

Appendix D: Proposed Regional Water Quality Control Board Compliance Approach

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*PROPOSED REGIONAL WATER
QUALITY CONTROL BOARD
COMPLIANCE APPROACH*

Final Draft



**City of San Diego
Water Purification Demonstration Project
San Vicente Reservoir Augmentation**



August 2012

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List of Abbreviations

AF	acre-feet
AFY	acre-feet per year
AWP Facility	Advanced Water Purification Facility
Basin Plan	<i>Water Quality Control Report for the San Diego Region</i>
CEQA	California Environmental Quality Act
CDPH	State of California Department of Public Health
CFR	<i>Code of Federal Regulations</i>
CTR	California Toxics Rule
CWA	Clean Water Act
Demonstration Project	City of San Diego Water Purification Demonstration Project
DO	dissolved oxygen
EIR	Environmental Impact Report
EPA	United States Environmental Protection Agency
FSI	Flow Science Incorporated
full-scale project	Full-scale indirect potable reuse (reservoir augmentation) project
IAP	Independent Advisory Panel
MCL	Maximum Contaminant Level (drinking water standard)
mgd	million gallons per day
mg/l	milligrams per liter
NCWRP	City of San Diego North City Water Reclamation Plant
N:P	ratio of total nitrogen to total phosphorus
NPDES	National Pollutant Discharge Elimination System
NWRI	National Water Research Institute
Point Loma	City of San Diego E.W. Blom Point Loma Wastewater Treatment Plant
Regional Board	California Regional Water Quality Control Board, San Diego Region
RO	reverse osmosis
TM	Technical Memorandum
Title 22	Division 4, Chapter 3, Title 22 of the <i>California Code of Regulations</i>
UV	ultraviolet

Summary

The City of San Diego has implemented the Water Purification Demonstration Project (Demonstration Project) to assess the feasibility of a full-scale indirect Potable Reuse/Reservoir Augmentation project (hereinafter full-scale project) at San Vicente Reservoir. The Demonstration Project includes a 1 million gallon per day (mgd) advanced water purification facility (AWP Facility) at the North City Water Reclamation Plant and associated treatment, reservoir modeling and limnology studies to assess full-scale project feasibility.

One of the key objectives of the Demonstration Project is to coordinate with the California Department of Public Health (CDPH) and California Regional Water Quality Control Board, San Diego Region (Regional Board) to identify applicable regulatory requirements for reservoir augmentation. Using guidance received from CDPH staff and input from an Independent Advisory Panel of recognized public health and water quality experts, the City has submitted a project proposal to CDPH that (1) outlines the City's proposed concept for a full-scale project at San Vicente Reservoir, and (2) requests CDPH conceptual approval of a full-scale project at San Vicente Reservoir.

This report summarizes the proposed San Vicente Reservoir water purification concept, and identifies key permitting issues and Regional Board regulatory decisions and actions that would be required in order for the Regional Board to approve a full-scale project at San Vicente Reservoir.

In October 2011, the Regional Board adopted Resolution No. R9-2011-0069, which expressed support for the City's water purification project concept. The resolution also outlined the Regional Board's approach toward permitting a full-scale project at San Vicente Reservoir through the issuance of a NPDES (National Pollutant Discharge Elimination System) permit that implements requirements established within the Regional Board's *Water Quality Control Plan for the San Diego Basin* (Basin Plan).

AWP Facility monitoring data indicate that the purified water supply will be equal to or superior in quality to existing San Vicente Reservoir inflows for virtually all constituents. Nitrogen may be the only exception to this, as purified water nitrogen concentrations will be slightly higher than existing imported water inflows to San Vicente Reservoir, but superior in quality to the local runoff captured within the reservoir. Comprehensive reservoir modeling conducted as part of the Demonstration Project, however, indicate that nitrogen concentrations under a full-scale project at the expanded San Vicente Reservoir are projected to be lower than historic nitrogen concentrations in the reservoir.

While the Regional Board supports the proposed water purification and reservoir augmentation concept, Regional Board staff indicate that the Regional Board has yet to address two key procedural questions which will determine the exact pathway the City will need to take to proceed with applying for and receiving a NPDES permit for a full-scale project. These questions include:

1. Prior to the Regional Board's consideration of a NPDES permit for a full-scale project at San Vicente Reservoir, will the Regional Board, State Water Resources Control Board (State Board), and U.S. Environmental Protection Agency (EPA) need to take actions to modify the Clean Water Act (CWA) Section 303(d) impaired water list for San Vicente Reservoir?
2. Prior to the Regional Board's consideration of a NPDES permit for a full-scale project at San Vicente Reservoir, will the Regional Board, State Board, and EPA need to modify any requirements within the Regional Board's Basin Plan?

The City understands that the Regional Board is currently coordinating with EPA and the State Board to address these questions. If the answer to both pending questions is "no", the pathway for project approval is straight-forward, and the City could be in a position to submit an application to the Regional Board for a NPDES permit for a full-scale project at San Vicente Reservoir in less than 18 months after the date the City Council approves and funds the project. The City believes that this direct approval pathway (no Basin Plan modification or 303(d) list revisions) is both feasible and appropriate.

If the Regional Board, State Board, or EPA determine that the answer to either or both pending questions is "yes", the full-scale project remains feasible, but the project implementation schedule would be lengthened. In this event, four to five years may be required to achieve modifications in the 303(d) list and/or Basin Plan to procedurally support the Regional Board's issuance of a NPDES permit for a full-scale project at San Vicente Reservoir.

The City requests that Regional Board staff coordinate with State Board and EPA staff to determine whether the Regional Board can move forward with implementing attainable NPDES requirements for a full-scale reservoir augmentation project without the need for (1) revision of the San Vicente Reservoir 303(d) listings, or (2) modification of the Basin Plan. The City also requests any guidance or recommendations the Regional Board can offer relative to implementing a full-scale reservoir augmentation project at San Vicente Reservoir.

Section 1 Purpose of Report

The City of San Diego proposes an indirect potable reuse project (also known as reservoir augmentation) that would supplement the approximate 240,000-acre-foot San Vicente Reservoir with up to 15,000 acre-feet per year (AFY) of purified recycled water produced at an advanced water treatment facility that would be sited at the City's North City Water Reclamation Plant (NCWRP). This report:

- (1) summarizes results from the City's Water Purification Demonstration Project (Demonstration Project) that is assessing the feasibility of full-scale project at San Vicente Reservoir,
- (2) describes the proposed concept for introducing purified water from a full-scale project to San Vicente Reservoir,
- (3) summarizes permitting guidance received from the staff of the California Regional Water Quality Control Board, San Diego Region (Regional Board),
- (4) identifies two key pending Regional Board decisions that will determine how the City proceeds with Regional Board NPDES permitting requirements, and
- (5) identifies the approach preferred by the City for achieving project approval from the Regional Board.



Section 2 Water Purification Demonstration Project

Planning Background. In 1994, the City, in partnership with the San Diego County Water Authority, initiated a series of technical studies to assess the potential for indirect potable reuse at San Vicente Reservoir. Based on the results of these studies, which included pilot testing of advanced treatment technologies and studies of reservoir hydrodynamics, the Department of Health Services (now called California Department of Public Health, or CDPH) issued conditional concept approval for that project in 1994.

Demonstration Project Elements. The City chose not to pursue indirect potable reuse in the 1990s, but in 2007 the City of San Diego City Council issued a directive to initiate a renewed feasibility assessment of the concept at San Vicente Reservoir. In accordance with this Council action, the Public Utilities Department launched the Demonstration Project. Key elements of the Demonstration Project include:

- Constructing a 1 mgd advanced water purification facility (AWP Facility) at the NCWRP and operating the facility for one year to assess treatment technologies and the effectiveness of purified water treatment.
- Initiating a comprehensive hydrodynamic study that included three-dimensional modeling of San Vicente Reservoir to assess hydrodynamic, water quality, and biostimulation issues at the reservoir.
- Coordinating with CDPH and the Regional Board to define probable regulatory requirements for a full-scale project.
- Implementing a public education and outreach program.
- Conducting energy and economic analyses.

The National Water Research Institute (NWRI) assembled a ten-member Independent Advisory Panel (IAP) to provide independent expert oversight of the Demonstration Project effort. Table 1 presents the IAP members.

Table 1 NWRI Independent Advisory Panel (IAP)	
IAP Panel Members and Organizations	
George Tchobanoglous, Ph.D., P.E. (IAP Chair) University of California, Davis	Richard Gersberg, Ph.D., (IAP Vice-Chair) San Diego State University
Michael Anderson, Ph.D. University of California, Riverside	Richard Bull, Ph.D. Consulting Toxicologist
Joseph Cotruvo, Ph.D. Joseph Cotruvo Associates	James Crook, Ph.D., P.E. Water Reuse and Public Health Consultant
Sunny Jiang, Ph.D. University of California, Irvine	Audry D. Levine, Ph.D., P.E., DEE U.S. Environmental Protection Agency
David R. Schubert, Ph.D. Salk Institute for Biological Studies	Michael P. Wehner Orange County Water District

Treatment Studies. The 1 mgd AWP Facility utilizes tertiary treated water from the NCWRP as a source of influent. AWP Facility treatment processes consist of:

- membrane filtration,
- reverse osmosis (RO),
- ultraviolet (UV) disinfection, and
- advanced oxidation.



**Figure 2
AWP Facility RO Units**

On the basis of data collected since operation of the AWP Facility was initiated in July 2011, the City has concluded that:

- NCWRP recycled water (the influent to the AWP Facility) typically complies with most CDPH drinking water Maximum Contaminant Levels (MCLs).
- Concentrations of minerals in the purified water are significantly lower than existing imported supplies.
- Concentrations of phosphorus in the purified supply are near zero.
- Concentrations of nitrogen in the purified water are comparable (but depending on the blend of Colorado River and State Water Project supplies, can be slightly higher than) the existing imported water supply.
- The purified water consistently and reliably complies with all CDPH MCLs.
- The advanced purification processes provide a level of reliability and pathogen inactivation that is consistent with (or is superior to) anticipated CDPH requirements.
- The advanced purification treatment process train utilized as part of the Demonstration Project is appropriate for a full-scale project.

Reservoir Limnology Studies: Hydrodynamics. As a key element of the Demonstration Project, the City has completed a comprehensive Reservoir Detention and Limnology Study of San Vicente Reservoir (Limnology Study) to assess how a potential full-scale project might influence hydrodynamic, water quality, and biostimulation conditions within San Vicente Reservoir. The primary advantage of retaining purified water in San Vicente Reservoir is to provide substantial retention and blending of purified water in a natural setting prior to delivering it to a water treatment plant for final potable water treatment and distribution. Such reservoir retention provides an environmental buffer between purified water treatment and potable water treatment. This environmental buffer effect is provided through the following:

- *Thermal Stratification.* Above a temperature of 4° C (39° F), warmer waters are less dense than cooler waters. As reservoir surface waters warm in the spring months, the warmer buoyant waters remain near the reservoir surface, resulting in further warming by convective and solar radiation. By mid-spring, a strong thermocline is formed which acts as a barrier to separate the warmer surface waters (epilimnion) from the deeper cool waters (hypolimnion). In San Vicente Reservoir, this thermal stratification persists for approximately 10 months each year, until winter when epilimnion temperatures are reduced to the point where wind-driven energy is sufficient to completely mix the reservoir. A full-scale project would take advantage of this thermal stratification by discharging less dense (warmer and less saline) purified water to the epilimnion and withdrawing raw potable supplies from the hypolimnion. Using this technique, the thermal stratification provides for significant retention times and a significant barrier to reservoir short-circuiting (e.g. preventing the withdrawal of purified water soon after it is introduced to the reservoir).

- *Reservoir Size.* San Vicente Reservoir is currently undergoing an expansion that will raise the height of San Vicente Dam by 117 feet and increase the reservoir storage capacity from 90,000 AF to over 240,000 AF. The introduction of 15,000 AFY of purified water to San Vicente Reservoir would represent a relatively modest annual quantity compared to the reservoir capacity, and would result in significant dilution. During times the reservoir is not thermally stratified, this high degree of dilution would ensure that only a small fraction of reservoir waters withdrawn during complete mix conditions would be comprised of recently introduced purified water.



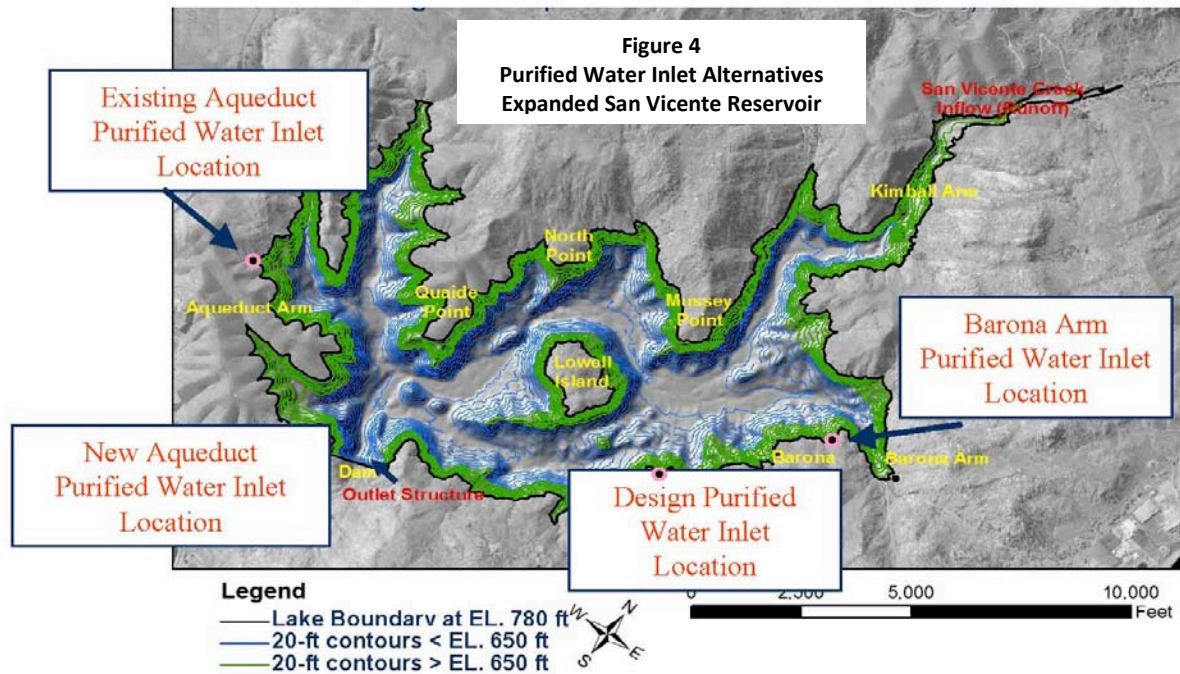
Figure 3
San Vicente Reservoir Prior to Expansion

As an initial element of the Limnology Study, Flow Science Incorporated (FSI) calibrated a numerical three-dimensional model (ELCOM) of San Vicente Reservoir hydrodynamics. Model results were verified by utilizing observed reservoir and tracer study data. The results of this analysis were documented in two Limnology Study Technical Memoranda (FSI, 2010; FSI 2011).

The Technical Memoranda and model were peer-reviewed by the IAP, which concluded that the ELCOM model was "an effective and robust tool" for simulating thermoclines and hydrodynamics of the San Vicente Reservoir and assessing options for the purified water inlet location. (NWRI, 2010)

FSI used the calibrated model to simulate augmenting San Vicente Reservoir inflow with purified water under a range of future operating conditions, including:

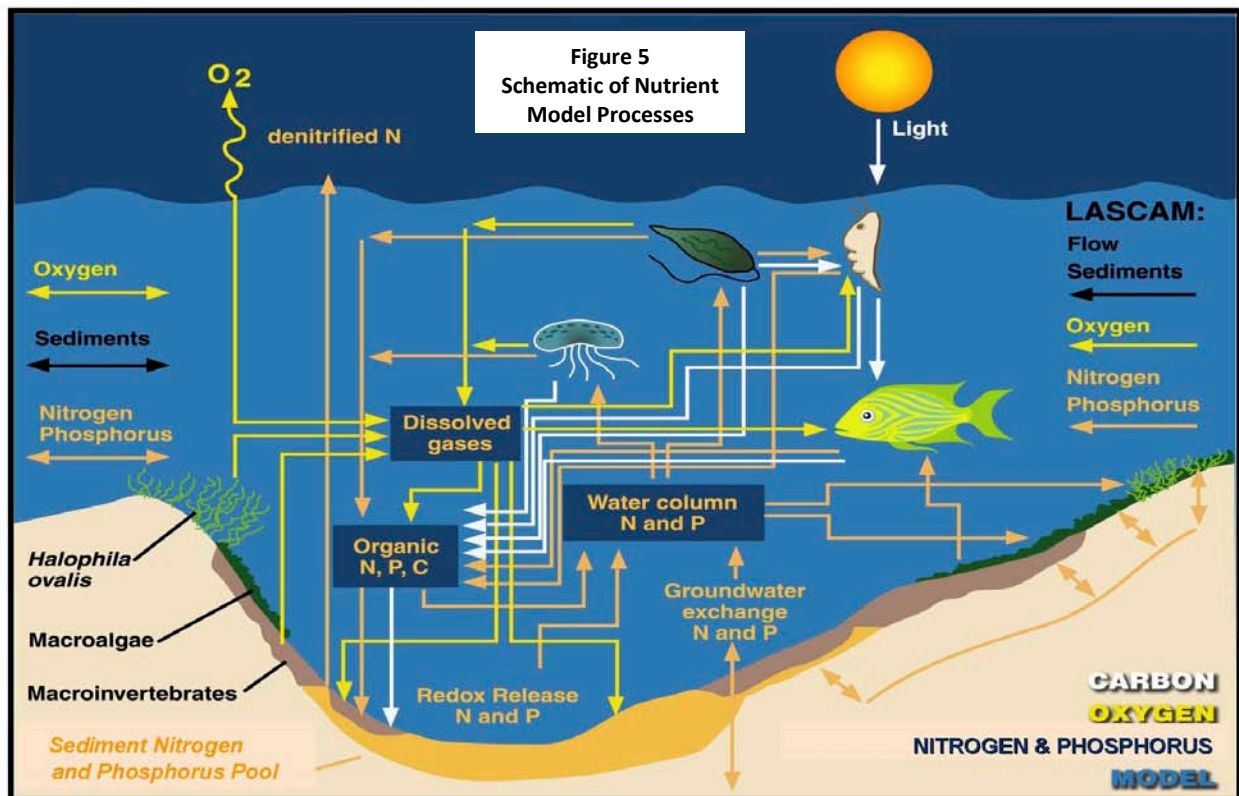
- alternatives with and without the addition of purified water,
- normal, extended drought, and emergency drawdown reservoir operating scenarios, and
- four alternative purified water inlet locations (see Figure 4 on page 7).



Key conclusions of the hydrodynamic modeling effort presented by FSI (2011) include:

- Expansion of San Vicente Reservoir will increase the volume of the hypolimnion, but will not discernibly affect the depth, duration or strength of thermal stratification.
- The reservoir would provide a substantial barrier to pathogen organisms due to solar radiation (photolysis effects), temperature effects and natural predation.
- For all anticipated reservoir operational scenarios and purified water inlet locations, at all times the reservoir provides at least a 200:1 dilution of a 24-hour purified water release event prior to withdrawal.
- During typical operations and using the inlet location currently under consideration (referred to in reservoir hydrodynamic modeling as “design inlet location”), the reservoir provides greater than 2000:1 dilution of a 24-hour purified water release event prior to withdrawal.

Reservoir Limnology Studies: Water Quality and Biostimulation. As an additional element of the Limnology Study, FSI superimposed and calibrated an aquatic ecosystem dynamics model (CAEDYM) on the ELCOM hydrodynamic model. The CAEDYM model (see Figure 5 on page 8) assesses nutrient loads, nutrient concentrations, water clarity, and algae. Model results were verified by utilizing observed nutrient concentrations, algae concentrations and Secchi disk data from San Vicente Reservoir. Results of the nutrient and biostimulation modeling effort were documented in Limnology Study Technical Memorandum #3 (FSI, 2012a). The nutrient and biostimulation Technical Memorandum and the model were peer-reviewed by the IAP, which concluded that the combined hydrodynamic/nutrient model (ELCOM plus CAEDYM) was an effective and robust tool for assessing biological water quality for nutrients. (NWRI, 2010)



FSI used the calibrated ELCOM plus CAEDYM model to simulate nutrient and biostimulation conditions at San Vicente Reservoir under:

- 1) existing conditions prior to reservoir expansion (Existing Case),
- 2) the expanded reservoir with no purified water inflow (No Purified Water Case), and
- 3) the expanded reservoir with purified water inflow (Base Case).

As part of the modeling effort, FSI used data from the AWP Facility to estimate purified water nitrogen and phosphorus concentrations. Observed nitrogen and phosphorus data from 2006-2007 were used to characterize nitrogen and phosphorus concentrations in the San Vicente Reservoir runoff inflow and imported water inflow. Table 2 (page 9) compares nitrogen and phosphorus concentrations in the reservoir inflow sources.

Key conclusions of the nutrient and biostimulation modeling effort presented by FSI (2012a) include:

- Nutrient sediment release from the reservoir bottom constitutes a significant portion of all nutrient loadings into the reservoir water column for all modeled scenarios.
- Expansion of the reservoir will result in increased sediment nutrient loadings as a result of increased depth and wetted sediment surface area.

- Despite the higher sediment nutrient releases for the expanded reservoir, nutrient concentrations in the water column are projected to be reduced due to the larger volume of water in the expanded reservoir.
- Concentrations of chlorophyll- α in the epilimnion are simulated as being reduced for all expanded reservoir scenarios, likely as a result of projected reductions in water column nutrient concentrations.
- Under all simulated scenarios, anoxic conditions are projected to occur in the hypolimnion once oxygen demands use up the available dissolved oxygen. This effect naturally occurs in all thermally stratified reservoirs, independent of whether or not purified water is introduced.
- San Vicente Reservoir hypolimnion volumes are significantly increased as a result of reservoir expansion for all simulated scenarios. This increased hypolimnion volume will lead to a slight increase in the number of days that anoxic conditions occur in the hypolimnion for the simulated reservoir expansion scenarios, regardless of whether or not purified water is introduced to the reservoir.
- Chlorophyll- α concentrations will be lower and average Secchi depths will be greater (i.e., improved water clarity) in the expanded reservoir than in the existing reservoir, regardless of whether or not purified water is introduced into San Vicente Reservoir.
- Since the nitrogen:phosphorus (N:P) ratio in the purified water is projected to be approximately 160:1, the Base Case scenario (expanded reservoir with purified water inflow) is projected to be more phosphorus-limited than historic (90,000 AF reservoir capacity) conditions.

Table 2
San Vicente Reservoir Inflow Nutrient Concentrations¹

Parameter	Concentration in mg/l		
	Purified Water ²	Imported Water Inflow ³	Runoff Inflow ⁴
Nitrate and nitrite	0.64	0.12 - 0.47	0.02 - 3.0
Ammonia ⁵	0.14	0.02 - 0.09	0.02 - 0.5
Total nitrogen	0.78	0.17 - 0.68	0.18 - 4.2
Total phosphorus	0.004	0.024 - 0.081	0.22 - 0.32

1 From FSI (2012a).

2 Based on results of DEMONSTRATION PROJECT demonstration plant effluent data for 2011-2012.

3 Range of observed data for the aqueduct inflow during 2006-2007.

4 Range of observed data in surface runoff into San Vicente Reservoir during 2006-2007 from Kimball Creek, San Vicente Creek, Barona Creek, Tool Road Creek, and Aqueduct Creek.

5 Ammonia is in the form of ionized ammonia (NH_4^+ -N).

Table 3 summarizes the nutrient and biostimulation results for the modeled scenarios. As shown in Table 3, chlorophyll- α concentrations are projected to be less with the expanded reservoir and the proposed purified water inflow than under current conditions. The simulations predict that reservoir water clarity under the Base Case (expanded reservoir and purified water inflow) is projected to be improved compared to existing conditions.

Model Scenario	Average Annual Number of Days Hypolimnion is Anoxic ^{2,3,4}	Average Chlorophyll- α Concentration in Surface Waters ^{2,4}	Average Secchi Depth ^{2,4}
Existing Case ⁵ (existing reservoir capacity and no purified water)	189 days (52%)	5.8 $\mu\text{g/l}$	3.2 meters
Expanded Reservoir with no purified water ⁶	207 days (57%)	3.1 $\mu\text{g/l}$	4.8 meters
Base Case ⁶ (expanded reservoir with purified water inflow)	215 days (59%)	3.7 $\mu\text{g/l}$	4.3 meters
<ol style="list-style-type: none"> 1 ELCOM/CAEDYM model results presented by FSI (2012a). 2 Based on two-year simulation using hydrologic data for 2006 and 2007. 3 Number of days in which the average hypolimnion dissolved oxygen concentration is less than 0.5 mg/l. 4 Average annual value for the two-year simulation. 5 Initial reservoir volume of 64,000 AF in year 1 and 64,000 AF in year 2. 6 Initial reservoir volume of 155,000 AF in years 1 and 2. 			

Coordination with CDPH. Regulatory coordination was another key element of the Demonstration Project evaluation. The City engaged CDPH staff in establishing the Demonstration Project work plan. CDPH staff have attended IAP workshops and have been active participants in working group meetings. Through these venues, CDPH has reviewed reservoir technical studies and purified water treatment results.

CDPH has indicated that requirements for a full-scale project would be, in part, based on providing a level of public health protection equivalent to that provided within CDPH's 2011 "Draft Regulations for Groundwater Replenishment with Recycled Water" (Groundwater Recharge Regulations). (CDPH, 2011) Based on guidance provided by CDPH to date, the following elements are expected to provide the framework for CDPH regulation of a full-scale project at San Vicente Reservoir:

- Enhanced Wastewater Source Control
- Pathogenic Microorganism Control
- Control of Nitrogen Compounds
- Regulated Contaminants, Additional Chemicals, and Contaminant Monitoring, and Total Organic Carbon Control

- Reliability and Redundancy
- Monitoring and Response Plan
 - AWP Facility Integrity Monitoring
 - San Vicente Reservoir Retention and Blending
 - Mitigation of an AWP Facility system failure by San Vicente Reservoir

In accordance with provisions within Senate Bill 918, CDPH is required to adopt uniform water recycling criteria for indirect potable reuse (reservoir augmentation) by December 31, 2016, provided that an expert panel (convened pursuant to the bill) finds that the criteria would adequately protect public health. In advance of adopting uniform criteria, CDPH can review reservoir augmentation projects on a case-by-case basis. In March 2012, the City submitted a draft proposed reservoir augmentation project proposal and request for conceptual approval to CDPH. CDPH is currently reviewing the draft submittal. (City of San Diego, 2012)

Coordination with Regional Board. The City has engaged Regional Board staff throughout the Demonstration Project feasibility evaluation. This coordination has included a number of project-specific meetings held at the Regional Board office and Regional Board staff attendance at IAP sessions.

The most recent City meeting with Regional Board staff focused on (1) Regional Board interpretation of Basin Plan nutrient water quality objectives and (2) potential implications of the CWA Section 303(d) impaired water listings for San Vicente Reservoir. This report is submitted as a follow-up to the most recent meeting of June 18, 2012, and addresses pathways for demonstrating compliance with Regional Board requirements.

Public Education and Outreach. The Demonstration Project effort also included a public education and outreach plan that included developing:

- a communication plan,
- speakers bureau,
- multi-language information materials and brochures,
- stakeholder interviews and research surveys,
- videos, electronic updates and a website, and
- AWP Facility tours.

Outreach efforts have garnered positive coverage both locally and nationally. On January 23, 2011, the *San Diego Union-Tribune* published an editorial declaring that the newspaper editorial board accepts the science behind water purification technology and encourages the rest of San Diego to do the same. National media coverage has included a front page cover story in *USA Today* (March 3, 2011) and an article on the cover page of the *New York Times* (February 10, 2012).

Demonstration Project Report. The City Public Utilities Department is currently developing a project report that summarizes the results of the Demonstration Project feasibility effort. Submittal of the report to the City of San Diego City Council is scheduled for late 2012.

Section 3 Full-Scale Project Concept

The concept for a full-scale project at San Vicente Reservoir is based on guidance from CDPH and the IAP. The project concept components are illustrated in Figure 6 (below). Figure 7 (page 13) summarizes the primary roles and key public health protection features of the project elements.



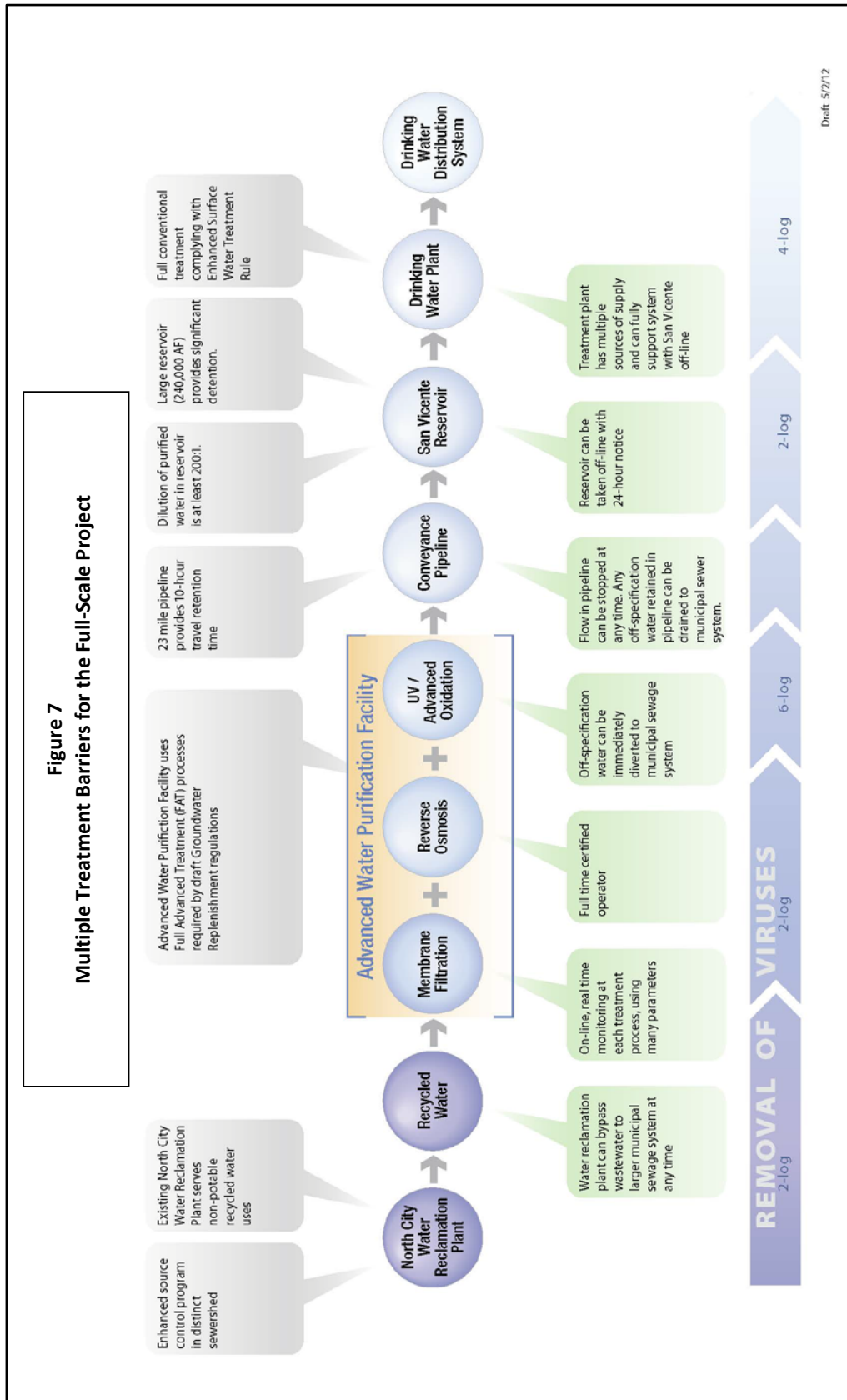
Figure 6
Components of the Full-Scale Project

Collection System Source Control. The City maintains a comprehensive industrial pretreatment and source control program approved by EPA to control waste discharges from industrial sources into the wastewater collection system. The main components of the program are:

- evaluating, issuing and administering industrial user permits,
- establishing sampling, reporting, record keeping, and notification requirements for industrial dischargers,
- performing compliance inspections and compliance monitoring, and
- enforcing permit requirements, requiring corrective actions, and authorizing penalties for discharge violations.

As part of the City of San Diego NPDES permit and 301(h) waiver for the Point Loma Wastewater Treatment Plant (Point Loma), the City is required to implement an Urban Area Pretreatment Program per Title 40, Section 125.65 of the *Code of Federal Regulations* (40 CFR 125.65).

Regulations established in 40 CFR 125.65 require 301(h) dischargers to demonstrate that the combination of enhanced source control and wastewater treatment provides the equivalent to secondary treatment for the removal of toxic constituents. The Urban Area Pretreatment Program requirements of 40 CFR 125.65 have been incorporated into the Point Loma NPDES permit adopted by the Regional Board and EPA (Order No. R9-2009-0001, NPDES CA0107409).



The City's source control program organizes industrial users into 27 sewersheds. Four of these sewersheds are tributary to the NCWRP, where the full-scale AWP Facility will be located. The City's pretreatment program currently regulates 198 industries within these four sewersheds. A total of 102 of these industrial users are research and development companies. The remaining 96 industries cover 49 different industry types including car washes, gas stations, electronic equipment manufacturers and veterinary services.

North City Water Reclamation Plant. The NCWRP is a 30-mgd water reclamation plant serving roughly 7,500 AFY of recycled water to irrigation and industrial customers throughout the North City area. NCWRP operates as a scalping plant, receiving flows that would otherwise be treated at Point Loma. Biosolids are sent offsite for processing, with no return flow to the NCWRP. NCWRP treatment processes include:

- headworks and barscreens,
- aerated grit removal,
- primary sedimentation,
- secondary aeration with aerated and anoxic selector zones to achieve full nitrification and partial denitrification,
- secondary clarification, and
- deep bed anthracite tertiary filtration.

NCWRP recycled water used for irrigation use undergoes chlorination, but NCWRP recycled water flows directed to the AWP Facility project would be diverted prior to chlorine disinfection to control formation of chlorination byproducts. NCWRP also includes flow equalization, which allows for near-constant flowrates through the secondary treatment facilities, maximizing the stability of the plant's biological processes.

Advanced Water Purification Facility. As part of a full-scale project, NCRWRP tertiary treated recycled water would serve as an influent flow to the proposed 18 mgd AWP Facility. AWP Facility treatment processes would include:

Membrane Filtration: Tertiary effluent will flow to a low pressure membrane filtration process consisting of either microfiltration or ultra-filtration. In addition to minimizing RO fouling by removing colloidal and suspended particles, low pressure membranes provide a barrier to a wide array of microbes and will assist the project in meeting microbial removal targets.

Reverse Osmosis: All AWP Facility flow will undergo RO treatment, the primary barrier to organic chemicals. The RO system will meet applicable salt rejection specifications established by CDPH. Concentrated brine from the RO treatment will be discharged back into the sewer for treatment at Point Loma.

Disinfection/Photolysis/Advanced Oxidation: Permeate from the RO process would undergo disinfection and advanced oxidation. High intensity UV irradiation provides both the primary disinfection step in the AWP Facility and photolysis of certain classes of organic chemicals such as

NDMA. With the addition of hydrogen peroxide, high intensity UV provides an additional barrier (to RO) for oxidizable contaminants. The advanced oxidation process will be designed to adhere to criteria established in the Draft CDPH Groundwater Recharge Regulations.

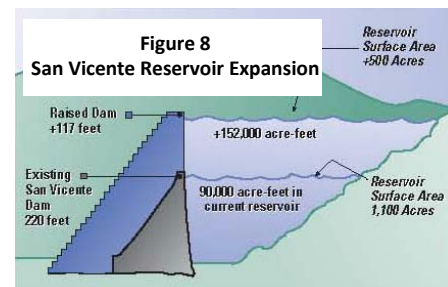
A flow analysis study conducted as part of the Demonstration Project evaluated source water availability due to NCWRP's seasonal irrigation demands, and identified 18 mgd as the optimum capacity for a full-scale AWP Facility. The 18 mgd AWP Facility would annually produce approximately 15,000 AFY of purified water.

Conveyance to San Vicente Reservoir. Purified recycled water will be pumped through a 23-mile, 36-inch diameter pipeline to San Vicente Reservoir. The static lift from the purified water pump station to San Vicente Reservoir is approximately 445 feet. A flow control structure at the reservoir outlet and surge control facilities will be required to optimize flow conditions in the pipeline.

The travel time of the purified water from the AWP Facility to the reservoir would be approximately 10 hours, based on a maximum pumping rate of 18 mgd. In case of an operation malfunction at the AWP Facility, this would allow time to interrupt conveyance before any affected water reaches the reservoir. The conveyance system will include features allowing the entire volume of the pipeline to be drained to sanitary sewer.

Reservoir Storage. Under the full-scale project, approximately 15,000 AFY of purified water would be introduced into San Vicente Reservoir. The purified water inflow would augment existing reservoir inflows (aqueduct inflow, local runoff, and transfers from Sutherland Reservoir) and replace a commensurate amount of imported water that would otherwise be introduced into the reservoir.

San Vicente dam and reservoir are owned and operated by the City of San Diego Public Utilities Department. San Vicente Reservoir impounds local runoff from its 75 square-mile catchment, stores water transferred from Sutherland Reservoir, and stores water imported from the Colorado River and northern California. The reservoir's principal use is for municipal water supply. The reservoir also supports limited recreational activities including boating, fishing, and water skiing, although these activities have been suspended during construction of facilities to raise San Vicente Dam.



While San Vicente Reservoir is being expanded to a capacity exceeding 240,000 AF, the additional capacity is to be primarily utilized for emergency storage purposes. During non-emergency conditions, annual inflows to and withdrawals from the reservoir are not expected to be significantly different from historic operations. It is anticipated that the expanded San Vicente Reservoir will be substantially filled prior to initiation of a full-scale project.

The amount of imported water introduced to San Vicente Reservoir depends on water availability, water price, and the operational needs of the City of San Diego and San Diego County Water Authority, but has typically averaged approximately 20,000 to 30,000 AFY. Runoff inflow the reservoir varies significantly depending on hydrologic conditions, but typically averages approximately 4,500 AFY, a total roughly equivalent to the annual evaporation from the reservoir. (FSI, 2010) Thus, under typical conditions, a 15,000 AFY purified water flow would represent roughly half of the annual San Vicente Reservoir inflow. As demonstrated by the Demonstration Project Limnology Studies (see pages 4 - 8), a 15,000 AFY purified water inflow into San Vicente Reservoir would result in significant reservoir detention.

San Vicente Dam has overflowed on only a few occasions since its construction in 1943; the most recent spill occurred in 1995. San Vicente Reservoir overflows are not projected to occur once the reservoir is expanded. As a result, is not projected that any waters (imported or purified) introduced into the expanded reservoir will be released to downstream water bodies (San Vicente Creek and the San Diego River).

Potable Water Treatment. Water withdrawn from San Vicente Reservoir would undergo conventional potable water treatment prior to conveyance to potable water customers. Under normal operations, water from San Vicente Reservoir is conveyed to the City of San Diego Alvarado Water Treatment Plant which serves the central portion of San Diego.

Through agreements with the San Diego County Water Authority, a portion of San Vicente Reservoir's storage may be used in emergency and extended drought conditions to supply water treatment plants serving the southern half of San Diego County. In an emergency event, other water treatment plants that could be supplied from San Vicente Reservoir include the City's Miramar and Otay Water Treatment Plants, Helix Water District's Levy Treatment Plant, the Sweetwater Authority's Purdue Water Treatment Plant, and the Santa Fe Irrigation's Districts Badger Water Treatment Plant.

Section 4 Regional Board Support and Guidance

Regional Board Resolution of Support. On October 12, 2011, the Regional Board adopted Resolution No. R9-2011-0069, which documents the Regional Board's support of the City's proposed reservoir augmentation project at San Vicente Reservoir, and sets forth the Regional Board's proposed means of regulating the project. Resolution No. R9-2011-0069 states that:

NOW THEREFORE, BE IT RESOLVED THAT, the San Diego Regional Water Quality Control Board:

- 1. Supports the efforts to develop the Reservoir Augmentation Project at the San Vicente Reservoir as a means to reduce reliance on imported water, increase the use of recycled water, and to implement goals in California Water Code section 13510 and the 2008-2012 Strategic Plan Update for the Water Boards.*

2. *In accordance with implementation provisions of the Basin Plan, the San Diego Water Board will regulate San Diego Region recycled water reservoir augmentation projects through the issuance of project-specific NPDES Permits.*
3. *Reservoir augmentation NPDES permits issued by the San Diego Water Board will incorporate requirements established and the provisions recommended by California Department of Public Health.*

City and Regional Board Coordination. As part of the Demonstration Project, City of San Diego and Regional Board staff held a series of coordinating meetings to discuss Demonstration Project progress and issues associated with Regional Board issuance of a NPDES permit for a full-scale project at San Vicente Reservoir.

Should the City Council choose to move forward with a full-scale project at San Vicente Reservoir, Regional Board staff indicate that the City will be required to submit a "Report of Waste Discharge" in application for a NPDES permit. As part of the Demonstration Project coordination effort, City and Regional Board staff have discussed information needs for the Report of Waste Discharge, which will include:

- describing the proposed full-scale project and purified water quality,
- evaluating water quality effects on San Vicente Reservoir,
- demonstrating compliance with Basin Plan water quality standards,
- demonstrating compliance with *California Toxics Rule* standards, and
- demonstrating compliance with CDPH requirements.

Pending Regional Board Procedural Decisions. While Resolution No. R9-2011-0069 confirms Regional Board support for the reservoir augmentation concept, Regional Board staff indicate that they are still working to finalize staff recommendations on two key procedural issues that will influence the pathway and schedule for securing a NPDES permit for a full-scale reservoir augmentation project at San Vicente Reservoir. These two key procedural questions include:

1. Prior to the Regional Board's consideration of a NPDES permit for reservoir augmentation at San Vicente Reservoir, will the Regional Board, State Board, and EPA need to take actions to modify the CWA Section 303(d) impaired water list for San Vicente Reservoir?
2. Prior to the Regional Board's consideration of a NPDES permit for reservoir augmentation at San Vicente Reservoir, will the Regional Board, State Board, and EPA need to modify any requirements within the Regional Board's Basin Plan?

Regional Board staff indicate that they are seeking guidance from EPA and the State Board in determining the answers to these questions.

Section 5 Basin Plan Compliance

As indicated by Regional Board staff, a key element of a NPDES application for a full-scale project at San Vicente Reservoir involves demonstrating compliance with Basin Plan water quality standards. How the Regional Board, State Board, and EPA resolve the two above-noted procedural questions will, in part, depend on how the agencies interpret and apply existing Basin Plan water quality standards to the proposed project. This section summarizes key Basin Plan compliance issues for a full-scale project at San Vicente Reservoir.

Basin Plan Overview. The Basin Plan establishes water quality concentration objectives to protect designated beneficial uses of San Vicente Reservoir. The Basin Plan surface water quality objectives have been approved by EPA as federal water quality standards that are subject to regulation and enforcement under provisions of the CWA. Basin Plan water quality objectives within San Vicente Reservoir, in part, are established for:

- mineral parameters,
- CDPH drinking water parameters, and
- phosphorus and nitrogen.

Mineral Parameters. The Basin Plan establishes numerical mineral concentration objectives for San Vicente Reservoir for total dissolved solids, chloride, sulfate, percent sodium, iron, manganese, boron, and fluoride. Because the purified water supply will undergo full RO treatment, the purified water supply is projected to contain concentrations of these mineral constituents that are significantly below the Basin Plan water quality objectives. Concentrations of minerals in the purified water will also be significantly below existing concentrations in both the imported water and local runoff inflow to San Vicente Reservoir. As a result, the proposed project will improve the mineral quality of water in the reservoir, and compliance with Basin Plan mineral parameters will not be an issue of concern for a full-scale project at San Vicente Reservoir.

CDPH Drinking Water Parameters. The Basin Plan incorporates State of California drinking water MCLs as surface water quality objectives. AWP Facility treatment processes have been selected (and tested during the Demonstration Project) to ensure that a full-scale project will comply with the MCLs. As noted, the City has submitted a draft project proposal to CDPH that documents projected compliance with CDPH requirements and presents the result of testing at the AWP Facility to document compliance with CDPH MCLs.

Phosphorus and Nitrogen. The Basin Plan establishes the following narrative and numerical water quality objectives to prevent adverse biostimulatory effects in surface waters:

Concentrations of nitrogen and phosphorus, by themselves or in combination with other nutrients, shall be maintained at levels below those which stimulate algae and emergent plant growth. Threshold total Phosphorous (P) concentrations shall not exceed 0.05 mg/l in any stream at the point where it enters any standing body of water, nor 0.025 mg/l in any standing body of water. A desired goal in order to prevent plant nuisances in streams and other flowing waters appears to be 0.1 mg/l total P. These values are not to be

exceeded more than 10% of the time unless studies of the specific water body in question clearly show that water quality objective changes are permissible and changes are approved by the Regional Board. Analogous threshold values have not been set for nitrogen compounds; however, natural ratios of nitrogen to phosphorus are to be determined by surveillance and monitoring and upheld. If data are lacking, a ratio of N:P = 10:1 shall be used.

Phosphorus. As shown in Table 2 (see page 9), the AWP Facility treatment processes achieved near total removal of phosphorus. Based on the AWP Facility treatment results, purified water from a full-scale project at San Vicente Reservoir is projected to comply with the Basin Plan numerical water quality objectives for total phosphorus by a significant margin.

Nitrogen. As part of the full-scale project, existing NCWRP operations and facilities would be optimized for nitrogen removal. Additional nitrogen removal would occur through membrane filtration and RO treatment. Despite this advanced degree of nitrogen removal, the purified water supply is projected (see Table 2 on page 9) to contain total nitrogen concentrations on the order of 0.8 mg/l. The purified water is projected to be highly phosphorus limited, with a N:P ratio on the order of 160:1 or more.

The Basin Plan objective for total nitrogen has been subject to varying interpretation over the years as to whether the objective represents a numerical objective or narrative objective. The Basin Plan establishes numerical concentration objectives for phosphorus and states that "analogous thresholds for nitrogen have not been established". At the same time, however, the Basin Plan directs that natural nitrogen to phosphorus (N:P) ratios are to be determined through surveillance and upheld. Current Regional Board interpretation of the Basin Plan nitrogen objective, as presented to the City during a June 18, 2012 meeting, is that the Basin Plan surface water nitrogen objective consists of (1) a narrative objective prohibiting biostimulation effects that adversely impact beneficial uses, and (2) a numerical objective based on upholding "natural" N:P ratios.

The Basin Plan objective that natural N:P ratios be identified and upheld is derived from water quality criteria published by EPA (1976) in *Quality Criteria for Water* (Red Book). The Red Book N:P guidance recognized that biostimulation is limited by the availability of the least available nutrient. The availability of phosphorus limits biostimulation growth when N:P ratios are greater than approximately 10:1, while the availability of nitrogen limits biostimulation growth when N:P ratios are less than approximately 10:1. In the absence of data on whether nitrogen or phosphorus is limiting biostimulation, the Basin Plan presents guidance that a 10:1 N:P ratio should be used for assessing conformance with the narrative biostimulation objective.

Nitrogen concentration effluent limits established by the Regional Board in a reservoir augmentation NPDES permit will, in part, be determined by how the Regional Board chooses to interpret the "upholding natural N:P ratios" Basin Plan objective. If the Regional Board were to apply a 10:1 N:P ratio in establishing standards for introducing purified water to San Vicente Reservoir, the Board might require the purified water to achieve a total nitrogen concentration limit of 0.25 mg/l to 0.5 mg/l. In this event (see Section 5), modification of the Basin Plan nitrogen objective could be required to support implementation of a full-scale project at San Vicente Reservoir.

As a result of the uncertainty on how the Basin Plan nitrogen objective translates to NPDES permit limits, additional Regional Board guidance on Basin Plan nitrogen and N:P compliance will be required to:

- identify probable purified water total nitrogen effluent limits that would be recommended by the Regional Board in the NPDES permit, and
- determine whether or not modification of the Basin Plan total nitrogen objectives for San Vicente Reservoir will be required prior to Regional Board consideration of a NPDES permit for a full-scale project at San Vicente Reservoir.

Dissolved Oxygen. The Basin Plan designated San Vicente Reservoir as supporting both warm water habitat and cold water habitat. The Basin Plan requires that dissolved oxygen (DO) concentrations be maintained at 5.0 mg/l for warm water habitats, and 6.0 mg/l or more for cold water habitats. The Basin Plan also requires that mean annual DO concentrations be maintained at 7.0 mg/l or more.

The purified water would contain high concentrations of DO, and would not contain any discernible quality of oxygen-demanding material. Further, reservoir modeling conducted as part of the Limnology Study indicates no significant differences in DO concentrations within the epilimnion (where the purified water would be introduced) between the purified water and no purified water scenarios. (FSI, 2012a)

Despite these facts, however, a demonstration of compliance with the Basin Plan DO requirement will depend on Regional Board interpretation of the Basin Plan. The existing Basin Plan DO objectives are not based on and do not take into account thermal stratification in reservoirs. Once reservoirs stratify, no source of dissolved oxygen is available to the hypolimnion, and (in the absence of artificial aeration) hypolimnion DO concentrations naturally fall below the Basin Plan objectives in all thermally stratified reservoirs. As a result, compliance with the Basin Plan dissolved oxygen concentration objectives in the hypolimnion are not sustainable under natural conditions in San Vicente Reservoir or any other thermally stratified reservoir.

Demonstrating this natural effect, reservoir modeling conducted as part of the Demonstration Project Limnology Study (see Table 3 on page 10) indicates that hypolimnetic anoxia (DO concentrations of less than 0.5 mg/l) will occur slightly more than half of the year as a result of thermal stratification, regardless of whether or not reservoir augmentation is implemented.

Because the existing Basin Plan dissolved oxygen concentrations are inconsistent with conditions that naturally occur within stratified reservoirs, additional Regional Board guidance on Basin Plan DO compliance will be required to:

- assess probable dissolved oxygen requirements that would be recommended by the Regional Board in the NPDES permit to implement the Basin Plan DO objectives, and

determine whether or not modification of the Basin Plan dissolved oxygen objectives for San Vicente Reservoir will be required prior to Regional Board consideration of a NPDES permit for a full-scale project at San Vicente Reservoir.

Section 6 California Toxics Rule Compliance

California Toxic Rule. EPA in 2000 promulgated the *California Toxics Rule*, or CTR (40 CFR 131), which establishes water quality standards for inland surface waters of California. The CTR establishes the following standards for discharges to inland surface waters:

- maximum (acute) concentration standards for toxic inorganic and organic constituents for the protection of freshwater aquatic habitat,
- continuous (chronic) standards for toxic inorganic and organic constituents for the protection of freshwater aquatic habitat, and
- standards for the protection of human health (consumption of organisms and consumption of water plus organisms).

Projected CTR Compliance. Data from the AWP Facility indicate that CTR standards for metals and cyanide are not projected to represent a compliance concern for a full-scale project, as (1) the NCWRP tertiary effluent contains low concentrations of these compounds, and (2) RO treatment to be provided as part of the AWP Facility is effective in removing such inorganic compounds.



Figure 9
AWP Facility at NCWRP

For these same reasons, the Demonstration Project data also has not indicated any toxic organic constituent which appears to represent a compliance concern. (It should be noted that bromodichloromethane was detected in one AWP Facility sample at a level above the CTR limit, but bromodichloromethane was normally below detection limits and this single sample result is considered an anomaly.) While no CTR compliance issues have been identified through Demonstration Project monitoring, CTR standards for the protection of public health include several standards that are significantly more stringent than can be reliably analyzed using available detection technology and detection limits. CTR-regulated compounds that include standards more stringent than available detection limits include:

- chlorinated pesticides such as DDT, Aldrin, Dieldrin, Heptachlor,
- polychlorinated biphenyls (PCBs),
- poly-aromatic hydrocarbons (PAHs), and
- N-nitrosodimethylamine (NDMA).

No reason appears to exist for chlorinated pesticides, PCBs, and PAHs to appear in the NCWRP effluent. Additionally, RO typically achieves significant removal of these compounds. The City's Demonstration Project testing included special focus on NDMA, as:

- NDMA is occasionally present in Southern California recycled water supplies,
- typical RO removal efficiencies for NDMA are on the order of 50 percent, and
- the CTR standard for NDMA is 0.00069 µg/l.

Despite these original concerns, however, existing Demonstration Project purified water data do not indicate that NDMA will represent a compliance issue. If the City chooses to move forward with a full-scale project at San Vicente Reservoir, however, the City's NPDES Report of Waste Discharge will reassess NDMA to determine if implementation of additional NDMA compliance measures are appropriate.

Section 7 Pathways for Demonstrating Regulatory Compliance

Implementation Approach. The City has submitted a preliminary project proposal to CDPH seeking conceptual approval for a full-scale reservoir augmentation project at San Vicente Reservoir. The Public Utilities Department is also scheduled to submit a feasibility report to the City Council in late autumn 2012.

Should the City Council choose to move forward with a full-scale project at San Vicente Reservoir, the City will initiate work to develop additional information required to support the design, environmental review, and regulatory permitting for the project. Such additional work would support:

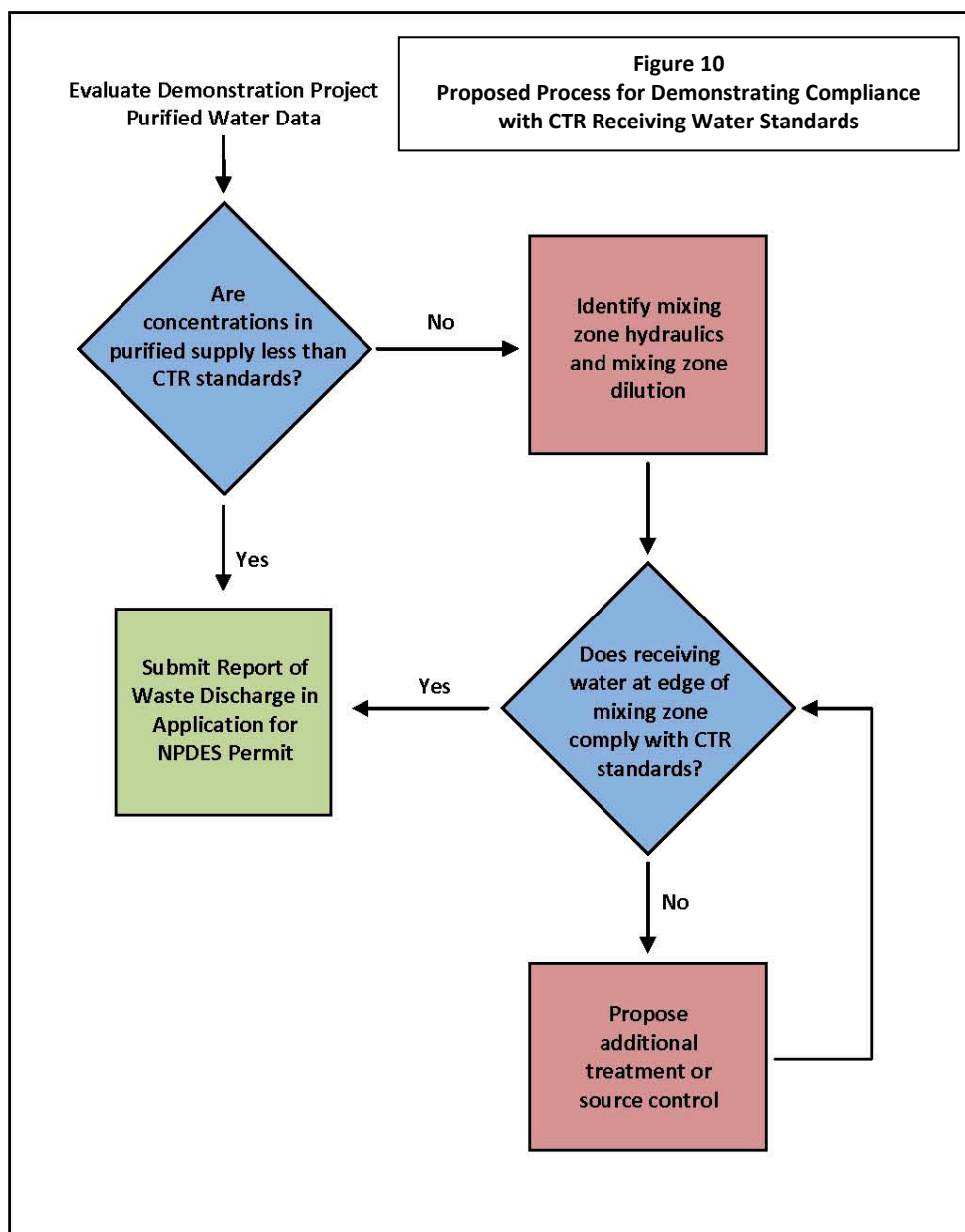
- ongoing coordination with CDPH in support of modifying the City's CDPH water supply operating permit,
- assessing compliance with provisions of the California Environmental Quality Act (CEQA), and
- coordination with the Regional Board to assess Basin Plan compliance issues and information needs for submitting a Report of Waste Discharge to the Regional Board in application for a NPDES permit for a full-scale project.

Basin Plan Concentration Standards. The Basin Plan provides clear implementation guidance on the development of NPDES effluent standards for mineral constituents, drinking water MCLs, and total phosphorus. As noted in Section 6, available purified water data demonstrate compliance with Basin Plan water quality objectives. For these constituents, the City proposes the following pathway for demonstrating compliance of a full-scale project:

- present the results of Demonstration Project monitoring data and demonstrate that the AWP Facility purified water complies with applicable Basin Plan objectives, and
- submit the results of the comparison in a Report of Waste Discharge submitted in application for NPDES requirements for a full-scale project.

CTR Standards. Figure 10 schematically presents the process the City will utilize to demonstrate compliance with CTR standards. As noted in Section 6, available Demonstration Project data indicate compliance with applicable CTR standards for toxic organic and inorganic constituents without the need for an assigned mixing zone or dilution credit.

In the event additional data indicate a potential need for the consideration of a CTR mixing zone, the City will conduct studies to assess mixing zone hydraulics, dilution, and concentrations of CTR constituents at the edge of the mixing zone. As part of the dilution studies, the fate (e.g. half-life) of discharged constituents would be evaluated in order to assess re-entrainment effects.



Total Nitrogen and N:P Ratios. Additional coordination with Regional Board staff will be required to evaluate the appropriate pathway for regulatory approval of with respect to total nitrogen. Regional Board guidance will be required to address whether (1) modification of the Basin Plan or (2) modification of the CWA Section 303(d) impaired water body list will be required prior to Regional Board consideration of a NPDES permit for full-scale project at San Vicente Reservoir.

Figure 11 (page 25) presents the regulatory pathways for addressing issues associated with total nitrogen in San Vicente Reservoir. As shown in Figure 11, if the Regional Board, EPA, and State Board determine that no modifications of the 303(d) list or Basin Plan are required to support a full-scale project at San Vicente Reservoir, the City could directly move forward (if approved by the City Council) with preparing:

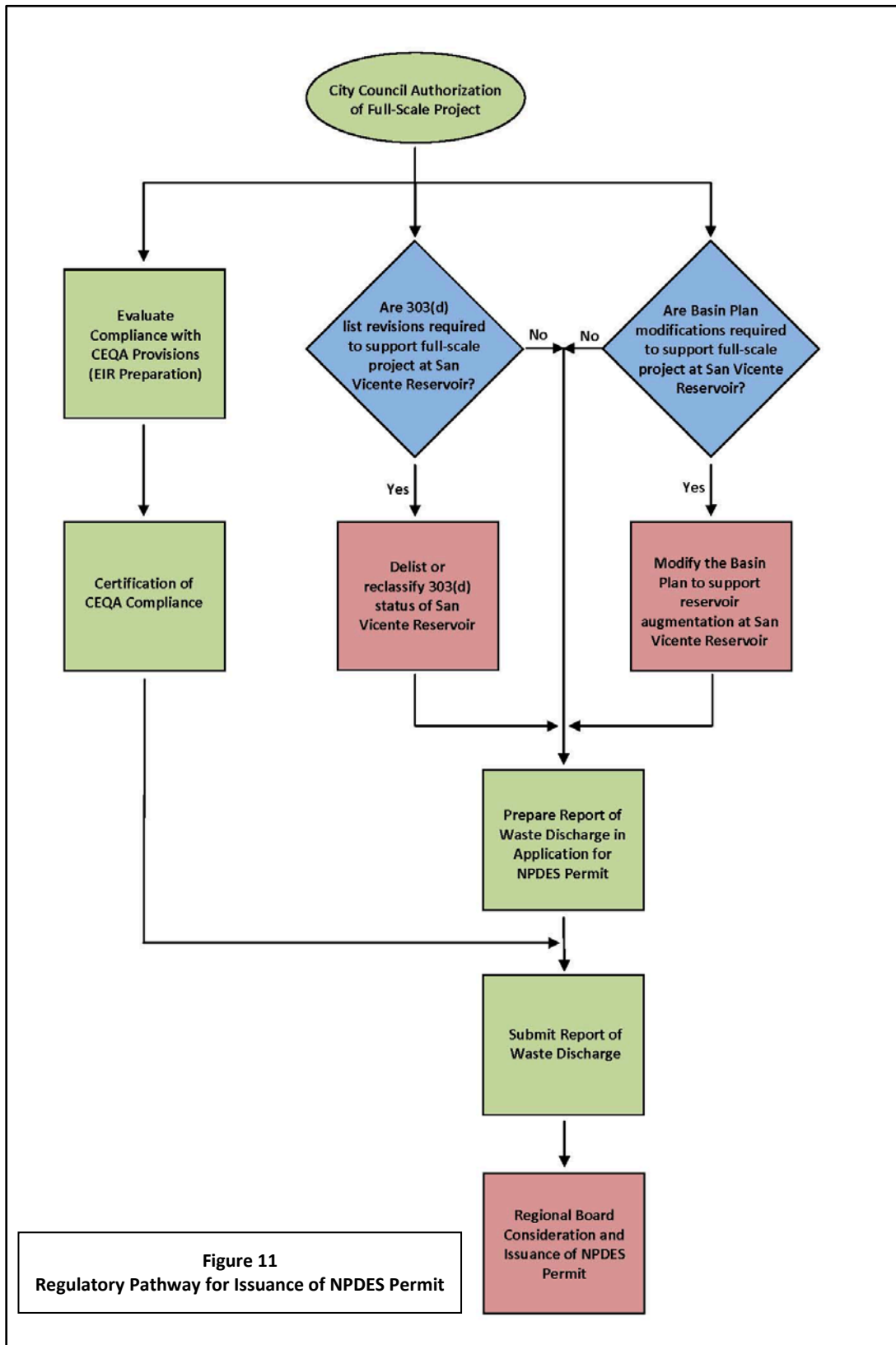
- a Report of Waste Discharge in application for a full-scale project at San Vicente Reservoir, and
- an Environmental Impact Report (EIR) that assesses compliance with provisions of CEQA.

While CEQA does not apply to the issuance of NPDES permits, the City recognizes the Regional Board preference for applicants to utilize the normal CEQA compliance process for assessing construction and operation impacts prior to the Regional Board's processing of a NPDES permit. Accordingly, the City anticipates completing an EIR and demonstrating compliance with CEQA in advance of Regional Board consideration of a NPDES permit for the full-scale project at San Vicente Reservoir.

303(d) Implications. One of the key factors that will dictate the pathway for regulatory approval of a full-scale project at San Vicente will be how regulators choose to interpret requirements established within Section 303(d) of the CWA. It is the City's understanding that the Regional Board has yet to determine whether revision of the existing CWA Section 303(d) impaired water list is required prior to issuing a NPDES permit for a full-scale project at San Vicente Reservoir.

In accordance with requirements established within CWA Section 303(d), the Regional Board identifies surface waters not complying with applicable water quality standards (impaired waters), and establishes priorities and schedules for the preparation of Total Daily Maximum Load (TMDL) and waste load allocations required to attain and maintain the standards. In 2008, the Regional Board added San Vicente Reservoir to the 303(d) list as a Category 5 (TMDL-required) impaired water body, and scheduled a TMDL for year 2021 to address the non-compliance.

The Regional Board's 2008 rationale for the 303(d) listing of San Vicente Reservoir for total nitrogen was based on the use of a "default" N:P ratio of 10:1 and data indicating that San Vicente Reservoir total nitrogen concentrations routinely exceeded 0.25 mg/l. In presenting the justification for the San Vicente Reservoir 303(d) listing, the Regional Board did not address or identify San Vicente Reservoir "natural" N:P ratios. Additionally, the 303(d) listing for San Vicente Reservoir only considered historic loads associated with the pre-expansion reservoir.



Regional Board guidance is required to address if and how the 2008 303(d) impaired water listing of the historic San Vicente Reservoir applies to the expanded San Vicente Reservoir, and whether or not the existing 303(d) listings properly addressed San Vicente Reservoir N:P ratios. Additional Regional Board guidance will be required to address how the 303(d) listing of San Vicente Reservoir influences how the Regional Board can establish NPDES concentration limits for total nitrogen.

The City understands that the EPA and Regional Board are currently assessing implications of a 2007 ruling by the U.S. Court of Appeals for the Ninth Circuit that addressed a case involving issuance of a NPDES permit for a discharge to a 303(d) listed water. This Court of Appeals ruling appeared to place restrictions on when and how NPDES permits can be issued for discharges to 303(d) impaired waters. EPA has not yet issued guidance on how to interpret and apply this ruling. The regulatory pathway to project approval will, in part, depend on the direction of this guidance, and may include the need to:

- delist San Vicente Reservoir as being impaired for total nitrogen,
- revise the 303(d) listing to address identifying and upholding "natural" N:P ratios, or
- modify the San Vicente 303(d) listing to a lesser category (e.g. Category 4, where no TMDL is required).

Interpretation of Basin Plan N:P Objective. Regional Board guidance (see Figure 11) is also required to determine whether or not modification of the Basin Plan is required prior to Regional Board consideration of a NPDES permit for a full-scale project at San Vicente Reservoir.

As noted, the Basin Plan does not establish "analogous thresholds" for nitrogen, but requires that natural N:P ratios be identified and upheld. How the Regional Board chooses to interpret this requirement will influence the City's pathway to regulatory approval. Under the proposed project concept, approximately 15,000 AFY of imported water would be replaced by purified water that contains extremely low concentrations of phosphorus (resulting in N:P ratios on the order of 160:1 or more). Such a consistent purified water flow would allow the reservoir epilimnion (which comprises the euphotic portion of the reservoir where photosynthesis can occur) to be maintained in a phosphorus-limited mode (high N:P ratios). In minimizing the potential for biostimulation by upholding this high N:P ratio, Regional Board could be justified in establishing an attainable purified water NPDES effluent total nitrogen limit (e.g., a limit on the order of 1.0 mg/l). Under this interpretation, modification of the Basin Plan total nitrogen objective may not be necessary in order for the Regional Board to implement attainable effluent nitrogen limits for a full-scale project at San Vicente Reservoir. Additionally, an argument can be made that no basis exists for identifying "natural" N:P ratios in the historic San Vicente Reservoir because:

- the reservoir is being replaced by a larger reservoir which will be subject to a different set of natural conditions, and
- historic N:P ratios in the reservoir have been largely a function of how the reservoir is operated and which source of imported water (e.g. State Project Water or Colorado River) is being delivered to the reservoir, as opposed to "natural" conditions.

Dissolved Oxygen. As described in Section 6, the Basin Plan implements a "one-size-fits-all" approach in applying a fixed set of dissolved oxygen concentrations to all San Diego Region surface waters. Basin Plan dissolved oxygen objectives do not take into account thermal stratification conditions in San Diego Region reservoirs, and are not physically sustainable in the hypolimnion under natural conditions once a thermocline has been established. The Regional Board has not addressed this Basin Plan inconsistency to date, and the reservoir augmentation project at San Vicente Reservoir would represent the first circumstance since the 1976 adoption of the Basin Plan in which the Regional Board is asked to consider NPDES requirements for a discharge to a thermally stratified reservoir.

Coordination with Regional Board staff will be required to assess implications of Basin Plan dissolved oxygen concentrations on a full-scale project at San Vicente Reservoir. In the event that the Regional Board determines that Basin Plan modifications are required to support the reservoir augmentation concept, such Basin Plan modifications (see Figure 11 on page 25) would be required in advance of (or in parallel with) developing the NPDES Report of Waste Discharge.

Section 8 Implementation and City-Preferred Pathway

Implementation Schedule for Preferred Pathway. As documented herein, the full-scale project will comply with all CDPH requirements and conform to applicable Basin Plan mineral standards, drinking water standards, and CTR standards. Additional Regional Board guidance, however, is required regarding whether or not:

- Revisions in the CWA Section 303(d) impaired water listings for San Vicente Reservoir are required prior to Regional Board issuance of a NPDES permit for the project, and
- Modifications in the Basin Plan are required prior to Regional Board issuance of a NPDES permit for the project.

The City believes that it is both feasible and appropriate for the Regional Board to consider and issue a NPDES permit for a full-scale project at San Vicente Reservoir without revisions to either the 303(d) list or Basin Plan. The pathway for project approval (see Figure 11) is straight-forward if the Regional Board and EPA agree with this interpretation.

Table 4 (page 28) presents a preliminary implementation time line for issuance of a NPDES permit for a full-scale project if no Basin Plan or 303(d) list modifications are required. Virtually all of the technical information required for preparation of a Report of Waste Discharge has been developed as part of the Demonstration Project. As a result, the City could prepare the requisite NPDES application documents concurrent with the City's CEQA compliance work. Under this scenario, the City could submit a NPDES application to the Regional Board immediately upon certification of CEQA compliance for the full-scale project. It is anticipated that the Regional Board should be able to issue a NPDES permit (and EPA approve the NPDES permit) within 12 months of the date the NPDES application is submitted.

Table 4 NPDES Permit Implementation Schedule If No 303(d) List or Basin Plan Modifications are Required													
Task	Elapsed Time After City Council Approves and Funds the Full-Scale Project at San Vicente Reservoir												
	Year 1				Year 2				Year 3				
	1 st Qtr	2 nd Qtr	3 rd Qtr	4 th Qtr	1 st Qtr	2 nd Qtr	3 rd Qtr	4 th Qtr	1 st Qtr	2 nd Qtr	3 rd Qtr	4 th Qtr	
City Approvals and CEQA Certification													
City Council approval of funding for full-scale project at San Vicente Reservoir	●												
CEQA consultant selection; draft EIR preparation; public review and comment													
City Council certification of CEQA compliance for full-scale project								●					
NPDES Permit Application and Approval													
City coordination with Regional Board staff and CDPH													
City selection of technical consultant; contract issuance and notice to proceed													
Preparation of draft and revised draft Reports of Waste Discharge for full-scale project													
City submits Report of Waste Discharge to Regional Board								●					
Regional Board staff reviews Report of Waste Discharge and coordinates with City for any additional required data													
Regional Board staff prepares Tentative NPDES permit; public comment period													
Regional Board consideration and approval of NPDES permit for full-scale project												●	
EPA approval of NPDES permit													●

Implementation Pathway if 303(d) List Revisions are Required. The City understands that EPA proposes to soon issue guidance to the states on how to issue NPDES permits for inflows to 303(d)-listed receiving waters. If EPA and the Regional Board determine that 303(d) revisions are required prior to issuance of a NPDES permit for a full-scale project at San Vicente, justification exists for supporting such a 303(d) delisting or modification. This justification, in part, is based on the following:

- The original 2008 303(d) listing did not examine historic N:P data and ratios as required by the Basin Plan, but instead used a default 10:1 N:P ratio that the Basin Plan states is to be used "in the absence of available data."
- The original 2008 303(d) total nitrogen listing of San Vicente Reservoir was based on historic concentrations and nutrient loads associated with the former 90,000 AF reservoir capacity.

- Demonstration Project reservoir modeling results show that reservoir nutrient concentrations will be lower with expansion of the reservoir.
- San Vicente Reservoir is dominated by imported water inflows, and 303(d) listing of potable water storage reservoirs essentially comprised of imported water is not appropriate.
- Conformance with the Basin Plan biostimulation objectives can be provided through operating the reservoir in a phosphorus-limited mode.

While significant justification exists for delisting or revising the 303(d) listing for San Vicente Reservoir, a number of tasks would be required to proceed through the 303(d) listing process, including:

- coordination between City staff and regulators to determine the required 303(d) revisions,
- bringing technical consultants on-board (if required) to support the 303(d) revision process,
- conducting a technical evaluation of the 303(d) criteria and proposed revisions,
- developing technical documents justifying the proposed 303(d) revisions,
- reviewing proposed 303(d) revisions through the Regional Board stakeholder input and triennial review process,
- preparing the Regional Board staff report for the proposed 303(d) revisions,
- presenting the proposed 303(d) revisions to the Regional Board,
- forwarding the proposed 303(d) list to the State Board,
- State Board staff review of the proposed 303(d) revisions and coordination between State Board and Regional Board staffs,
- conducting the State Board public review and hearing process,
- State Board approval of the proposed 303(d) revisions,
- submitting the proposed 303(d) revisions to EPA, and
- EPA review and approval of the proposed 303(d) revisions.

If 303(d) list revisions are required, State Board and EPA review and approval of the 303(d) list revisions would comprise a significant portion of the overall implementation schedule. The process for achieving revision of the San Vicente Reservoir 303(d) listing could add an additional two to five years to the project implementation schedule, depending on:

- the State Board and Regional Board schedule for the next update to the 303(d) list,
- whether delisting of San Vicente Reservoir or modification of the listing category will be required,
- whether Basin Plan modifications are required in conjunction with the 303(d) list revisions,
- Regional Board staff availability, priorities, and funding, and
- EPA and State Board review and approval.

Implementation Pathway if Basin Plan Revisions are Required. In coordination meetings between the City and Regional Board, Regional Board staff have indicated a preliminary position (subject to confirmation by EPA) that the Basin Plan allows the Regional Board the flexibility to assess N:P ratios on a site-by-site basis and establish project-specific N:P ratios for any given receiving water. The City contends that this flexibility should allow the Regional Board to establish achievable NPDES permit limits for total nitrogen without the need for revision of the Basin Plan, in part, based on the following:

- Historic reservoir N:P data will no longer be applicable to the expanded San Vicente Reservoir, and N:P ratios in the expanded reservoir are largely dependent on which water sources (e.g. Colorado River water, State Water Project water, or purified water) the City stores in the reservoir.
- Reservoir modeling indicates that nutrient concentrations will be reduced in the expanded reservoir compared to historic conditions, regardless of whether or not reservoir augmentation is implemented.
- Implementation of a full-scale project at San Vicente Reservoir would allow the City to better manage biostimulation by maintaining phosphorus-limited conditions in the reservoir.
- Reservoir modeling can be used to help predict and manage potential biostimulation conditions.

If Basin Plan modifications are required prior to issuance of a NPDES permit, tasks required to proceed through the Basin Plan modification process would include:

- coordination between City staff and regulators to determine the required Basin Plan revisions,
- bringing technical consultants on-board to support the Basin Plan revision process,
- assembling data and technical documents to support the proposed Basin Plan revisions,
- assessing conformance of the proposed Basin Plan revisions with applicable state and federal water quality policies,
- preparing the Regional Board staff report and administrative record that supports and justifies the proposed Basin Plan revisions,
- preparing the Tentative Resolution for Basin Plan modification,
- conducting the Regional Board review, public input, and hearing process,
- Regional Board consideration and adoption of the proposed Basin Plan modifications,
- State Board staff review of the proposed Basin Plan modifications,
- State Board consideration and approval of the proposed Basin Plan modifications,
- Review and approval of the proposed Basin Plan modifications by the State of California Office of Administrative law, and
- EPA review and approval of the proposed Basin Plan modifications.

Once the Regional Board has approved the proposed Basin Plan modifications, an additional 12 to 24 months may be required for State Board, Office of Administrative Law, and EPA approval. As a result, the process for revising the Basin Plan could add two to three years to the overall project implementation schedule, depending on:

- the nature of the proposed revisions (e.g. revision of numerical standards vs. revision of implementation provisions),
- Regional Board staff availability, priorities, and funding, and
- State Board, Office of Administrative Law, and EPA review and approval.

Requested Regional Board Feedback. The full-scale project remains technically feasible whether or not EPA or the Regional Board determine that revision of the Basin Plan or 303(d) list is required prior to Regional Board issuance of a NPDES permit for the full-scale project at San Vicente. Requiring such Basin Plan modifications or 303(d) list revisions in advance of the NPDES permit issuance, however, would lengthen the City's implementation schedule and potentially affect the City's decision on whether and how to proceed with a full-scale reservoir augmentation project at San Vicente Reservoir.

The City requests that Regional Board staff coordinate with State Board and EPA staff to determine whether the Regional Board can move forward with implementing attainable NPDES requirements for the City's proposed project without the need for (1) revision of the San Vicente Reservoir 303(d) listings, or (2) modification of the Basin Plan. The City also requests any guidance or recommendations the Regional Board can offer relative to implementing a full-scale project at San Vicente Reservoir.

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