd at 285 feet of head, and its 36-inch, above-grade discharge head is connected to a 2,000 horsepower motor. The pumps can supply raw water to just the VSWTP or the EBMUD delivery point, or to both facilities at the same time. Pump controls are utilized to regulate pump discharge-based operator inputs: flow rate, destination and start time. Automatic controls are used to assess and address adverse river conditions, such as tidally influenced reverse and low flows. Action may include automatic shut down of the intake. Automatic shut downs are discussed further in the Operation and Maintenance part of this report.

2.2.1.4 INTAKE SURGE CONTROL

Surge control is provided by four 52,000 - gallon hydropneumatic surge tanks at the intake site. These tanks are filled with a combination of air and water. The surge control system for the FRWP is primarily for down-surge control. Therefore, the tanks are mostly full of water under normal operating conditions. In the event of a power failure during full operations, the water in the tanks will flood into the discharge pipeline behind the down-surge pressure wave to help prevent potentially damaging negative pressures along the length of the Joint Pipeline. A reflected surge wave will return to the tank area and create an upsurge, but predictive modeling shows that this upsurge will be small relative to the normal working pressure and should not cause damage.

A level control system on each tank monitors water level in the tank and either adds or vents air to maintain the appropriate level. When air addition is required, a compressed air system dedicated to the surge tanks is used. The compressed air system is designed to maintain the required air levels in the system and may function with a single compressor.

The intake surge tanks are also equipped with a recirculation system. This system utilizes small pumps to allow the water in the surge tanks to be recirculated into the raw water discharge system.

2.2.1.5 ELECTRICAL SUBSTATION AND SYSTEM REDUNDANCY

The FRWA intake substation is designed as a dual-redundant, feed-through substation, that is, two power sources are available in lieu of standby generators. The substation will transform power from one Sacramento Municipal Utilities District (SMUD) owned, overhead, 69-kV sub-transmission line to 4.16 kV for distribution within the pump station and intake site. Although there is initially only one 69-kV station service from SMUD, a second sub-transmission line to supply the substation is planned for completion shortly after commissioning of the FRWA intake substation and pumping station. The substation has been designed to accommodate this future connection line.

In addition to the redundant power system, described above, the overall system design and user (EBMUD or SCWA) flexibility ensure the reliability of the surface water source and conveyance facilities. In the absence of redundant power supply, due to delayed installation of the second feed system or outage of both power supplies, the overall FRWA system is designed to withstand some level of service interruption. SCWA's ability to withstand outage is made possible through the phased construction of the Vineyard treatment Plant. Phase 1 of the construction is scheduled to be completed by Fall of 2011. During the period from 2011 to approximately 2025, SCWA's water supply is redundant between the surface water and groundwater supply. The clearwell storage of 20.6 million gallons provides capability to withstand power outages at the intake. Prior to Zone 40 build out, a second phase of the Vineyard treatment plant will be completed, which will include a raw water storage reservoir. The 16 million gallon reservoir will store raw water to bridge intake pumping outages foreseen at that time. From EBMUD's perspective, short term outages at the intake pumping station can be accommodated since the demand for water is supplementary (as described in Section 1 of EBMUD's permit amendment application).

2.2.1.6 CHEMICAL INJECTION

A sodium hypochlorite system is provided at the intake for potential use to control biological growth in the raw water joint pipeline or for treatment of exotic species. Dosing equipment, residual measurement and anticipated demand are listed in **Appendix F Chlorination Data Sheet**. A 5,000-gallon capacity tank composed of polyethylene with double-walled construction includes a leak detection system and containment sump. Under normal conditions (when chlorination is not necessary) sodium hypochlorite will not be stored on site.

2.2.1.7 SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA)

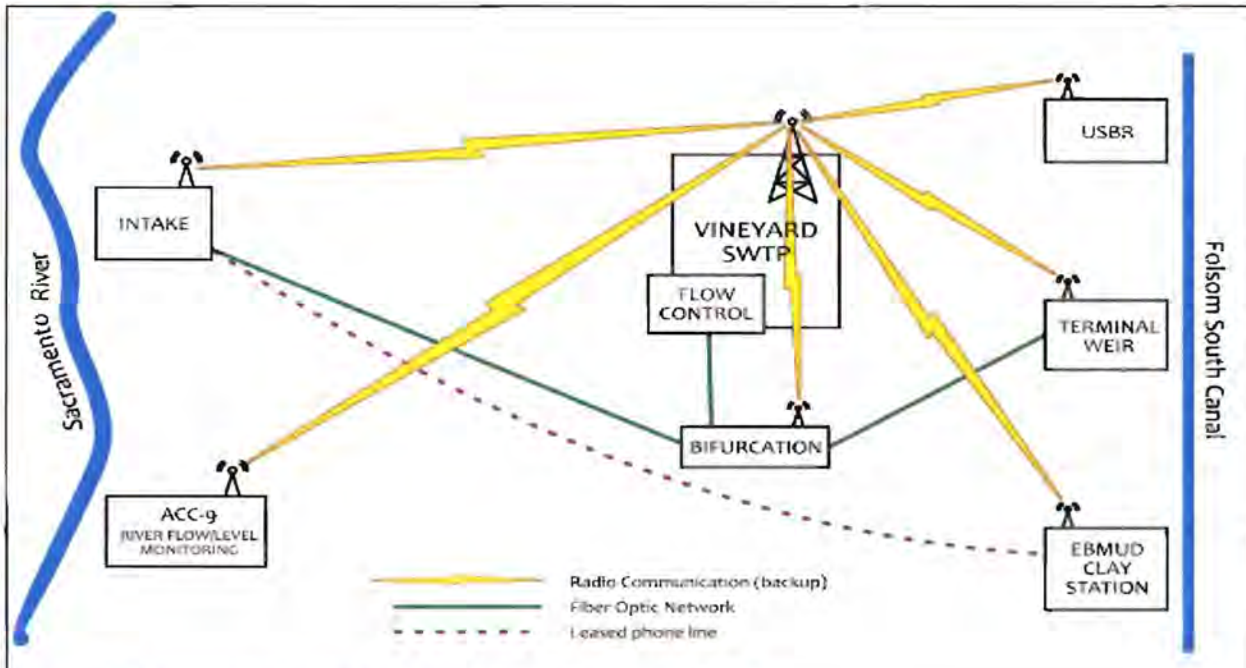

Figure 6 - Communication and Backup Communication Diagram for FRWP System

A distributed control system, composed of Allen Bradley/Rockwell PLCs and managed using a commercial SCADA/HMI software package over a fiber optic communications network, will operate within the FRWP project and also extend to the EBMUD FSC connection at the terminal weir. A radio telemetry communication system will also be provided for communications to ACC-9 (a river flow monitoring station located downstream of the intake at Freeport Bridge) and USBR. The radio telemetry system will provide a backup communications path to all FRWP sites and EBMUD's Clay Station Pump Station (shown in the figure above). EBMUD's primary communications link to the FRWP SCADA system will be by leased telephone line via the communication and control system at the intake.

Each PLC will be equipped with an uninterruptible power supply (UPS) for primary power. The SCADA system will monitor UPS status and operators will need to manually switch the PLCs over to line power in the event a UPS must be taken off-line. For long-duration line power outages (outages lasting more than 4 hours) at any FRWP site, the UPS system will be deactivated. PLC and SCADA programming will return all stored set-point values to active memory when any PLC is powered down.

The system will normally communicate over the fiber optic network to the main FRWP sites. A radio telemetry system will be available in backup mode and will be continuously polled for availability. If a site is missed on the fiber optic network, the radio system will automatically fill the communication gap. To ensure the security and reliability of the SCADA network the SCADA network will be separate from (not interconnected with) the security and administrative (office functions, e-mail, internet access, etc.) networks. Only common security alarm signals will be linked from the security network to the SCADA network.

2.2.2 RAW WATER PIPELINES

The FRWA raw water conveyance system consists of approximately 13 miles of cement mortar lined welded steel pipe connecting the intake facility to the bifurcation facility. Pipeline diameter from the intake to the bifurcation tee at Gerber and Vineyard Roads is 84 inches, with a 0.40 to 0.36-inch thick steel cylinder. All pipe is lined with 0.75-inch thick layer of cement mortar to protect from internal corrosion, and coated with an 80 mil layer of tape-wrap to protect from external corrosion. The pipeline alignment as well as the delineation of pipeline segments is shown in **Figure 2. The data sheet can be found in Appendix G** The various design considerations including trench design, drainage, air release/air vacuum, maintenance access, and cathodic protection are described in the sections below.

Figure 7 - Typical Trench Section

2.2.2.1 TRENCH DESIGN

Thickness of the steel cylinder, depth (seven ft minimum) and composition of cover and pipe alignment were optimized to achieve adequate protection of the pipeline facility and adjacent and future utilities. Pipeline is encased in controlled low-strength material (CLSM) slurry to provide needed support to the pipeline, and to minimize the chance of accidental puncture from other utility excavation in the future. Three 6-inch wide metallic warning tapes were buried one foot above the CLSM and positioned vertically over the edges and center of the pipeline. A 4-inch diameter PVC conduit is encased in the CLSM to allow placement of fiber optic communication cables for system operations between the Bifurcation Structure, Flow Control Structure, and the Terminal Weir (located at the Folsom South Canal) Structure with the Intake Facilities. A photograph of a typical pipe trench and some of the features described above appear in **Figure 6.**

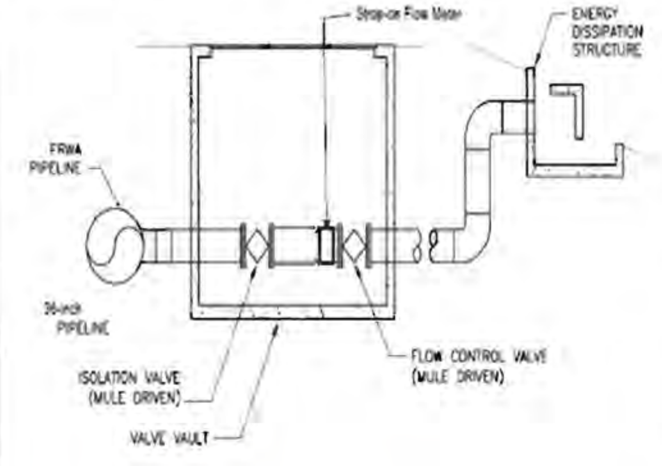

Figure 8 - Typical High Volume Drain Structure

2.2.2.2 PIPELINE DEWATERING FACILITIES

The Freeport Pipeline may be required to be drained completely during times of maintenance or emergency. High volume drains are placed along the pipeline to provide the means for draining all the free draining portions of the water from the pipeline within approximately 8 hours. Two of the high volume drains are located at low points so that the pipe can be drained via gravity into the Meadowview and Union House Creeks. The third provides a low point where sump pumps can pump water to Morrison Creek. Once the majority of the water has been drained by gravity, the remaining water in the pipe shall be pumped out via smaller blow-off stations located at low points or other critical flushing points along the system including, but not limited to, appropriate drainage crossings such as local storm sewers, drainage channels, and sanitary sewers. The typical configuration for the high volume drain vaults is shown in **Figure 7.**

2.2.2.3 AIR/VACUUM VALVES

Combination air valves (CAV's) protect the pipeline from damaging pressure differentials by allowing air to enter and escape from the pipeline during draining and filling operations. They are housed in below-grade concrete vaults with each CAV connected to a vent pipe that penetrates the wall of the vault and traverses to a suitable location where venting to atmosphere via an above-ground "candy cane" will occur. A break-away flange is incorporated at the base of the candy cane for safety purposes. CAVs were located at approximate intervals of 1,500 feet along the pipeline, with additional CAVs placed at vertical points of intersection or high points along the pipe line.

2.2.2.4 ACCESS MANWAYS

To allow for future access to the pipeline, 36-inch nozzles with a blind flange have been provided within a below ground vault every 1,500 feet along the pipeline. In some locations, the access manway is located in the same vault as a CAV to minimize the number of vaults required.

2.2.2.5 CATHODIC PROTECTION

A cathodic protection system is used to protect the FRWA pipeline from corrosion. A number of deep anode wells are installed along the pipeline alignment. Each anode well is connected to an above ground rectifier and reference electrode. The rectifier converts alternating current (AC) power from a power source to direct current (DC) with a positive connection to the pipeline material and a negative connection to the anode well. With the completed circuit, the pipeline becomes the cathode, while the sacrificial anodes bear the brunt of any corrosive activity. Test stations are installed at approximately 1000-foot intervals to aid in the operation and maintenance of the system. The test stations can also be used in for future locating of the pipeline facilities by underground locating services to prevent accidental excavation.

2.2.3 PIPELINE-RELATED RAW WATER CONVEYANCE STRUCTURES

There are four major structures included with the raw water conveyance facilities to allow remote operation. The Surge Control Structure and Bifurcation Valve Vault (located very near the bifurcation tee), a Flow Control Structure (located at the connection to the VSWTP), and a Terminal Weir Structure (though the structure is not part of the joint facilities) is located at the discharge to the Folsom South Canal (FSC). Each of the structures is described in the following paragraphs.

2.2.3.1 SURGE CONTROL STRUCURE

The Surge Control Structure (SCS) is an above-grade structure that houses an air compressor, programmable logic control (PLC) equipment for remote control of isolation valves, the surge tank, recirculation pumps, and raw water sampling equipment. A 72-inch isolation valve vault with two 72-inch motor actuated butterfly valves can be used to isolate the 72-inch pipeline when EBMUD is not accepting water. The isolation valves are equipped with an 8-inch bypass line with plug valves for isolation. An 8-inch diameter magnetic flow meter, installed on the bypass line, transmits flow data to the PLC. A flow meter vault is also located on the site to allow a strap-on type ultrasonic flow meter to be installed on the 72-inch pipeline. The 36-inch pipeline that connects the surge tank to the main pipe is also equipped with an isolation valve vault housing a 36-inch motor actuated butterfly valve that can isolate the surge tank. The site is fenced on all sides with two motorized gates providing access for a turnaround driveway onto Gerber Road. The PLC at the SCS will also control the isolation valve on the 66-inch segment of the pipeline at the bifurcation tee, where a 66-inch motor actuated butterfly valve is located. An overview of SCS site is provided as part of the **Figure A-1** System Flow Control Diagram, at the end of this report.

A surge tank located next to the SCS protects the 72-inch pipeline between the bifurcation tee and the FSC from surge events when EBMUD is taking water. The tank is filled with a combination of air and water to allow water in the pipeline to expand into the tank, or to flow from the tank into the pipeline during a transient pressure event. A level transmitter sends the water level in the tank to the PLC, which then opens or closes solenoid valves for air supply and air release to regulate the water level within preset elevations. An air compressor connected to the tank automatically supplies air when necessary, and can also be controlled through the PLC.

Recirculation pumps located within the SCS are used to move water from the SCS to the bifurcation tee when the 72-inch isolation valves are closed. The recirculation supply line is connected to the 66-inch pipeline at the bifurcation tee, and pumps fresh water into the 72-inch pipe approximately 5 feet up stream of the 72-inch isolation valves. Recirculation water is pumped at a rate that will refresh the entire volume of water in the dead-end leg once per day. A smaller recirculation pump also refreshes the water within the surge control tank.

Water sampling equipment is also located within the surge control structure, and allows for remote detection of raw water quality parameters. Temperature, pH, turbidity, and conductivity transmitters send raw water quality data to the PLC and SCADA systems, where it can be viewed by operators at both the intake facility and the VSWTP.

To provide uninterrupted power to equipment at the SCS, an automatic transfer switch is located at the site to activate a diesel powered emergency generator. The generator is mounted on a pad outside of the structure with a diesel belly tank that will supply approximately 3 days of operation in the event of an emergency.

2.2.3.2 BIFURCATION VALVE VAULT

A 66-inch motor actuated butterfly valve is housed in a below-grade vault structure approximately 30 feet north of the bifurcation tee. The valve allows isolation of the 66-inch segment that connects to the VSWTP and can be controlled via the system wide supervisory control and data acquisition (SCADA) system, or at the valve itself. An 8-inch bypass line around the 66-inch isolation valve is also provided within the vault, and is equipped with an 8-inch motor actuated globe valve. The globe valve can also be controlled through the SCADA system, or locally at the valve.

2.2.3.3 FLOW CONTROL STRUCTURE

The Flow Control Structure (FCS) is located at the VSWTP and houses flow meters and energy dissipating sleeve valves to control flow and to dissipate energy in the line prior to discharge into the treatment plant's distribution system. At the FCS the pipeline splits into two parallel 48-inch diameter lines. The flow meters transmit to a PLC located on the ground floor of the FCS that controls the sleeve valve and the 48-inch isolation valve positions. The FCS is equipped with a monorail crane and to allow the removal of the magnetic flow meters and/or energy dissipating sleeve valves as necessary. A schematic view of the FSC appears in **Figure A-2** System Flow Control Diagram, at the end of this report.

2.2.3.4 TERMINAL WEIR STRUCTURE

The terminal weir structure is designed to provide a means of introducing water into the Folsom South Canal and prevent water from the Canal back flowing into the FRWA pipeline. The weir is hydraulically connected to the previously discussed pipeline components, but is outside the scope of this amendment. The Weir has an outfall elevation that is greater than the canal water elevation by four feet, and higher than the surrounding ground by one foot. This outfall elevation will prevent water from back flowing into the pipeline. The end of the pipe as it enters the weir structure will be covered with a slide gate when it is not in use. This will prevent entrance into the pipe and keep the interior of the pipe moist, maintaining the lining integrity.

This structure and the incoming pipeline segment will be operated by EBMUD, and is thus not part of this permit amendment. There are system-wide control and communication systems as well as water level and quality equipment, however, to be operated and maintained by SCWA as a FRWP facility.

2.2.3.5 STRUCTURE SECURITY SYSTEMS

Security systems for the structures include keypad and card-reader entry control, with associated door strike hardware, surveillance cameras (interior and exterior), motion detection, entry alarms, and voice broadcast systems with outdoor speakers. The security systems are monitored using the security network at the intake control room and/or at the VSWTP control room. The security system is an independent system, separate from the FRWA SCADA/HMI system and the administrative network systems. It will communicate with other FRWA sites over a separate communications fiber, without a backup communication system. The security network will communicate a common alarm signal to the SCADA network, but will otherwise have no interconnection to that system.

2.3 OPERATION AND MAINTENANCE

For the new FRWP facilities, the objectives of this section are to:

- describe the control strategies that prevent diversion of contaminated water (Section 2.3.1)

- describe the available certified personnel resources at SCWA and discuss operator certification requirements of the FRWP system (Section 2.3.3)
- discuss the emergency response plan documents that have been (or will be) created, (Section 2.3.3)
- list the supporting documents which contain operations and maintenance procedures (Section 2.3.4)

2.3.1 KEY CONTROL STRATEGIES

Operational and Maintenance practices which safeguard the facility and diverted water supply were generated from several technical memoranda and negotiated agreements during the design phase to address the water supply's and facility's greatest vulnerabilities. For the purpose of the sanitary engineer's review, two FRWP practices or "control strategies" **(Appendix 2-H),** which prevent diversion of contaminated water, are discussed briefly below.

The FRWA intake, located at river mile 47.2, can be appreciably impacted by two downstream discharges in the event of tidally influenced low or reverse river flow: wastewater treatment plant treated discharges at Sacramento River Mile 46 and City of Sacramento urban runoff discharge from "Sump 28" at River Mile 47. To prevent diversion of these discharges, two operating rules were incorporated into the FRWP control strategies:

- When river flow rates drop to less than 3,000 cfs the raw water pumps and the City's Sump No. 28 pumps are operated in a coordinated manner to prevent sump discharge from being drawn into the FRWA system. The FRWA operator can verify coordinated operation through SCADA by observing Sump 28 pump "off "status as well as Sump 28 water surface elevation.

- Diversions will not take place when treated effluent from the Sacramento Regional Wastewater Treatment Plant may be present in the river at dilution ratios exceeding about 0.1%. The FRWP control system calculates "particulate position" based on the velocity of the river (velocity X time= distance). See **Figure 8**. The pumps will shut down when the "particle" has traveled 0.9 miles upstream of ACC-9 (a flow sensor located between FRWP Intake and the treatment plant) and can resume pumping when the "particle" has returned to 0.7 miles upstream of ACC-9. In Figure 8, ACC-9 is denoted as "USGS Flow Meter".

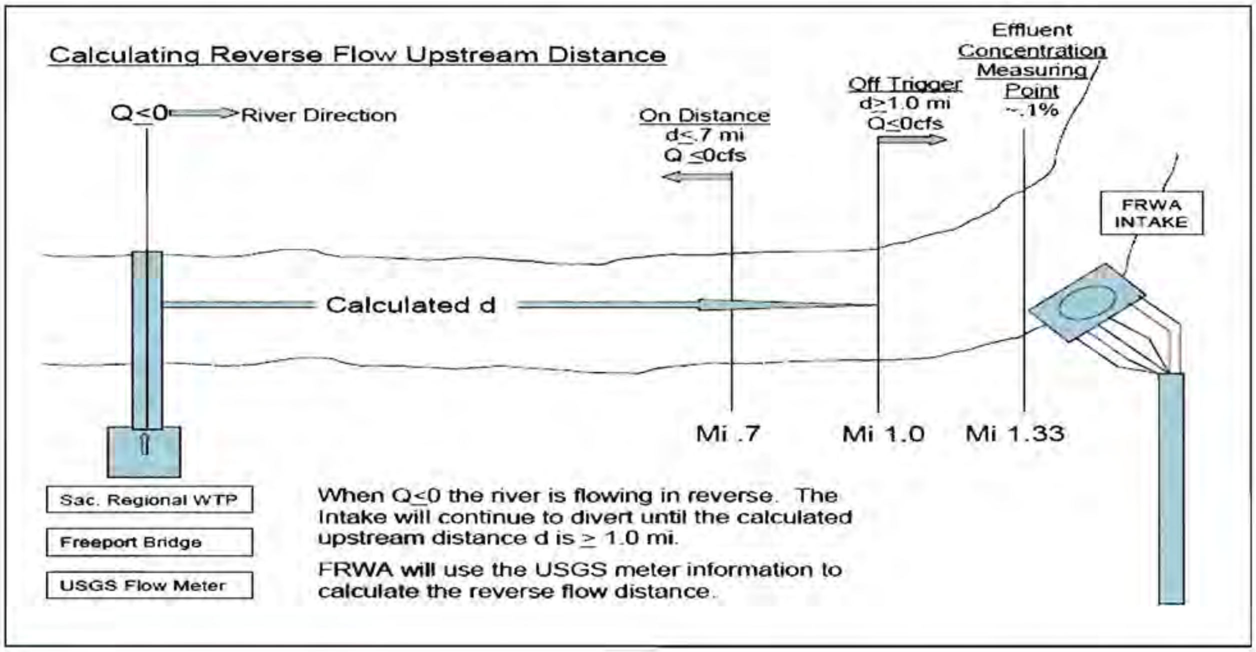

Figure 9 - Calculation of Particulate Position

Two *Coordinated Operations Agreements* (**Appendix 2-I & 2-J)** describe the coordination between the FRWA and the discharging agencies. The outcome of these agreement is summarized in the "Operating Constraints" section of the Preliminary Operations plan, see page 11.

2.3.2 CERTIFICATION LEVELS

When no chlorine is being used, the raw water conveyance (FRWP intake and pipeline) will be treated as a raw water pump station and pipeline and will not require certified operators.

When chlorine is added at the intake the use of certified operators in accordance with Title 22 Chapter 15 is required.

While SCWA is acting as FRWA's operating agent, SCWA intends to utilize certified operators on the FRWA system including several existing and experienced staff listed in **Appendix 2-K**. However, uncertified operators may be utilized to operate the FRWA system (not including Laguna Vineyard water system), in a manner outlined by the Operations Plan, as deemed appropriate by FRWA.

2.3.3 EMERGENCIES AND DISASTERS

EMERGENCY RESPONSE PROGRAMS FOR THE OPERATOR'S EXISTING SYSTEM

SCWA has an Emergency Response Plan for all its water systems including the Laguna Vineyard water system. The plan was last updated in 2005 and is on file with the Department. SCWA is currently drafting an update to the Laguna Vineyard plan, and will submit an ERP by September 2009.

EMERGENCY RESPONSE PROGRAMS FOR THE FRWP SYSTEM

An update to the SCWA Water System emergency response plan for the FRWP facilities is being developed by SCWA to be submitted to DPH prior to the operation of the intake. The plan will change only slightly to deal with the surface water source and new raw water pipeline. SCWA shall develop and maintain, an annually updated Emergency Operations Plan to address operations under Emergency Operating Conditions. The Emergency Operations Plan shall incorporate the requirements of and services offered by local and state offices of emergency services and other public safety organizations such as local fire and police departments. SCWA shall implement the procedures contained in the Emergency Operations Plan. SCWA may enter into contracts and/or issue purchase orders as necessary to address any Emergency Operating Condition. Under circumstances when an Emergency Operating Condition exists, SCWA shall brief the Executives or their designees as necessary of the status of conditions, future impacts of such conditions, and the actions SCWA has taken and plans to take to address the Emergency Operating Condition. (Operating Agreement Sec. 4.8)

SCWA will participate in two local, voluntary spill notification programs. SCWA has partnered with local water agencies within the American River and Sacramento River Watersheds to fund the maintenance of the call tree and periodic operator training in anticipation of the operation of the FRWA intake in 2010.

No new emergency chlorination plan for the new raw water facilities will be written as chlorine addition does not affect the Laguna treated water system. There are chlorination facilities (a tank and metering equipment) at the intake, but the intent of chlorination from this location would be to manage biological growth in the pipeline and possibly for exotic species control, not in response to an emergency situation.

2.3.4 BACKGROUND INFORMATION ON OPERATIONS

- Operations Plan (Preliminary) (**Appendix 2-L**)

  This technical 72-page memorandum (TM) describes the objectives, limitations, constraints, and recommended operational procedures for the system. Preliminary summaries of staffing requirements and operations and maintenance (O&M) equipment are also included.

- Sediment Management – Sediment in Pipeline

  A number of technical memoranda have been written by the intake, pipeline and VSWTP design engineers offering perspectives on sedimentation management particularly focused on the pipeline. The memoranda support the FRWP design which includes components described previously: chain and scrapers, and sedimentation ponds at the intake, and a flushing basin at the treatment plant. The designers anticipated that a flushing program would be adequate to move settled solids in the pipeline to one delivery point or another. The flushing program will be implemented in accordance with the intent of the memoranda and in accordance with physical constraints such as flushing basin size, etc. In the event that the program is inadequate or unverified, the Operations and Maintenance Committee may elect to shut down the pipeline for inspection and if necessary implement pigging or other sediment removal. Since these events are unlikely, infrastructure to accommodate them (such as pigging stations) was not justified based in a cost benefit analysis but the pipeline is properly sized and oriented to accommodate construction of insertion and removal facilities. The reader is directed to the following technical memoranda:

CH2MHill Oct 28, 2005 Freeport Regional Water Authority Intake Facilities Design Sedimant Management Plan.

Brown and Caldwell September 9, 2005, FRWA- Pipeline Sedimentation and Pipe Cleaning Options

MWH, February 28, 2006 -Sacramento County Water Agency Vineyard Surface Water Treatment Plant Preliminary Design – Review of the Raw Water Reservoir for the VSWTP

Also- Pipeline training conducted by the design engineers July 14, 2009.

- Control Strategies **(Appendix 2-G)**

  The draft Control Strategies report describes how the SCADA system will monitor and control the overall intake, pipeline and delivery system. While this report is intended to be used by programmers, and is technical in nature, the operation plan must be consistent with it.

- Staffing Plan

  This document will be finalized around the time start up and commissioning takes place.

  The staffing plan outlines operating personnel, including number of staff, certification levels and responsibilities. Prior to the availability of a complete staffing plan, a staff list of current certificate holders appears in Appendix2-F (Operator Listing and Certification)

- Record keeping

  This document will be finalized around the time start up and commissioning takes place.

  Data Historian Server - This server will be utilized as part of the operator's record keeping program.

  Complaints - This section will cover the procedure for recording complaints (calls reporting pipeline leaks, odors, riverine issues/swimmers/boaters, noise etc.).

SECTION 3 - INVESTIGATION FINDINGS FOR SCWA-OWNED FACILITIES

This section contains investigative findings for the FRWA facilities used solely by SCWA. This Section also contains a description of the Vineyard Surface Water Treatment Plant (VSWTP), which shall be permitted separately. It is discussed below for context.

3.1 SCWA EXTENSION PIPELINE

3.1.1 PHYSICAL FACILITIES

The pipeline segment from the bifurcation tee to the Vineyard Surface Water Treatment Plant (VSWTP) is an approximately 1.3-mile long, 66 inch diameter 0.30-inch wall thickness mortar-lined, spiral welded steel pipe. The extension starts at the bifurcation tee near the intersection of Vineyard Rd and Gerber Rd and extends north through agricultural / grazing lands before crossing under Florin Road, going along Knox Road and terminating on the Vineyard Treatment Plant site. The details of this extension are similar to those of the shared pipeline; depth thickness, access man ways, air valves and corrosion protection facilities are similar or identical. The spiral welded steel pipe has double welds at joints and 0.75" mortar lining.

The pipe includes an isolation valve vault which is designed to shut off flow to the Vineyard plant when flows are directed only toward EBMUD's extension. The valve is motorized and controlled by the control system discussed in Section 2 of this engineering report.

3.1.2 ADMINISTRATIVE, FINANCIAL AND OPERATIONAL ASPECTS OF SCWA EXTENSION

SCWA will maintain full responsibility for its extension independent of the joint facilities.

3.2 FLOW CONTROL STRUCTURE

The SCWA extension pipeline splits into two 48" lines which lead into the Vineyard treatment plant after passing through energy dissipating sleeve valves. While this facility is located on the Vineyard treatment plant site, it is a FRWP or shared facility and is covered in Section 2 of this engineering report.

3.3 FUTURE SURFACE WATER TREATMENT PLANT

The treatment process that will be employed at SCWA's Vineyard SWTP site is conventional surface water treatment with dual media filters. Flow through the treatment process to the treated water clearwell is by gravity.

The new treatment plant will have provisions for feeding various chemicals at multiple injection locations along the treatment train. Potassium permanganate can be injected for taste and odor control if needed as raw water enters the plant. Other chemicals injected in the plant influent include sodium hypochlorite (disinfectant), aluminum sulfate (Alum – the primary coagulant), and caustic soda (pH control).

Following the initial chemical injection, the water flows through a flash mix process and into a flocculation/sedimentation basin. Settled water leaving the sedimentation basin flows to the filters, and filtered water flows to a 22 million gallon clearwell. There are multiple locations for chemical injection (chlorine, caustic soda, and polymers) provided for use as needed along the treatment process. Provisions for future UV Disinfection on the filter effluent piping were included in the design. Chemicals that are injected in the filtered water prior to the clearwell include sodium hypochlorite, fluoride, and caustic soda (if pH adjustment is necessary). The capacity of the treatment process will be 50 MGD after Phase 1 is completed and 100 MGD ultimately.

Finished water is pumped from the clearwell to the Laguna Vineyard service areas by a High Service Pump Station that sits at the south end of the clearwell. The pumping capacity of this pump station will be 60 MGD after Phase 1 is completed and 137 MGD ultimately.

Solids removed from the raw water through the treatment process will be dewatered mechanically and hauled off-site to a landfill. Water from the dewatering process will be discharged to sanitary sewer. Water from filter backwash and sludge thickening processes will be clarified and returned to the headworks of the treatment process.

Phase 1 construction of the Vineyard SWTP is currently under way and is expected to be complete by the end of 2011. The schedule of the future expansion of the treatment process to 100 MGD is uncertain and is dependent on the rate of new development. It has been estimated that the Phase 2 expansion will be needed by approximately 2025.

3.4 WATER QUALITY MONITORING

3.4.2 SOURCE WATER MONITORING PROGRAM

This section describes the a monitoring program to be conducted as part of operation of intake and Vineyard Treatment Plant. The program described below will be for the benefit of the SCWA system and monitoring required for deliveries to EBMUD will be handled by EBMUD and described in the EBMUD permit. SCWA, as the FRWA system operator, will provide access to EBMUD for sampling as well as data from in-line sensors located in the FRWA facilities it operates

A water quality monitoring program has been developed by the FRWP facilities operator. The plan (Appendix 3-A) covers the Vineyard surface Water Treatment Plant and associated distribution system monitoring programs for a five year period, 2009-2014. It is based on general regulatory requirements of the Title 22 for surface water, specific requirements of EPA Regulations such as the Stage 2 Disinfectant and Disinfection Byproducts Rule (D/DBRR) and Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR).

The plan incorporates potential monitoring waivers that could be obtained by SCWA /EBMUD for this source including

- Inorganics, General Physical, Secondaries (9 Year Waivers); VOCs and SOCs [except molinate and thiobencarb due to extensive use] (3 Year Waivers); Radiologicals (9 Year Reduction) - These would reduce monitoring, however FRWA would likely collect samples at least triennially for data assessment.
- Since aluminum will be added for treatment purposes at the VSWTP, this constituent will be monitored annually for raw and treated water.
- If waivers are obtained for selected SOCs, selected monitoring of the source would continue to support the lack of detection in the source waters during the times of projected use and the continuation of monitoring waivers.

LT2ESWTR

SCWA has formally submitted the first round of monitoring data for initial bin classification. Second round of monitoring will be conducted six years after initial bin classification for grandfathered data. The Existing Bacteria Sample Site Plan for the Laguna Vineyard system will need to be re-evaluated to determine if new site selection is appropriate to represent the new source, an updated Plan needs to be submitted to DPH. The existing Lead and Copper Rule monitoring plan for the Laguna Vineyard system will need to be re-evaluated to determine if any changes or additions need to be made, consensus from DPH should be obtained prior to implementation. Stage 2 D/DBP final distribution system monitoring sites will be re-evaluated once the Vineyard SWTP becomes operational. This will include a paper investigation as well as potentially additional treated water and distribution system sampling; an updated Plan will need to be submitted to DPH.

Appendices

These appendices will be transmitted electronically.

1-A. 2nd Amended JPA scanned.pdf

1-B Operating Agreement 10-19-06wAppx.pdf

1-C Delivery Agreement 10-19-06 29 agreemt only no signatures.pdf

1-D not used

1-E. Contract between USBR and SCWA.PDF

1-F. Contract between US and SMUD.PDF

1-G. Permit 021209 -Appropriative Rt .pdf

1-H Partial Assignment AGR among USBR, SMUD and SCWA.pdf

2-A. 2007 Water Quality Sampling Report.pdf

2-B. SRWSS_2005_Update.pdf

2-C. DWSAP -5-6-09.pdf

2-D. Bin Conc Calculation_3410029 SR Freeport version 10-6-09.pdf

2-E. Pumping System Data Sheet.pdf

2-F. draft Chlorine Disinfection Data Sheet Aug 09.pdf

2-G. Aqueduct -Transmission Data Sheet.pdf

2-H. 061008_Draft_Control_Strategies_FRWA_SCADA.pdf

2-I. Coord Ops Agreement FRWA Intake - City of Sacramento Sump 28 (10-3-06).pdf

2-J. Coord Ops Agreement SRCSD.pdf

2-K. Operator Listing and Certifications.pdf

2-L. Draft_Preliminary_Operations_Plan.pdf

3-A. WQMP_v2.pdf

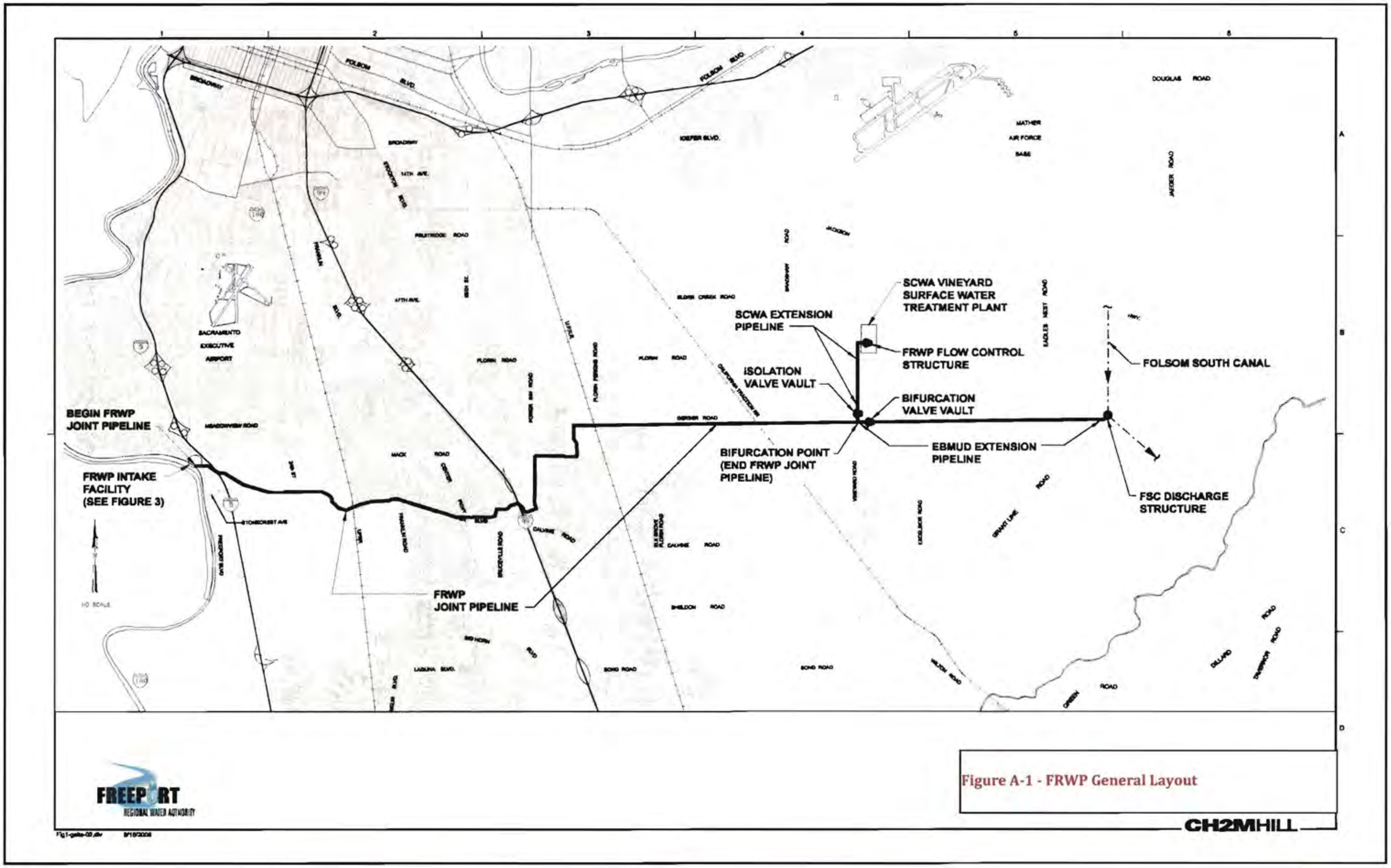

Figure A-1 - FRWP General Layout

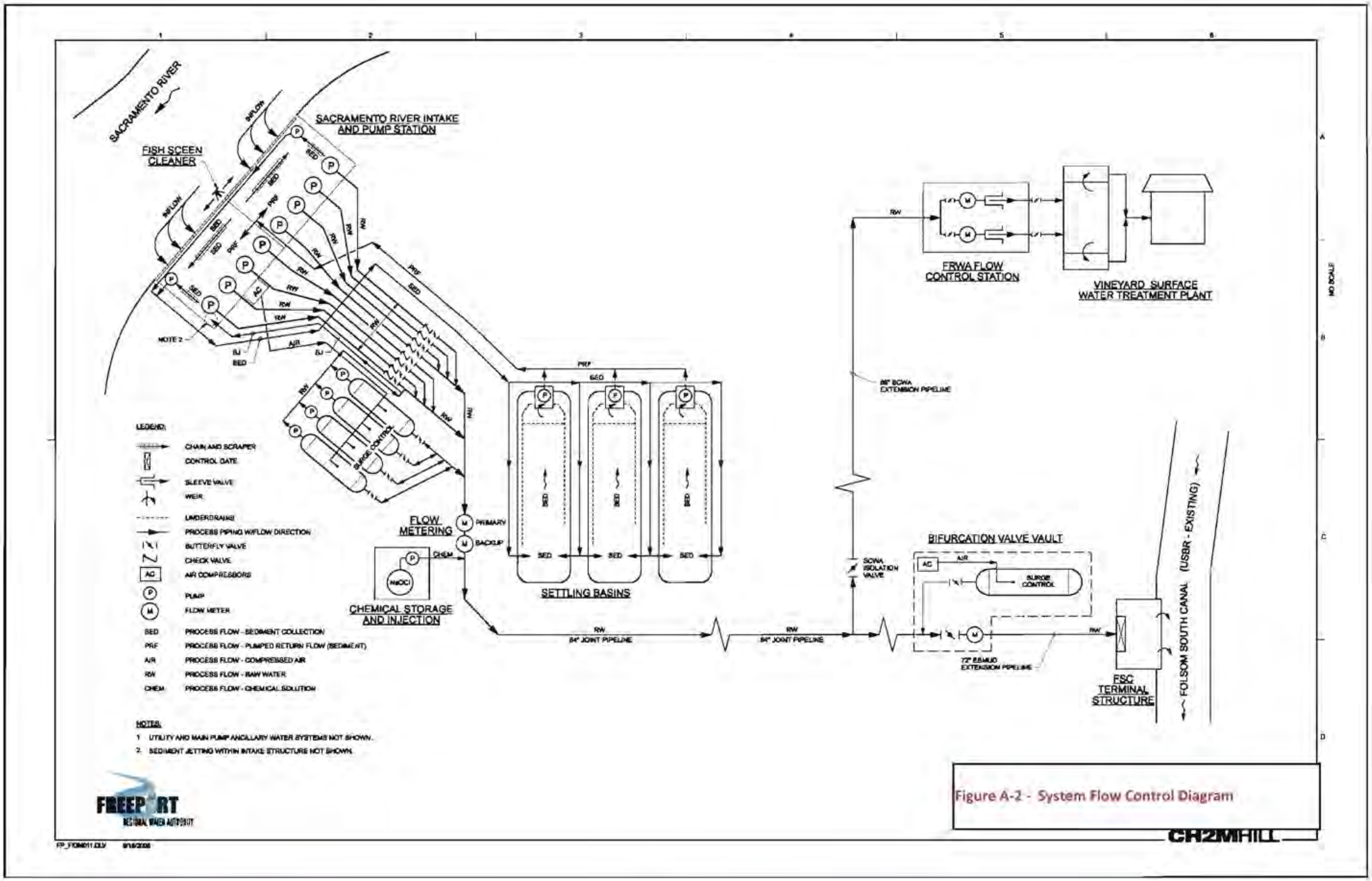

Figure A-2 - System Flow Control Diagram