Evaluation of Desalination as a Source of Supplemental Water

ADMINISTRATIVE DRAFT Technical Memorandum 2

Work Plan for Project Implementation

Nipomo Community Services District

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September 28, 2007

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Executive Summary

Purpose

The purpose of this Technical Memorandum is to provide the Nipomo Community Services District (NCSD) with a plan to implement a seawater or brackish water desalination plant capable of delivering at least 6,300 acre-feet per year of desalted water. The focus of this report is identification of several key preliminary studies which will be needed in order to build and operate a desalination facility. This plan includes the following components:

- A description of the necessary studies, a schedule for their implementation, and an opinion of their probable costs;
- Development of an overall project schedule including the impact studies, feasibility studies, preliminary engineering, design, construction, and operational testing/startup phases; and
- Establishment of a preliminary project budget, which is expected to be refined and modified significantly as the project proceeds.

Project Development Options

Project implementation will require the following choices, among others:

- Regional partnership or District-owned project? The City of Arroyo Grande, City of Grover Beach, and Oceano Community Services District are currently starting a desalination feasibility study. They were recently awarded Proposition 50 grant funding to assist with paying for this work. Policies for developing desalination facilities (including the Monterey Bay National Estuary Program Desalination Plan) encourage regional cooperation instead of development of nearby, separate desalination facilities.
- Design-build, conventional design-bid-build, or "hybrid" approach? Some owners prefer design-build partnerships based on claims that projects can be delivered quickly and less expensively than conventional design-bid-build projects. Variations of design-build projects can include financing and operation of the system in order to allow owners to minimize capital costs by spreading payments over a specified period. The conventional design-bid-build approach may be preferred because it typically results in complete design plans which are competitively bid among different contractors, encouraging competition while ensuring the client's standards are met.
- Brackish groundwater or seawater? The hydrogeology of the coastal area between Oceano and Oso Flaco is not understood in detail. Artesian conditions have been observed near the coast, but the yield and quality of this water has not been evaluated, other than some basic mineral parameters. It is assumed that extraction of seawater would not be prohibited or limited by the Santa Maria Groundwater Litigation, but brackish water may be affected. However, use of seawater is typically more expensive, because because the higher salt content requires greater power usage per amount of product water and results in greater potential impacts for brine disposal.

Conclusions and Recommendations

The District Board should consider the following

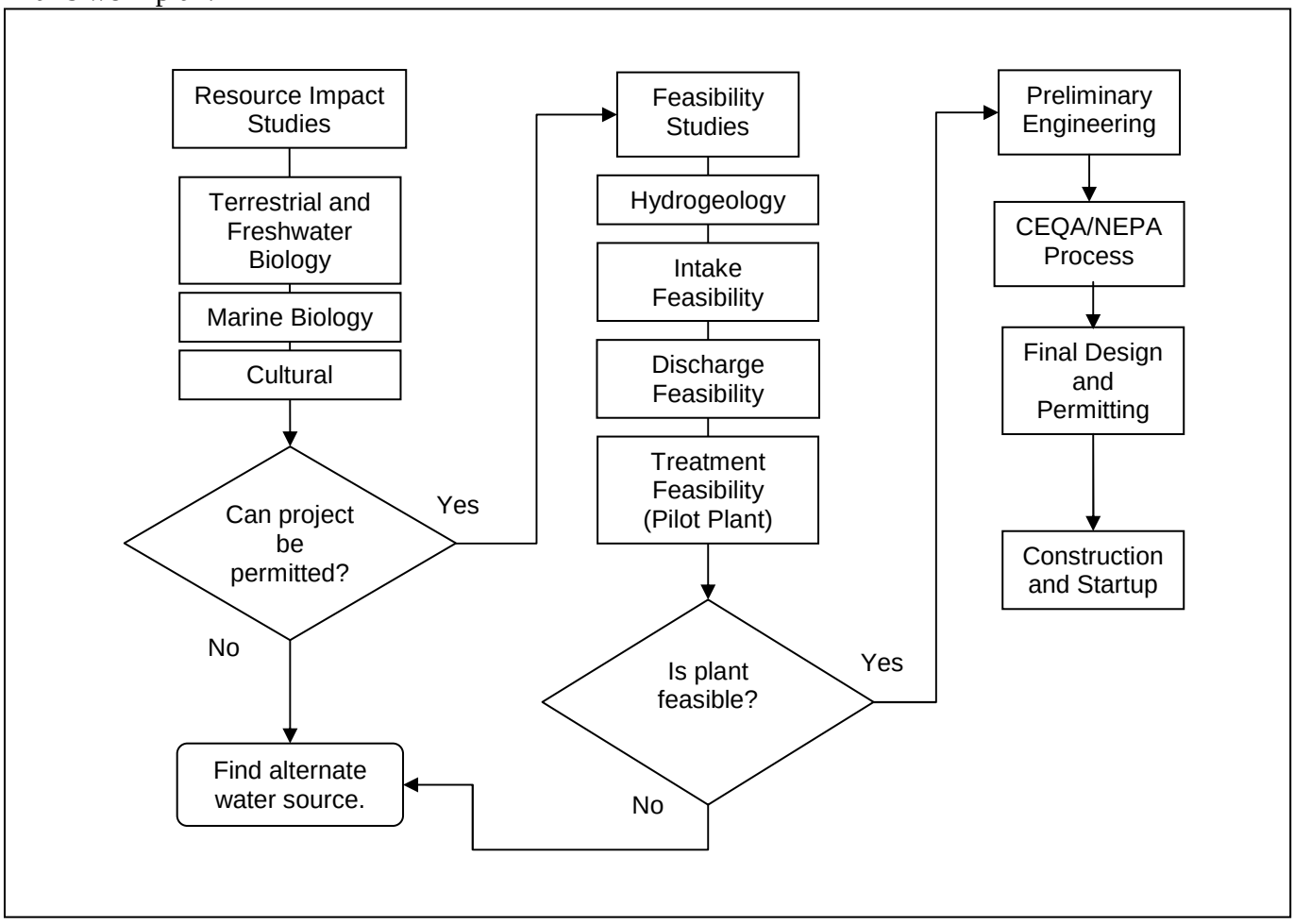
- As presented in this Work Plan, implementation of a desalination plant may require approximately $79 M on a present worth basis (not including cost escalation, which is included in the cost opinions and cashflow analyses presented in this study). These estimates are considered preliminary, and may change significantly as the project proceeds.
- Additional costs include the distribution system improvements for the long-term Supplemental Water Project as recommended in the draft Water Master Plan.
- The implementation period may take over 8 years.
- While other seawater desalination projects similar in size to the District's project, or larger (such as the Monterey Bay, or Dana Point facilities) have put significant time, effort, and expense into permitting and initial studies for a desalination project, neither projects have received all their permits and they are still in the pilot testing and feasibility study phases.
- Little is known about the hydrogeologic characteristics of the areas proposed for subsurface intakes and discharges. Therefore, it is unknown whether these structures will be feasible.
- Although the South SLO County desalination study participants have not begun implementation of a desalination project, there may be considerable pressure from regulatory agencies to form a regional partnership in lieu of developing two (2) desalination projects approximately 6-7 miles apart.

Boyle recommends proceeding with the following tasks, in order to begin implementation of a desalination project:

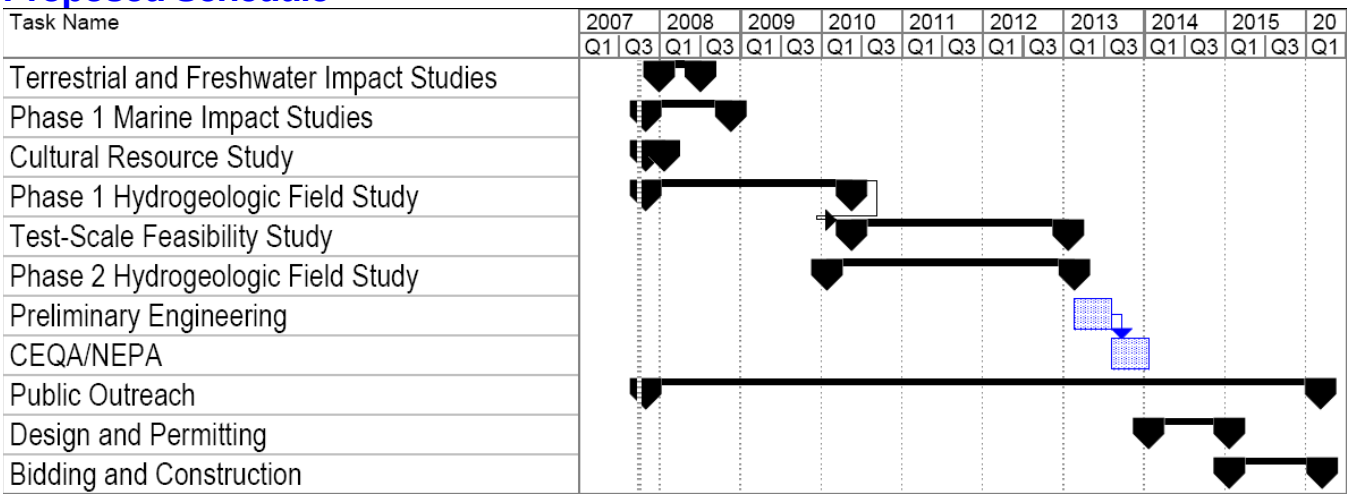
- Begin initial funding analysis of this project, in order to assess developer impact fees, water rates, and financial responsibility of project partners (other Nipomo Mesa water purveyors);
- Conduct an initial meeting with the San Luis Obispo County planning department, and other resource agency representatives, in order to begin identifying permitting issues and processes;
- Contact PG&E and discuss availability of power at the potential treatment plant sites, in order to identify the schedule and cost to upgrade electrical service to these locations (if required);
- Meet with the South SLO County desalination study partners to discuss potential for working together; and
- Begin searching for appropriate grant funding sources.

Proposed Work Plan

The following flow chart shows the inter-relationships between the various studies and plans described in this work plan.



Proposed Schedule



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Proposed Budget

Task	Probable Cost	% of Total
Terrestrial and Freshwater Impact Studies	$ 440,000	0.8%
Phase 1 Marine Impact Studies	250,000	0.4%
Cultural Resource Study	66,000	0.1%
Phase 1 Hydrogeologic Field Study	360,000	0.7%
Test-Scale Feasibility Study	2,320,000	4.2%
Phase 2 Hydrogeologic Field Study	180,000	0.3%
Preliminary Engineering	210,000	0.4%
CEQA/NEPA	240,000	0.4%
Public Outreach	1,310,000	2.3%
Design and Permitting	3,870,000	5.1%
Construction	67,940,000	82.5%
Project Management	1,500,000	2.7%
Total before Escalation	**$ 78,700,000**	100.0%
Cost Escalation	19,510,000	
Total with Escalation	**$ 98,210,000**	

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Section 1 Introduction and Summary

Objectives

The purpose of this Technical Memorandum is to provide the Nipomo Community Services District (NCSD) with a plan to implement a seawater or brackish water desalination plant capable of delivering at least 6,300 acre-feet per year of desalted water. If the plant were to run at a constant rate, it would need to produce at least 5.6 MGD (million gallons per day) or 3900 gpm (gallons per minute.) Higher design rates could be considered to allow for periodic maintenance or variable production rates, but that level of detailed evaluation is beyond the conceptual evaluations presented herein.

The focus of this report is identification of several key preliminary studies which will be needed in order to build and operate a desalination facility. This plan includes the following components:

- A description of the necessary studies, a schedule for their implementation, and an opinion of their probable costs;
- Development of an overall project schedule including the impact studies, feasibility studies, preliminary engineering, design, construction, and operational testing/startup phases; and
- Establishment of a preliminary project budget, which is expected to be refined and modified significantly as the project proceeds.

The goals of this Technical Memorandum are to:

- Provide schedule and budget information sufficient for preliminary financial planning;
- Identify typical project constraints for focusing and scheduling study efforts; and
- Develop a work plan for project implementation.

Original Scope of Work – Evaluation of Supplemental Water Alternatives

On February 8, 2007, the NCSD authorized Boyle to perform an evaluation of options to provide supplemental water to the District. The initial scope of work was intended to compare various alternatives to the NCSD Waterline Intertie Project, which was described in a draft Technical Memorandum by Boyle in November, 2006. The District Board decided the project cost (between $24 and 26 M) was prohibitive, and other options should be explored.

Boyle's original scope of services (including Contract Amendment dated April 6, 2007) included a constraints analysis and preliminary feasibility study of several alternatives including:

- acquiring water from the Central Coast Water Authority (CCWA) via the CCWA/State Water Pipeline that traverses NCSD;
- Santa Maria Valley groundwater at various well sites;
- extension of the Nacimiento Water Pipeline Project;

- brackish agricultural drainage from Oso Flaco Lake, located to the west of Guadalupe;
- groundwater recharge or direct irrigation reuse of treated wastewater; and
- seawater or brackish water desalination.

The work was organized into three tasks:

- Task 1 – Constraints analysis;
- Task 2 – Detailed evaluation of CCWA and Santa Maria Valley groundwater alternatives; and
- Task 3 – Detailed evaluation of extension of the Nacimiento Water Pipeline Project, brackish agricultural drainage from Oso Flaco Lake, groundwater recharge of treated wastewater, and direct reuse of treated wastewater.

Boyle submitted a draft of Task 1 which concluded the following:

- CCWA alternatives would likely require approval from City of Santa Maria and CCWA member agencies, but could be the least expensive alternative if the SWP pipeline was used to deliver City water in lieu of the Waterline Intertie Project (per the November, 2006, draft Preliminary Engineering Memorandum);
- Nacimiento Water Project Extension, Oso Flaco Lake, and Santa Maria Valley groundwater have significant "fatal flaws"; and
- Desalination requires a significant, long-term investment for studies and coordination with regulatory agencies, and had high capital and operation and maintenance cost compared to the other alternatives, but is considered a highly reliable water supply. It was the only water supply considered in this study which could reliably deliver up to 6,300 acre-feet per year (AFY), which is projected as future water demand per the District's draft Water Master Plan.

As a result of these findings, Boyle was authorized to redirect its study efforts. Instead of producing TMs 2 and 3 (as described above), Boyle revised the scope to produce TMs for two water supply projects:

- Short Term: CCWA/City of Santa Maria turnout near Tefft and Thompson to deliver City water directly to Nipomo distribution system (up to 3,000 AFY); and
- Long Term: Desalination of brackish water or seawater (up to 6,300 AFY).

This TM is the deliverable for the "long-term" water supply alternative, brackish or seawater desalination.

Scope of Work – Technical Memorandum 2 (Work Plan for Desalination Option)

The Scope of Work for this deliverable included the following tasks. The Scope was further defined in a letter to Bruce Buel dated August 6, 2007.

Task 201 – Coordination with Regional Water Quality Control Board, California Department of Health Services (DHS), San Luis Obispo County Planning Department, South SLO County Sanitation District, and Nipomo Refinery Staff

Boyle will plan and attend coordination meetings with Nipomo CSD staff and one or more of the entities noted above. The purpose of the meetings is to establish significant permitting tasks and milestones, as well as to obtain input from those agencies early in the project development process.

In the 8/6/07 letter, it was decided Boyle's study would assume the CSD was developing this project without partnering with South SLO County Sanitation District in a regional desalination project, because the agencies had not yet proceeded with their feasibility study (expected to begin in October, 2007).

Task 202 – Seawater / Brackish Water Intake Options

Boyle will evaluate potential sites for an intake, assuming that beach wells are the most viable option from permitting and cost perspectives. We will identify up to three (3) sites and recommend steps/objectives for a hydrogeological study to define intake design parameters.

Task 203 – Discharge Options

Boyle will review potential effluent discharge options, including sharing the Nipomo Refinery outfall, constructing a new ocean outfall, and subsurface discharge. Boyle will recommend one or more of the three options for further evaluation, and will recommend steps/objectives for defining design parameters.

Task 204 – Treatment Site Options

Boyle will evaluate up to three (3) potential treatment plant sites, including property adjacent to Nipomo Refinery, South County Sanitation District (shared facility), and another site to be identified by the District. It is assumed the District will be actively involved in identifying sites, and that Boyle will determine property ownership from tax assessor records at the County offices.

Task 205 – Project Budget

After completing the Tasks listed above, Boyle will work with the District to define a budget for planning studies, preliminary engineering, design, permit negotiation, and construction.

Task 206 – Implementation Schedule

Boyle will develop a schedule for implementing the desalination project. This will include appropriate tasks for permitting, design, construction, pilot-testing, performance testing, and startup/commissioning.

Project Development Options

Project implementation will require the following choices, among others:

- Regional partnership or District-owned project? The City of Arroyo Grande, City of Grover Beach, and Oceano Community Services District are currently initiating a desalination feasibility study. They were recently awarded Proposition 50 grant funding to assist in financing this work. Policies for developing desalination facilities (including the Monterey Bay National Estuary Program Desalination Plan) encourage regional cooperation instead of development of nearby, separate desalination facilities.
- Design-build, conventional design-bid-build, or "hybrid" approach? Some owners prefer design-build partnerships based on claims that projects can be delivered quickly and less expensively than conventional design-bid-build projects. Variations of design-build projects can include financing and operation of the system in order to allow owners to minimize capital costs by spreading payments over a specified period. The conventional design-bid-build approach may be preferred because it typically results in complete design plans which are competitively bid among different contractors, encouraging competition while ensuring the client's standards are met.
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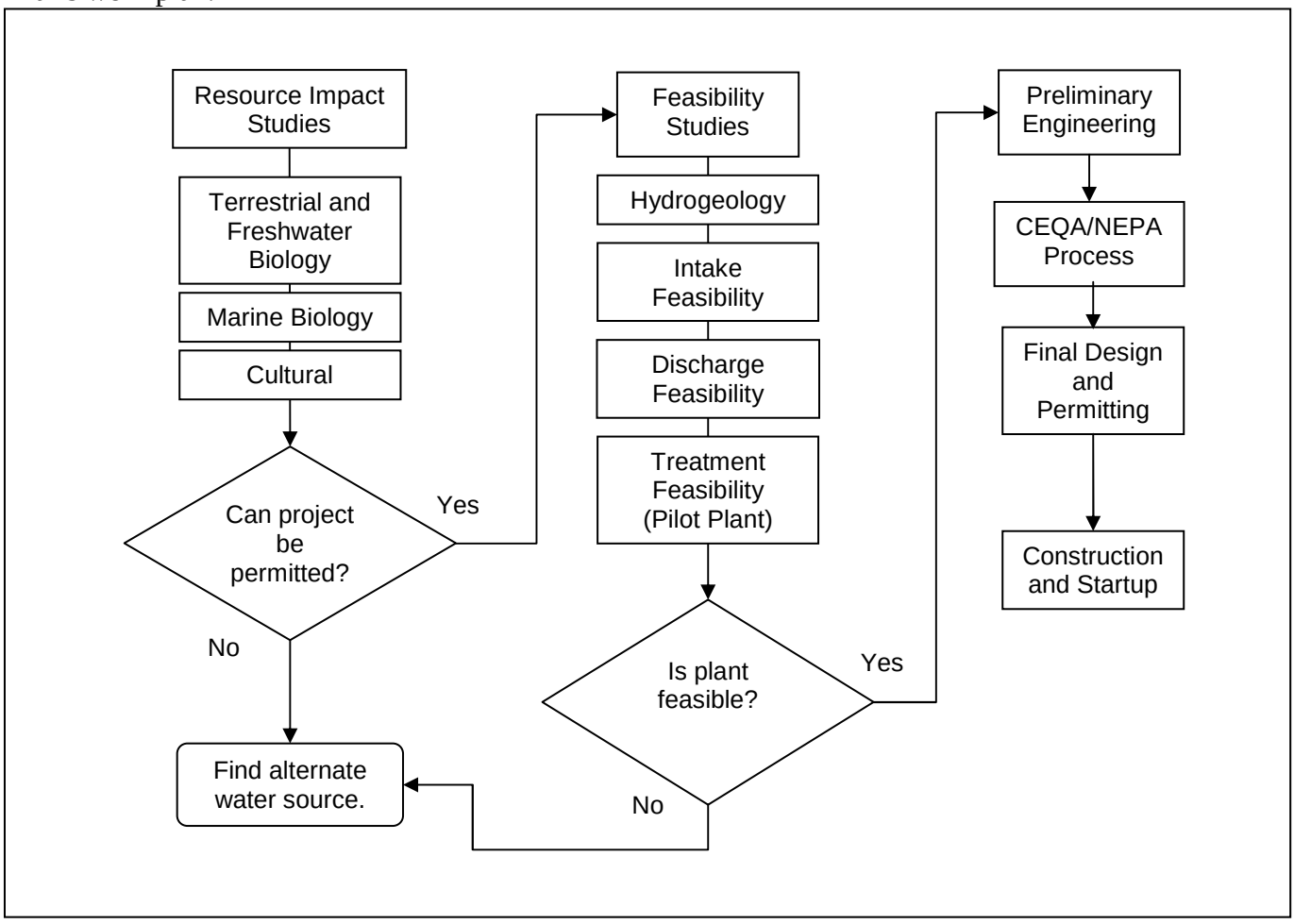
It is recommended that the District address these decisions early in the project development process. Based on Boyle's conversations and meetings with District staff, it is assumed that the project will be District-owned, will follow a conventional design-bid-build approach, and will treat seawater. It is further assumed that Boyle will assist the District in trying to attract partners in the desalination project.

Outline of Project Approach

The following flow chart shows the inter-relationships between the various studies and plans described in this work plan.



Section 2 Impact Studies

Overview of Impact Studies

The following sections describe the impact studies that would need to be completed prior to initiation of feasibility studies and project implementation.

Because the site of the proposed desalination facility and the alignments for the intake, discharge, and product pipelines have not been selected, it may be more economical if these resource impact studies are conducted in two phases: one phase for the areas to be impacted by the feasibility studies, and another phase for the areas to be impacted by the desalination facility and the intake, discharge, and product pipelines.

Purpose

The purpose of these studies is to provide information that can be used to minimize impacts associated with the construction and operation of the proposed facility, and to satisfy the information needs of the regulatory agencies that have jurisdiction over the proposed project.

Goals

The goals of these studies are to provide sufficient information to:

- Establish pre-project "baseline" conditions for long-term evaluation of project impacts and mitigation measures.
- Quantify the probable impacts of the feasibility studies.
- Quantify the probable impacts of the proposed project.
- Compare impacts of the proposed project to impacts associated with alternative projects. In these case, alternative projects would include different pipeline alignments, intake/discharge options (subsurface vs. open intake/outfall)
- Propose methods to minimize the expected impacts.
- Establish mitigation or restoration criteria.

Pertinent regulatory agencies are listed below.

Regulatory Agencies

The following table lists the regulatory agencies that are likely to have jurisdiction over the project, and the permits or associated reviews that would be required.

Table 2-1 Regulatory Agencies and Information Needs

Agency	Permit Requirement
US Army Corps of Engineers (USACE)	Section 10 – Construction of structures affecting navigable waters of the U.S.
	Section 404 – Dredging and/or Filling in Waters of the U.S.
US Fish and Wildlife Service	Compliance with Endangered Species Act for USACE permitted activities
U.S. Coast Guard	May review USACE Section 10 Permit.
NOAA/National Marine Fisheries Service	Compliance with Endangered Species Act for USACE permitted activities
US Dept. of Interior	Compliance with National Historic Preservation Act
Coastal Commission	Coastal Development Permit
State Lands Commission	State Lands Lease
California Regional Water Quality Control Board	Compliance with CWA for USACE permitted activities
California Regional Water Quality Control Board	NPDES Permit for Discharge
California Department of Health Services	Domestic Water Permit
Caltrans	Encroachment Permits for facilities which cross Highway 1.
California Department of Fish and Game	Review pipeline crossings over streams.
California Office of Historic Preservation	Compliance with National Historic Preservation Act.
County of San Luis Obispo	Coastal Development and Development Permits

Information Needs

The information needs associated with assessing the terrestrial and freshwater impacts of the proposed project have been discussed in the *Environmental and Permitting Constraints Analysis*, included as Appendix B. The information needs associated with assessing the marine impacts of proposed desalination facilities are less well defined. However, some guidance can be derived from examining recently proposed or permitted desalination projects, as well as concerns raised by regulatory and resource-management agencies.

Draft Monitoring Guidelines from the Monterey Bay National Marine Sanctuary

In responding to plans to implement several desalination plants that would discharge to the Monterey Bay National Marine Sanctuary (MBNMS), in 2003 a draft "Desalination Action Plan" was developed to lay out "a framework for a regional approach to address desalination, aimed at reducing impacts to marine resources…" This draft action plan identified a need for developing a comprehensive modeling and monitoring program "to determine predicted properties of brine plume, and measure short and long term, and cumulative impacts."

This draft action plan proposes development of minimal information needed in an application to implement a desalination facility, as follows:

1. *Initial evaluation of recreational, public use, and commercial impacts in vicinity of desalination facility*
2. *Initial monitoring to determine currents, tides, water depth and similar parameters of receiving waters*
3. *Pre-construction biological analysis with consideration of seasonal variability, of marine organisms in the affected area and control site to include indices, species richness, and abundance, along with evaluation of entrainment and impingement impacts.*
4. *Pre-construction estimation of expected brine composition, volumes, and dilution rates of the brine in the zone of initial dilution*
5. *Plan for toxicity testing of the whole effluent as an ongoing monitoring requirement.*
6. *Studies to determine properties of combined discharges (cooling water or sewage), and their effects and toxicity on local species*
7. *Post-operational monitoring of salinity in zone of initial dilution and control site, as indicator for plume spreading and dispersal, to be compared with expected results from plume and circulation modeling. If not in compliance then identify and implement corrective actions*
8. *End of pipe monitoring to verify results from expected brine composition and dilution*

In addition, this draft action plan proposes additional information requirements "for those proposed facilities that may affect sensitive wildlife habitats or may have increased or significant impacts on coastal resources" as follows:

1. *Pre-construction monitoring of affected area as well as a control site, to include sampling of water column, and sediment*
   (Note: Water column sampling in this context concerns collecting biota that are found freely swimming or otherwise suspended in the water, as compared to biota that are found attached to, or buried within, bottom sediments.)
2. *Post operational monitoring of affected area as well as a control site, to include sampling of water column and sediments, to be compared with preoperational monitoring results*
3. *Post operational monitoring of oxygen levels, turbidity, heavy metals or other chemical concentrations, with regard to water quality standards*
4. *Post operational sampling of sediments for heavy metals to monitor possible accumulation. (Possible bio-monitoring to sample tissues for heavy metals)*
5. *Post-operational biological analysis of marine organisms in the affected area and control site including indices, species richness, and abundance, to be compared with the pre-operational results*
6. *Monitoring of long term impacts of discharge (e.g. potential changes in species composition etc.)*

According to RWQCB staff, the MBNMS Desalination Plan provides general requirements which are expected to be very similar to any other project proposed within the Central Coast region of the State Water Resources Control Board. These requirements were assembled with input from various state and federal agencies, in order to develop a multi-agency approach to project development.

While these guidelines may not apply directly to the desalination facility proposed by the District, they may be used to develop an initial plan for assessing the marine impacts of the proposed facility, and its associated feasibility studies, as discussed below, and to develop a work plan for collecting sufficient hydrogeologic information to develop an acceptable model for assessing water-chemistry impacts.

Monterey County Experience – Coastal Water Project (CWP)

According to the project's web site, "The central feature of the CWP is a proposed desalination facility in Moss Landing. But, the CWP encompasses more than desalination. The project will create a comprehensive water supply through an efficiency and demand management program, including aquifer storage and recovery in addition to desalination.

"The CWP will produce Carmel River replacement water plus water for the Seaside basin overdraft, for a total of 11,730 acre-feet per year. A proposed location for the CWP desalination facility is on the Moss Landing Power Plant (MLPP) property. The co-location of the CWP desalination facility with MLPP will not only help to conserve power, it will require no additional intake of seawater. By combining brine discharge with the power plant's cooling water, the co-location also provides dilution of the brine discharge, which is the by-product of the desalination process, and makes use of MLPP's existing outfall structure."

Initial planning and public outreach aspects of the CWP project started in early 2004. Construction of a pilot plant was initially scheduled for the summer of 2005, but was not started until June, 2007.

The Proponent's Environmental Assessment (PEA) addresses environmental impacts of the project and may be used as the basis for the CPUC's draft Environmental Impact Report (EIR). The PEA was submitted on July 14, 2005.

Numerous technical studies were produced to support the PEA. The types of studies which are pertinent to NCSD's proposal are listed below. (http://www.coastalwaterproject.com/inc_pea.asp)

- Visual Impact Assessment
- Air Quality Data
- Fluid Dynamic Modeling Assessment (Ocean Impacts)
- List of Affected Property Owners
- Marine Biological Resources Assessment
- Noise Data
- Terrestrial Biological Resources Assessment
- Cultural Resources Assessment
- Preliminary Geotechnical Evaluation

- Preliminary Hazardous Materials Assessment
- Brine Disposal
- Site Assessments (3 Sites) and Comparison
- Desalinated Water Conveyance System (DWCS)
- Feasibility of Using HDD Wells for Water Supply and Brine Discharge
- HDD Well Supply Study
- System Flow Management and Hydraulics

Orange County Experience – Dana Point Ocean Desalination Project

Over the past five years, the Municipal Water District of Orange County (MWDOC) has investigated the feasibility of an ocean desalination facility in Dana Point, California. The MWDOC has undertaken various studies, reports, and investigations to explore the feasibility of this project. These reports are listed and summarized below.

Table 2-2 Reports Prepared (to date) in Support of Ocean Desalination at Dana Point

Report Title and Date	Summary
MWDOC's Metropolitan Water District Seawater Desalination Project Agreement and Application, 2001	Application to the MWD seeking funding for a full-scale desalination project.
MWDOC Ocean Desalination Plant Feasibility Study, January 2003.	An analysis of two potential sites for an ocean desalination facility. RO membrane technology was evaluated as the most feasible desalination technology. The report included evaluation of several power supply scenarios for the RO facility. The report also compared the two sites on cost and benefit basis and provided details about concentrate discharge as well.
South Orange County Water Reliability Study, 2004	Evaluated a variety of projects including surface water storage, ocean desalination, and agency interconnection projects that could improve emergency supplies.
Horizontal Well Technology Application in Alluvial Marine Aquifers for Ocean Feedwater Supply and Pretreatment, Dana Point Ocean Desalination Project, January 2005. (Submitted to Department of Water Resources [DWR] for Proposition 50, Chapter 6 funding.)	MWDOC proposed this research and development project to advance the design and construction capabilities of horizontal/angle well technology for use as a feedwater supply system for ocean desalination plants sited near the mouths of stream or river systems.
Phase 1 Hydrogeology Investigation, Dana Point Ocean Desalination Project, October 2005	This report presents the results of the first phase of the investigation into the feasibility of developing a feedwater supply. The scope of the Phase 1 investigation included a drilling investigation and laboratory testing.
Test Slant Well Plan/Initial Study/Negative Declaration Subsurface Intake System Feasibility Investigation Test Slant Well, October 2005	MWDOC, as lead agency, with its consultants assembled project and environmental documentation to support the permitting for construction, installation, and testing of a test slant well.
Phase 2 Hydrogeology Investigation, Test Slant Well	This report documented the demonstration project and

Report Title and Date	Summary
Project, Dana Point Ocean Desalination Project, 2006	evaluated the feasibility of using a subsurface well intake system.
Water Desalination Proposal for Pilot Plant Testing and Funding, March 2006 (submitted to DWR for Proposition 50, Chapter 6 funding)	MWDOC proposed this pilot plant treatment and testing project to advance desalination treatment technologies most applicable for saltwater produced from subsurface slant wells.
Dana Point Desalination Facility Power Delivery Aesthetic Impact Mitigation Report, February 2006.	The document reviewed some of the key assumptions made in the MWDOC Ocean Desalination Plant Feasibility Study and determined that there are a variety of options that MWDOC could consider to minimize the aesthetic impacts of the project.
Hydraulic Evaluation of San Juan Creek Ocean Outfall Evaluation, 2006.	This report established the firm hydraulic capacity of the San Juan Creek Ocean Outfall.
Preliminary Assessment of Power Options for the Dana Point Ocean Desalination Project (Phase 1), 2006	In this Phase 1 report, power supply options for the project were evaluated and a wide range of potential options were identified for power requirements ranging from 12 to 20 megawatts (MW).
Subsurface System Intake Feasibility Assessment Task 2, 2007	Under Task 2 of this phased investigation, the dual rotary drilling method was used to successfully construct a test slant well at the mouth of San Juan Creek.
Subsurface System Intake Feasibility Assessment Task 4 Report, 2007.	A three-dimensional groundwater flow and variable density solute transport model of the proposed subsurface intakes was developed. The model assessed the sustainable yield of a slant well intake system under a variety of configurations to suit a range of raw water capacities and examined the potential impact of intake operations on seawater intrusion and the “fresher” water aquifers.

Table 2-3 Geotechnical and Biological Assessments Prepared (to date) in Support of Ocean Desalination at Dana Point

Geotechnical Evaluation South Coast Water District Groundwater Recovery Plant, March 1999.
Phase I Environmental Site Assessment San Juan Creek Properties, May 1999.
Limited Geotechnical Evaluations San Juan Creek Properties, June 1999.
Biological Assessment South Coast Water District Project, South Coast Water District, July 1999.
Geotechnical Evaluation San Juan Creek Property, February 2001.
Updated Geotechnical Recommendations South Coast Water District Groundwater Recovery Facility- Phase I, October 2002.
Updated Geotechnical Evaluation South Coast Water District Groundwater Recovery Plant, December 2003.

Implications for Proposed Nipomo CSD Desalination Project

The number and type of investigations which were undertaken to provide information for the permitting and design of the proposed desalination facilities noted above provide an indication of the level of effort which may be expected for a similar facility in San Luis Obispo County. Initial discussions with the regulatory agencies listed in Table 2-1 will further define the requirements for these, and possibly other, investigations.

The District should expect to conduct the following types of studies:

- Impacts to terrestrial and freshwater ecosystems;
- Impacts to marine ecosystems;
- Impacts to cultural resources (i.e., archaeological sites);
- Hydrogeologic feasibility and impacts to groundwater resources; and
- Intake, discharge, and treatment feasibility (i.e., Pilot-scale desalination plant)

These studies are discussed below.

Terrestrial and Freshwater Impact Study

The following section describes a proposed study of terrestrial and freshwater ecosystems which may be impacted by the proposed project.

Existing Information

In 2006, California State Parks released an "Alternative Access Study" for Oceano Dunes State Vehicular Recreation Area, prepared By Condor Environmental. This report contains information pertinent to the terrestrial and freshwater impacts of the proposed project.

Potential impacts of the a District-owned desalination project to terrestrial and freshwater resources have recently been examined (*Supplemental Water Alternatives Environmental And Permitting Constraints Analysis*, Padre Associates, Inc., prepared for Nipomo Community Services District, May, 2007), and are summarized below.

- The desalination facility project is proposed in the Southern portion of San Luis Obispo County, and will be situated in the Nipomo-Guadalupe Dune complex, "a unique and sensitive area that has been heavily protected by land acquisition, land use planning, and regulatory activities."
- Numerous threatened or endangered species, such as the Western snowy plover and the California least tern, are present within the dune complex and along the beach areas of the Nipomo-Guadalupe dunes.
- The area around the Conoco-Phillips refinery is known to contain special-status plant species (e.g. Nipomo Mesa Lupine, La Graciosa Thistle, Dune Larkspur), as well as sensitive habitat (Central Coast Dune Scrub).

Work Plan

1. Complete a California Red-Legged Frog (CRLF) protocol-level surveys during the CRLF breeding season (January 1 through June 30) to identify populations of CRLF within the limits of the project boundary and nearby areas.
2. Botanical surveys should be conducted to determine the likelihood of impacts within any proposed pipeline alignments, at the pilot plant site, at the test intake and discharge sites, and at the treatment plant facilities. Alternative sites and alignments should be investigated so that impacts to rare plants can be avoided or minimized. The potential for seed collection and restoration, as necessary, should also be evaluated.
3. A wetland delineation should be conducted to determine the likelihood of impacts to wetlands or other waters of the U.S. within pipeline alignments and other impacted areas.
4. Propose site protection and impact minimization measures that can be incorporated into the construction and operation of the proposed test intake and discharge facilities, pilot plant, intake and discharge facilities, pipelines, and treatment plant.

Marine Impact Study

Existing Information

The proposed project calls for beach wells or intake galleries that would draw seawater from permeable zones within the near shore environment and beach areas.

Similar subsurface structures are also proposed for brine disposal.

The proposed sites for the feasibility study and intake and discharge facilities are exposed beaches.

In the vicinity of the ConocoPhillips outfall the slope of the ocean bottom is approximately 1.6% (27 feet depth at 1700 feet from shore.) (RWQCB, 2002)

Work Plan

1. Map the benthic topography and marine habitat types. Note the presence of sensitive habitat types that should be avoided such as kelp and hard bottom habitats, or other areas where resident species may be more sensitive to changes in water quality.
2. Select a site that is not planned to be impacted, yet is likely to be similar to the areas where impacts are planned. This site will be used as a reference or “background” site. Investigate this site, as well as the sites where impacts are planned, as discussed below.

3. Monitor the currents, tides, water depths, temperature, and salinity. Collect additional water quality data as appropriate. This data will be used in the development of models used to estimate the impact of the proposed project.
4. Quantify the ambient or "background" conditions, including daily and seasonal variations, and assess the existing level of water quality impairment (if any).
5. Sample the water column and benthic environments to determine species that are present. Determine and calculate appropriate indices of species richness and abundance.
6. Determine the marine organisms present and how they would be affected by salinity changes, including how the effects may vary by life stage.

Cultural Resource Impact Study

Existing Information

The "Alternative Access Study" for Oceano Dunes State Vehicular Recreation Area (ibid.) contains background information pertinent to the cultural impacts of the six potential access corridors studied. Archaeological surveys were conducted in January 2006, identifying or confirming 32 prehistoric and historic archaeological sites that would be impacted by the six potential access roads. The archaeological ground surveys were limited to the areas of the park that would be impacted by the six alternative access roads. Three of the six alternatives that were evaluated are at the southern end of the park, in areas where desalination project pipelines are being considered.

Work Plan

The purpose of the cultural resource study is to identify historic properties (prehistoric and historic archaeological resources, Native American site, and/or architectural properties) listed, determined or potentially eligible for inclusion on the California Register of Historical Resources (California Register) that could be affected by the proposed project, and to recommend measures to avoid, minimize, or mitigate impacts to these resources.

1. Conduct a search of prehistoric and historic site records and pertinent literature concerning the initial project alignments.
2. If needed, conduct a preliminary field survey of the initial project alignments.
3. Prepare a memorandum containing the results of the records search for the proposed project alignments, a brief review of pertinent literature, results of the field survey, summary of key findings, and management recommendations.

Section 3 Feasibility Studies

Hydrogeologic Feasibility Study

Conceptual Intake Options

Although potential intake options include both wells and open intakes, it is recommended that the District plan for construction of beach wells as discussed in the Scope of Work. Open intakes are typically discouraged by regulatory agencies, because they result in impingement of marine organisms and the construction typically has a greater impact on benthic communities than beach wells.

Conceptual Discharge Options

In this study, Boyle performed a preliminary evaluation of discharge options, including use of the Nipomo Refinery ocean outfall, construction of a new ocean outfall, and installation of subsurface discharge wells or an infiltration gallery. Based on our review of similar projects, and discussions with permitting agencies (including RWQCB), it appears the subsurface discharge presents the most feasible alternative for the District for the following reasons:

- **Nipomo Refinery outfall capacity is inadequate**. The Nipomo Refinery outfall cannot convey a sufficient quantity of brine discharge (approximately 6300 AFY at 50% recovery for an RO system), as concluded by Cannon in the District's draft Water Master Plan. In addition, the condition of the outfall is questionable because it was constructed in the 1950's and has not be replaced.

- **Open discharges or ocean outfalls are discouraged by resource agencies.** Construction of a new ocean outfall may be discouraged by regulatory agencies, who prefer subsurface discharges because they typically promote better mixing of brine and seawater, have less water quality impact than a direct outfall, and the construction is less disruptive to benthic organisms.

Therefore, we recommend planning based on a subsurface discharge, but continuing to consider the open discharge or ocean outfall as a viable alternative if the geology is not appropriate for subsurface discharge.

Preliminary Intake and Discharge Locations

The following locations are recommended for investigation as to their suitability for placement of a subsurface seawater intake structure:

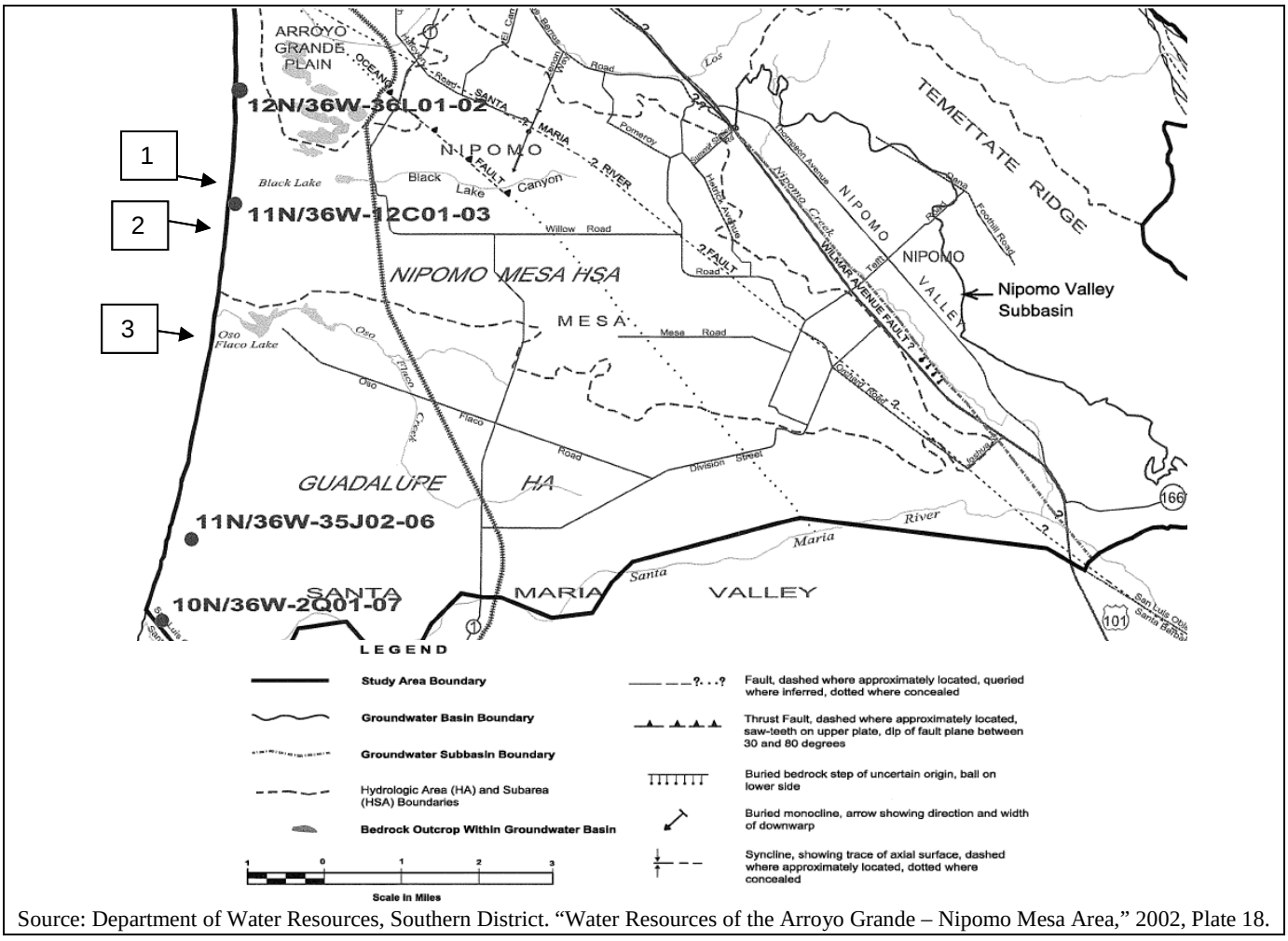
- Site 1: Pacific Ocean at extension of Black Lake Canyon
- Site 2: Pacific Ocean at extension of Willow Road
- Site 3: Pacific Ocean south of mouth of Oso Flaco Creek

These sites were selected based on an evaluation of the hydrogeologic information summarized below, each site's distance from a proposed desalination facility, minimization of environmental impacts, and potential cooperation of affected landowners.

Summary of Existing Information

The California Department of Water Resources, Southern District, produced a report "Water Resources of the Arroyo Grande – Nipomo Mesa Area" in 2002. Information pertinent to the construction of a subsurface seawater intake and outfall is summarized below.

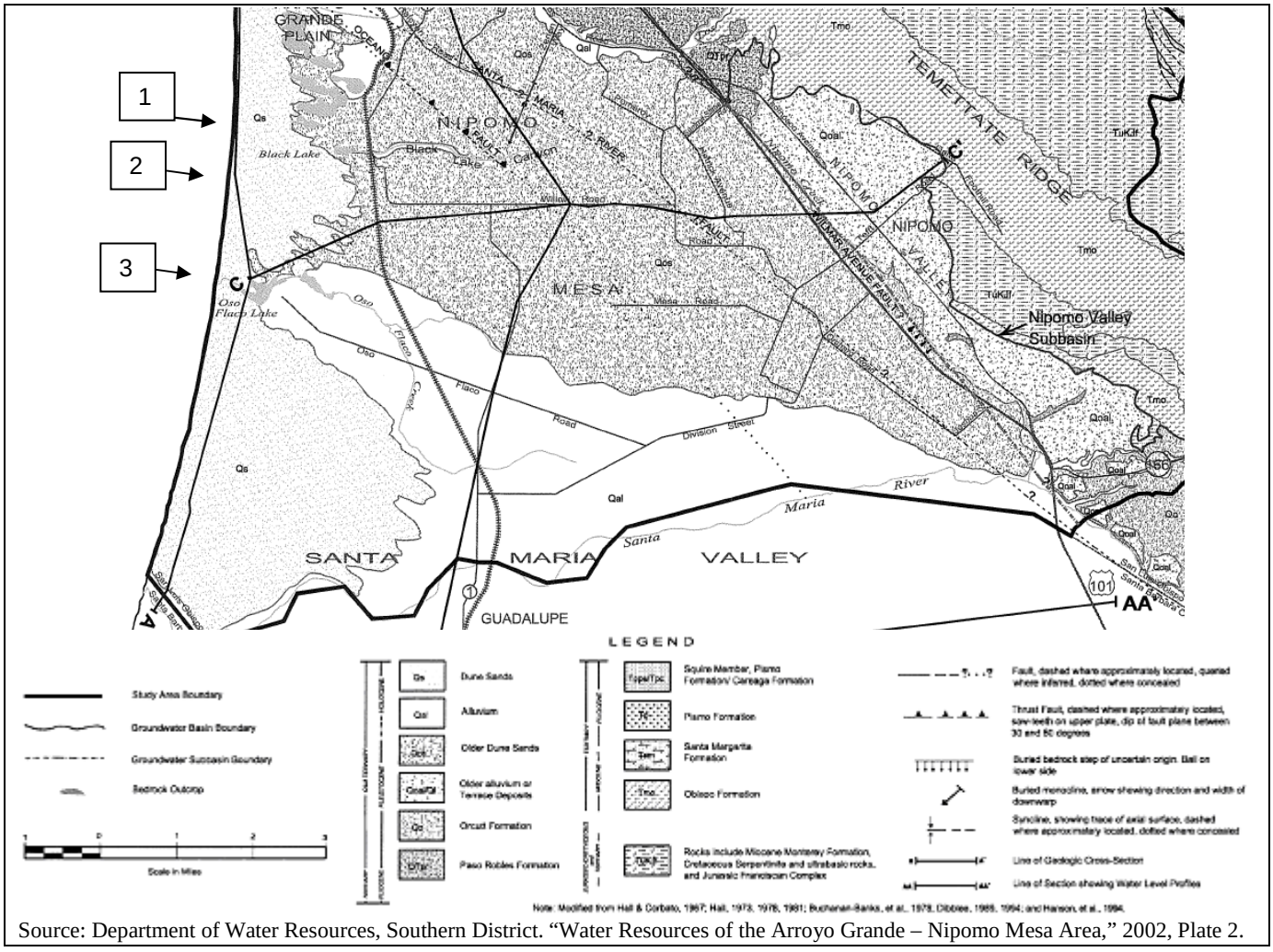
The locations of the proposed intakes/outfalls are centered around the monitoring well labeled 11N/36W-12C in the following figure. This well exhibited artesian flow when sampled in April, 2007.



Source: Department of Water Resources, Southern District. "Water Resources of the Arroyo Grande – Nipomo Mesa Area," 2002, Plate 18.

Figure 3-1 Seawater Intrusion Monitoring Wells

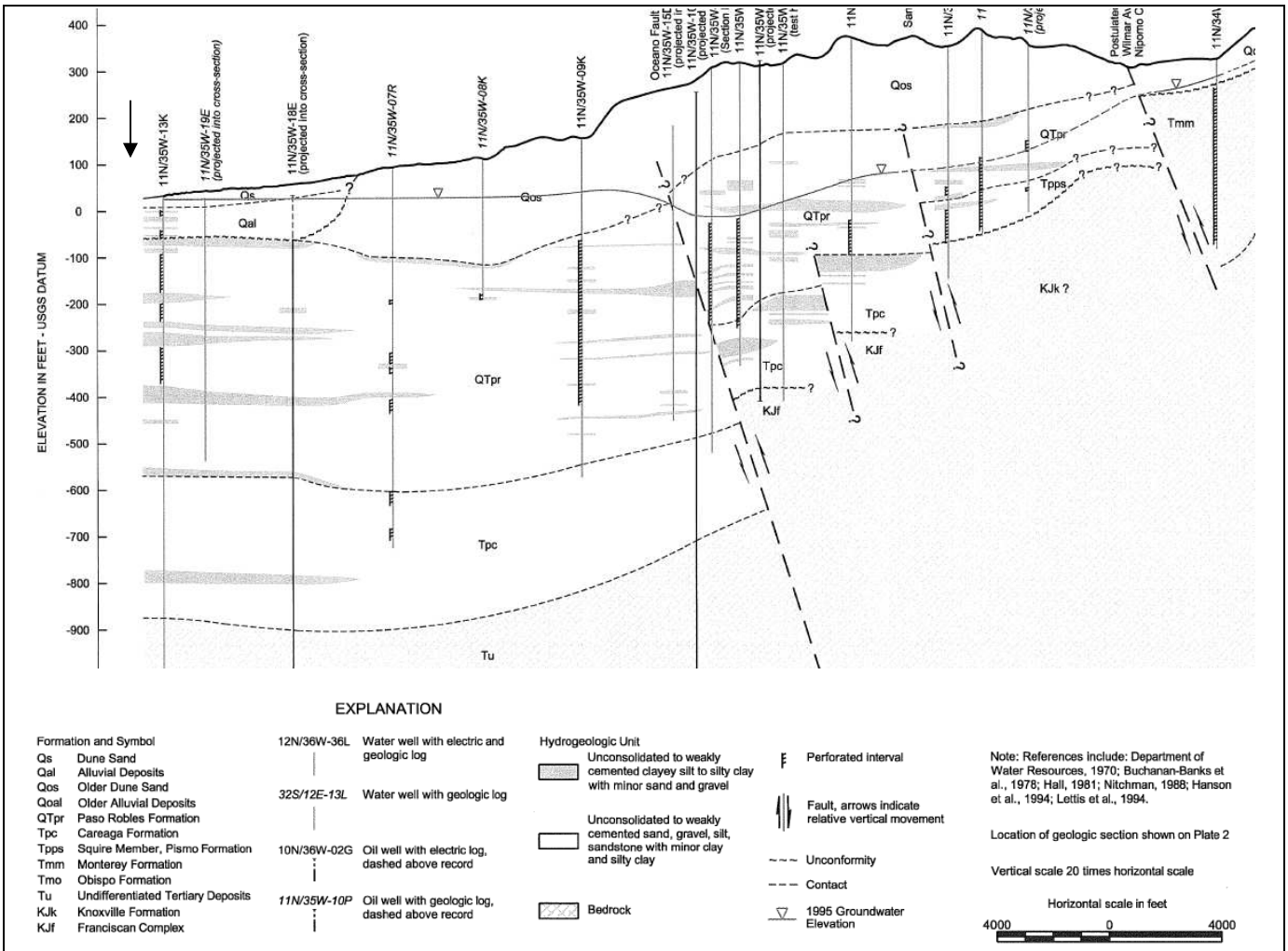
The surface geology in this area consists of "Dune Sands", as shown below.



Source: Department of Water Resources, Southern District. "Water Resources of the Arroyo Grande – Nipomo Mesa Area," 2002, Plate 2.

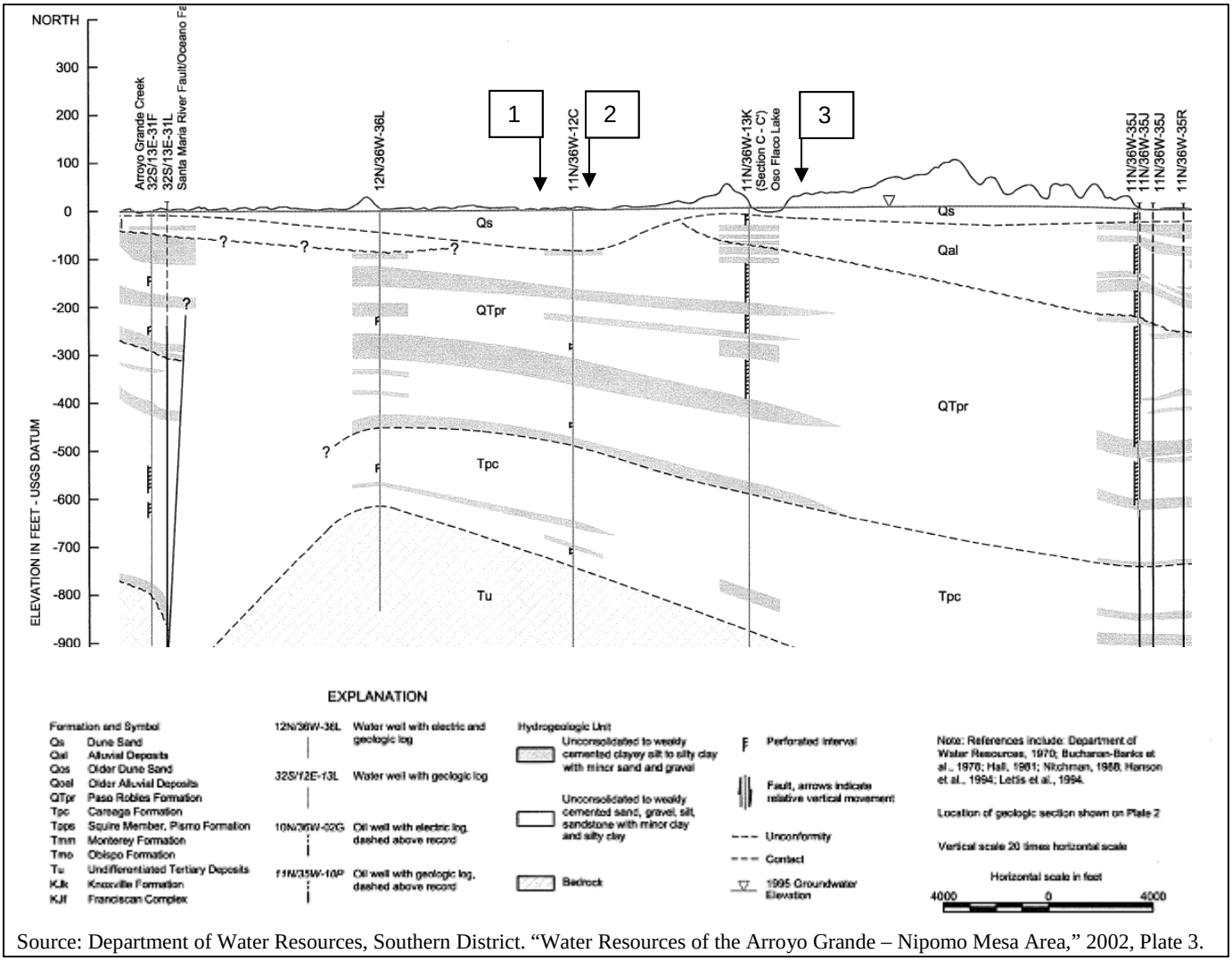
Figure 3-2 Generalized Geology

Extrapolation of regional well log data show that the dune sand (Qs) deposit, at the southern end of the study area an underlying "alluvial" (Qal) deposit, may extend down to a depth of less than 100 feet at the Pacific coast, as shown in the following two figures. A clay layer appears at the top of the "Paso Robles Formation" (QTpr).



Source: Department of Water Resources, Southern District. "Water Resources of the Arroyo Grande – Nipomo Mesa Area," 2002, Plate 5.

Figure 3-3 East-West Geologic Section C-C'



Source: Department of Water Resources, Southern District. "Water Resources of the Arroyo Grande – Nipomo Mesa Area," 2002, Plate 3.

Figure 4-4 North-South Geologic Section A-A' along Coast

Water levels in the Paso Robles formation are between 6 and 8 feet above sea level. Freshwater outflows have been estimated to be 1500 AFY in aggregate.

The offshore bathymetry does not show any submarine canyons. In the vicinity of the ConocoPhillips outfall the slope of the ocean bottom is approximately 1.6% (27 feet depth at 1700 feet from shore.) (RWQCB, 2002) Therefore, of the location of the sea water/fresh water interface is unknown at this time.

Purpose and Goals

The hydrogeologic feasibility study would likely be conducted in two phases.

Phase 1 - The purpose of the Phase 1 hydrogeologic feasibility study is to determine the geologic characteristics of the proposed sites; and to identify a preferred location for the pilot-scale subsurface intake and discharge facilities.

The Phase 1 goals of this study are:

1. Determine the lithology of the sites.
2. Estimate the permeability of the geologic layers encountered.
3. Describe the hydrogeologic relationships between the site geology and the regional aquifers.
4. Estimate the hydraulic connectivity between the aquifers of interest (beach sands, alluvial deposits, Paso Robles formation) and the ocean.
5. Install monitoring wells that can be used to calibrate the groundwater model and to monitor changes to the aquifers during pilot phase production and during full scale production.
6. Collect sufficient information to select a preferred location and technology for the pilot scale subsurface intake and discharge facilities.

Phase 2 - The purpose of the Phase 2 hydrogeologic feasibility study is to assess whether the aquifer(s) at the selected location could support a subsurface intake and outfall system.

The Phase 2 goals of this study are:

1. Determine formation and aquifer hydraulic properties;
2. Estimate the potential yield from a subsurface intake system and its configuration; and
3. Assess potential basin water supply benefits and impacts.

Phase 1 Work Plan

Phase 1 work will occur before installation of the pilot-scale intake and discharge facilities.

1. Review existing hydrogeologic data and estimate the number of test boreholes and monitoring wells which will be needed to assess aquifer materials at the proposed intake and discharge locations.
2. Obtain permits and comply with conditions imposed by regulatory agencies for the proposed field study. These permits/approvals are expected to include:
    - Regional Board
    - USACE
    - California Coastal Commission
    - State Lands Commission
    - State Parks
    - San Luis Obispo County
    - Landowner Approval

3. Drill the test boreholes and install monitoring wells. During the drilling operations, run geophysical logs and collect lithologic samples and water quality samples from the boreholes.

- In the laboratory, estimate hydraulic conductivities of lithologic samples using a permeameter, sieve the lithologic samples, and estimate the hydraulic conductivities based on grain size analyses.

1. Prepare a report to document the hydrogeologic field study's findings.

Phase 2 Work Plan

Phase 2 work will occur after installation of the pilot-scale intake and discharge facilities.

1. Conduct one or more pump tests to estimate pertinent hydrogeologic parameters of the aquifer (such as transmissivity, storativity, and leakance).
2. Utilize the results of the pump test and related geological information to develop a three dimensional groundwater flow and variable density solute model of the proposed subsurface intake and discharge facilities.
3. Use the model to estimate impacts to the aquifer(s) and to the ocean environment of long-term operation of the proposed desalination plant.

Intake Feasibility Study

Purpose

The purpose of the Intake Feasibility Study is to evaluate the feasibility of installing and operating a subsurface intake.

Goals

1. Verify technical capability and methods through construction of prototype test facilities;
2. Identify resource management and regulatory permits, as well as other required approvals;
3. Demonstrate the construction of the test facilities in an environmentally sound manner;
4. Estimate intake and discharge capacities; and
5. Determine and verify pretreatment filtration benefits (i.e., determine the quality of raw feed water after it has been filtered through the aquifer materials).

Work Plan

1. Assess whether the aquifer materials at the proposed locations could support a subsurface intake system for a pilot-scale desalination plant.
2. Based on the hydrogeologic study results, select the most appropriate subsurface intake system technology.
3. Fully describe the test facilities installation and operation plan.
4. Coordinate environmental processing with appropriate regulatory agencies to obtain the required permits and approvals.
5. Finalize the test intake facilities design.
6. Build the test intake facilities.
7. Conduct intake pump testing to estimate aquifer parameters needed to develop the hydrogeologic model noted above.
8. Analyze the data collected and prepare a technical report.

Discharge Feasibility Study

Purpose

The purpose of the Discharge Feasibility Study is to evaluate the feasibility of installing and operating a subsurface discharge system.

Goals

1. Verify technical capability and methods through construction of a prototype test facility;
2. Identify resource management and regulatory permits, as well as other required approvals;
3. Demonstrate the construction of the test facility in an environmentally sound manner;
4. Estimate receiving water quality under a range of flow rates.

Work Plan

1. Assess whether the aquifer materials at the proposed locations could support a subsurface discharge system for a pilot-scale desalination plant.
2. Based on the hydrogeologic study results, select the most appropriate subsurface discharge system technology.
3. Fully describe the test discharge facility installation and operation plan.
4. Coordinate environmental processing with appropriate regulatory agencies to obtain the required permits and approvals.
5. Finalize the test discharge facility design.
6. Build the test intake facility.
7. Comply with regulatory conditions.
8. Conduct discharge testing and receiving water quality monitoring to estimate aquifer parameters needed to develop the hydrogeologic model noted above.
9. Analyze the data collected and prepare a technical report.

Treatment Feasibility (Pilot) Study

Purpose

Determine the feasibility of operating a seawater desalination facility using subsurface intake and discharge facilities by operating a pilot-scale plant.

Goals

1. Verify technical capability and methods through construction of a pilot-scale plant;
2. Determine and verify pretreatment filtration benefits;
3. Estimate anticipated feedwater water quality under the range of hydrologic conditions expected; and
4. Conduct a long-term pilot study to verify treatment performance.
5. Measure receiving water impacts from the test-scale discharge.

Work Plan

1. Design a pilot plant.
2. Obtain permits and comply with conditions imposed by regulatory agencies for installation and operation of the proposed pilot plant.
3. Install the test the pilot plant.
4. Operate the intake structure in a manner that allows sufficient information to be collected to (a) determine and verify pretreatment filtration benefits, (b) determine formation and aquifer hydraulic properties, (c) estimate the potential yield from a subsurface intake system, and (d) estimate anticipated feedwater water quality under a range of hydrologic conditions.
5. Operate the pilot plant in a manner that allows sufficient information to be collected to verify treatment performance under the range of conditions that are expected to be encountered.
6. Operate the test-scale outfall in a manner that allows sufficient information to be collected to determine receiving water impacts under the range of conditions that are expected to be encountered.
7. Prepare a test-scale feasibility report to document the study's findings.

Section 4 Preliminary Engineering

Purpose

Provide project description sufficient for beginning the CEQA and possibly NEPA processes, as well as selecting major process components for subsequent detailed design.

Goals

Define conceptual design elements such as raw water and brine discharge pipelines; beach wells and subsurface discharge facilities; treatment plant; treated water pipelines; establishment of project phasing and water delivery schedule; connection(s) to the District water distribution system; disinfection; operational storage and pumping facilities; chemical addition required to reduce corrosion and "match" district water quality; and in-system improvements required to reduce hydraulic bottlenecks or improve water distribution.

Approach

It is assumed the following study elements would be included in the Preliminary Engineering stage of project development:

- Conceptual beach well and discharge facility layouts (including visual analysis);
- Raw water and brine discharge pipeline preliminary studies (alignment, materials, and size);
- Treatment plant site study (including size, layout, and visual analysis). The sites currently being considered are briefly described in Appendix A (Treatment Plant Site Options);
- Hydraulic analysis (addressing range of product flows, identification of hydraulic bottlenecks, conceptual pump sizing, and distribution system improvements); and
- Water quality evaluation (focus would include recommendations for chemical treatment to reduce corrosion potential of desalted water and disinfection system including investigation of compatibility with other District facilities).
- Pretreatment and treatment process description (including raw water quality, finished water quality, chemical additives, concentrate water quality, and residuals management;
- System integration/connection to distribution system (including layout, facilities, and operation);
- Power requirements and electrical supply study;
- Facilities plan and opinion of probable costs
- Schedule and procurement strategy

Section 5 CEQA/NEPA Process

Purpose

The purpose of the CEQA/NEPA Process component of the proposed project is to satisfy the requirements of the California Environmental Quality Act and the National Environmental Policy Act so that the proposed desalination project can be implemented.

Goals

The goals of the CEQA/NEPA Process component of the proposed project are to provide accurate resource assessment and impact information to stakeholders, provide adequate notice and opportunities for comment by stakeholders, and eliminate or mitigate significant impacts of the project.

CEQA Compliance Approach

Compliance with CEQA will be required. Given the scope of the proposed desalination project, it is assumed that a full Environmental Impact Report (EIR) will be required. The recommended work plan for preparing this EIR is:

- Publish and otherwise distribute a Notice of Preparation (NOP) to notify interested parties that the District will be preparing an EIR to evaluate potential environmental impacts of the proposed project.
- Widely distribute a Notice of Availability (NOA) to potentially interested members of the public about the availability of the NOP and the scheduled public scoping meetings.
- Hold a series of scoping meetings during the 30-day (minimum) project scoping period. Hold meetings in Nipomo, Santa Maria, and the 5-cities portion of San Luis Obispo County.
- Prepare a draft EIR, addressing pertinent issues raised during the scoping process.
- Publicly notice the availability of the draft EIR for review.
- Hold meetings to receive comments on the EIR.
- Modify proposed project and the EIR as needed.
- Adopt the EIR as modified.

NEPA Compliance Approach

Compliance with NEPA will be required because several federal agencies (USACE, NMFS, USFWS, etc.) will need to permit the project.

> "*The National Environmental Policy Act (NEPA) requires federal agencies to integrate environmental values into their decision making processes by considering the environmental impacts of their proposed actions and reasonable alternatives to those actions. To meet this requirement, federal agencies prepare a detailed statement known as an Environmental Impact Statement (EIS). EPA reviews and comments on EISs*

prepared by other federal agencies, maintains a national filing system for all EISs, and assures that its own actions comply with NEPA."
- http://www.epa.gov/compliance/nepa/index.html

To assist these agencies in completing their EIS's, the following actions should be undertaken:

1. Consult each agency affected and determine which agencies will be preparing an EIS, or which agency will take the lead in preparing an EIS for use by federal agencies.
2. Communicate with the EIS-preparing agency to determine what types of information will be needed to complete the EIS.
3. Coordinate with other team members to insure that the information is furnished as needed.

Section 6 Public Outreach

Purpose

The purpose of the Public Outreach component of the proposed project is to provide a consistent, centralized, and continuous public information resource for the implementation of public outreach activities that will be needed to gain public and agency approval to build and operate the proposed desalination project.

Goals

The goals of the Public Outreach portion of the proposed project are:

1. Provide a centralized location for information regarding the proposed project. This information will include status reports, technical reports, environmental assessment reports, public outreach material, schedules, etc.
2. Provide a framework for delivering a consistent description of the proposed project to stakeholders, pertinent regulatory agencies, and the general public.

Work Plan

1. Designate a Public Outreach Coordinator, either a member of NCSD staff or a consultant. The Public Outreach Coordinator will be responsible for coordinating public outreach efforts with other aspects of the project, including:
    - reviewing submittals to regulatory agencies for consistency with other documents;
    - providing periodic updates to NCSD and the public;
    - responding to NCSD concerns and direction; and
    - responding to requests for information.
2. Initiate a public outreach campaign to inform stakeholders and the general public about the proposed project.
3. Establish a web site devoted to the project. Post public documents associated with the project.

Section 7 Design and Permitting

Coordination of Design and Permitting Activities

Preceding activities will define the basic project (including intake, discharge, and treatment facility concepts), so that design and permitting can proceed concurrently. It is assumed one of the major design goals will be to minimize permit issues and proactively address resource agency concerns expressed during initial project planning activities.

Design and Permitting Issues

The following issues should be addressed during design and permitting:

Minimizing Energy Consumption— Reverse Osmosis (RO) desalting is energy intensive. There are several potential opportunities for minimizing energy consumption of the desalting project. These include careful attention to details such as minimizing hydraulic losses through piping and valving, selection of efficient pumps, etc. In addition, four opportunities could reduce energy consumption significantly. These include:

- The RO feedwater pressure in a seawater desalting plant is typically on the order of 1000 psi. Permeate, perhaps 50% of the feedwater, exits the RO equipment at low pressure (perhaps 20 psi). The remaining 50% of the RO feedwater exits the RO equipment as concentrate at a pressure very near the RO feedwater pressure. That is, about 50% of the pumping energy in the RO feedwater remains in the concentrate exiting the RO equipment.
- Reducing RO membrane flux (or flow rate per unit area of filter) below typical values. Seawater RO plants typically operate at fluxes of 8 or 9 gallons per square foot (of membrane area) per day (gfd). Reducing flux can significantly reduce costs. For example, Boyle recently provided "value engineering" services to the Honolulu Water Supply Board regarding the design of the Kalaeloa 5 MGD seawater desalting plant. The designers initial used a design flux value of 9.5 gfd. Boyle calculated that reducing the average flux to 6.1 gfd would add $1,500,000 in construction costs but save $500,000 per year in O&M costs. The $1,500,000 in construction cost includes additional RO membranes and pressure vessels. The O&M cost savings accounts for more membrane elements being required, but that cost is more than offset by power cost savings (at $0.10/KWHr.)
- Alternatives to purchasing all of the power needed for the desalting project from PG&E should be considered. Utilization of "waste heat" from the Nipomo Refinery cooling system may be an option.
- Feed pump selection is critical to designing an energy-efficient RO facility. For instance, positive displacement (piston) type pumps should be considered instead of centrifugal pumps. They offer several distinct advantages including:

  a) Piston pumps operate at a constant speed and flowrate, but variable pressure whereas vertical turbine pumps need to be equipped with variable frequency drives (VFD) so the pump speed can be adjusted to provide the flow and pressure required;

  b) Piston pumps operate in the range of 300 RPM whereas centrifugal pumps for seawater RO plants operate at about 3000 RPM;

c) The life-cycle cost of piston pumps is typically less than for centrifugal pumps; and,

d) Piston pumps are typically at least 15% more efficient than centrifugal pumps.

Noise Attenuation—The proposed desalting plant may be located adjacent to another industrial facility, and is nearby to state park and recreational areas. The desalter can be expected to generate noise, and it is unknown whether this will be a significant concern. "Point noise sources", such as pumps, can be "boxed" in sound reducing enclosures. In addition, the building can be insulated to mitigate noises generated inside the building.

Pretreatment Using Membrane Filtration - Filtration of seawater, prior to RO, should be considered. The budget estimates presented in this TM assume prefiltration will be provided. Even if pilot testing suggests that seawater from the proposed subterranean intake exhibits a low Silt Density Index (SDI), filtration should be considered as "insurance" to prevent solids from reaching the RO membranes and damaging or destroying them. Considering the cost of the project and its importance to the District, installing filtration as pretreatment for the RO feedwater is recommended. Furthermore, membrane filtration is recommended in lieu of conventional filtration because experience has shown that membrane filtration provides much better quality water on a consistent basis. This higher quality water is reflected in easier and less expensive operation and maintenance including less frequent membrane replacement.

Xenobiotics - Xenobiotic is a term that has been coined to collectively aggregate pharmaceuticals and drug metabolites, personal care products, hormones, plasticizers, pesticides (including many that have been banned for decades), petrochemical byproducts and metabolites, and other potential endocrine disrupting chemicals. This is an emerging field of interest to water quality professionals. Of particular interest in a seawater-desalting project is domoic acid, an organic acid produced by diatoms. (Diatoms are a common type of phytoplankton.) This acid is extremely toxic to some marine species. Its impact on humans is not yet known. Neither is the amount (concentration) present in seawater at any particular location known.

Treating for removal/destruction of xenobiotics is in its infancy. (A xenobiotic is a chemical which is found in an organism but which is not normally produced or expected to be present in it. Specifically, drugs such as antibiotics are xenobiotics in humans because the human body does not produce them itself nor would they be expected to be present as part of a normal diet. However, the term is also used in the context of pollutants such as dioxins and polychlorinated biphenyls and their effect on the biota.) RO membranes remove some xenobiotics. Other potential treatment processes include carbon adsorption, ultraviolet light, and electron beam irradiation.

Boron Reduction - There is presently no Maximum Contaminant Level (MCL) for boron in drinking water. Boron concentration in seawater is in the range of 4 mg/L, and boron limits are commonly included in waste discharge requirements (WDRs) for wastewater treatment facilities around the state. Seawater RO membranes would reject some of the boron, but not all. If additional boron removal should be needed, ion exchange could be employed.

California Department of Health (DHS) Issues

- Sanitary Survey and Source Water Assessment—The DHS will most likely require a Sanitary Survey and Source Water Assessment for the project. Defining the area to be covered by the Sanitary Survey will probably require negotiation with DHS.
- Disinfection Requirements—Even if the seawater supply to the desalter should come from an subsurface collection system, it would still be considered surface water. It would be necessary to meet the Surface Water Treatment Rule. Membrane filtration and RO will certainly meet the filtration requirements. However, it should be expected that the DHS would also require at least 0.5 Log inactivation of giardia and 1.0 Log inactivation of viruses. Disinfection using chlorine or chloramines, with provisions to provide contact time prior to delivery of the desalted water to the first customer, should be anticipated.
- Disinfection By-Products—Chlorination byproducts such as Trihalomethanes (THM) and haloacetic acids (HAA) are not expected to be a problem. However, should ozone be used, bromate would be a problem. There is also the potential for xenobiotic disinfection byproducts. As noted above, xenobiotics is a new field and means of removing/destroying them are yet to be demonstrated.

General Approach

Project Design will likely consist of a Concept Design Report (including 30% plans and estimate) and 60%, 90%, and 100% plans, specifications, and estimates. Permitting will likely proceed in parallel with project design as follows:

- The Concept Design Report will become the basis of permit applications;
- Draft permit conditions will be included in the 60% submittal; and
- Final permit conditions will be incorporated in the 90% submittal.

Permit issuance should occur prior to completion of final plans and specifications, and prior to bidding the project and procuring a contractor.

Other work items that are typically performed during this phase may include:

- Prequalification and equipment selection for reverse osmosis system and/or pretreatment equipment (if necessary)
- Prequalification of (sub)contractors for beach well construction;
- Prequalification of general contractors for RO treatment plant construction;
- Value engineering of the 30% design; and
- Selection of a construction manager, and possibly use of their services for constructability review at the 60% and 90% progress milestones.

Section 8 Bidding and Construction

Overview

After design activities are completed, and permits are in hand, procurement of one or more contractors can proceed. Prequalification of consultants and/or subconsultants for specialty construction items was discussed briefly in the preceding section.

Bid-Phase Activities

Developing a bid strategy is critical for projects such as desalination facilities, with specialty items such as beach wells and treatment process equipment. This project will likely attract attention from contractors around the nation. The bid phase for this project could consist of several bid phases for separate work items, which overlap or are accomplished in parallel, or one bid phase for one contract (if multiple contracts are not issued). For the purposes of this project schedule, it is assumed the bid phase will be approximately 60-90 calendar days and will include the following activities:

- Prebid meetings (either mandatory or non-mandatory);
- Bid advertisement;
- Bid review and recommendation for award(s);
- Contract negotiation; and
- Notice to proceed

Construction-Phase Activities

Construction-phase activities will include construction by one or more contractors;

- Environmental mitigation and monitoring of various project components (as established in permit conditions and in CEQA/NEPA processes);
- Construction management and operation;
- Startup and testing of project components;
- Performance testing of the completed facility (as required by CDHS); and
- Initial deliveries to potable water customers.

Section 9 Schedule

A detailed schedule is included in Appendix C, and is summarized below. Note that the schedule presented is a "best case" opinion and assumes that no significant obstacles to implementation arise in the course of the impact studies, feasibility studies, design, environmental review, and construction.

Note that this is a "best case" projection, and that management and public outreach tasks are not shown as these tasks are assumed to run for the length of the project.

Projected Schedule

Task	Projected Completion Date
Terrestrial and Freshwater Impact Studies	April 2008
Phase 1 Marine Impact Studies	January 2009
Cultural Resource Study	March 2008
Phase 1 Hydrogeologic Field Study	July 2010
Test-Scale Feasibility Study	March 2013
Phase 2 Hydrogeologic Field Study	April 2013
Preliminary Engineering	October 2013
CEQA/NEPA	March 2014
Design and Permitting	March 2015
Bidding and Construction	May 2016

Section 10 Budget

Probable Cost of Implementation and Operation

An opinion of the probable cost of implementing and operating the proposed project, producing 6,300 acre-feet (af) per year, is presented below. Implementation costs are annualized at 6% over 20 years to determine probable annual costs.

	Cost	Annual Cost**	Cost/af
Implementation Costs*			
Terrestrial and Freshwater Impact Studies	$ 440,000		
Phase 1 Marine Impact Studies	250,000		
Cultural Resource Study	66,000		
Phase 1 Hydrogeologic Field Study	360,000		
Test-Scale Feasibility Study	2,320,000		
Phase 2 Hydrogeologic Field Study	180,000		
Preliminary Engineering	210,000		
CEQA/NEPA	240,000		
Public Outreach	1,310,000		
Design and Permitting	3,870,000		
Construction	67,940,000		
Project Management	1,500,000		
Total before Escalation	**$ 78,700,000**		
Cost Escalation	19,510,000		
Total with Escalation	**$ 98,210,000**	**$8,562,000**	**$1,400**
Operation and Maintenance Costs			
Intake Pipeline Pumping Cost @ $0.13/kWh		$180,000	$29
Treatment Plant Operation and Maintenance		$6,220,000	987
Delivery Pipeline Pumping Cost @ $0.13/kWh		$630,000	$100
Subtotal O&M Costs		**$7,030,000**	**$1,100**
Total		**$15,590,000**	**$2,500**
* Cost items include allowance for 20% to 30% contingencies.			
** Implementation costs annualized at 6% over 20 years.			

Phased Implementation

It may be possible to implement the proposed project in phases. Phase 1 would produce 3,000 acre-feet per year (afy) and Phase 2 would produce an additional 3,300 afy. All of the intake, discharge, and delivery facilities would be implemented during Phase 1. Most of the treatment plant itself would also be constructed during Phase 1, with provisions made for future connection of additional pre-treatment and RO components. An opinion of probable construction costs associated with this phased approach is presented in Appendix D. It is expected that under a phased approach at most 20% of implementation costs could be shifted to Phase 2. Probable total and annualized costs for Phase 1 would be as follows:

	Cost	Annual Cost	Cost/af
Phase 1 Implementation Costs			
Terrestrial and Freshwater Impact Studies	$ 440,000		
Phase 1 Marine Impact Studies	250,000		
Cultural Resource Study	66,000		
Phase 1 Hydrogeologic Field Study	360,000		
Test-Scale Feasibility Study	2,320,000		
Phase 2 Hydrogeologic Field Study	180,000		
Preliminary Engineering	210,000		
CEQA/NEPA	240,000		
Public Outreach	1,310,000		
Design and Permitting	3,870,000		
Construction	58,200,000		
Project Management	1,500,000		
Total before Escalation	**$ 68,950,000**		
Cost Escalation	16,940,000		
Total with Escalation	**$ 85,890,000**	**$7,488,000**	**$2,500**
Operation and Maintenance Costs			
Intake Pipeline Pumping Cost @ $0.13/kWh		$86,035	$29
Treatment Plant Operation and Maintenance		$2,960,000	$987
Delivery Pipeline Pumping Cost @ $0.13/kWh		$300,000	$100
Subtotal O&M Costs		**$3,346,035**	**$1,100**
Total		**$10,830,000**	**$3,600**
* Cost items include allowance for 20% to 30% contingencies.			
** Implementation costs annualized at 6% over 20 years.			

Section 11 Conclusions and Recommendations

The District Board should consider the following

- As presented in this Work Plan, implementation of a desalination plant may require approximately $79 M on a present worth basis (not including contingency or cost escalation, which are included in the cost opinions and cashflow analyses presented in this study). These estimates are considered preliminary, and may change significantly as the project proceeds.

- Additional costs include the distribution system improvements for the long-term Supplemental Water Project as recommended in the draft Water Master Plan.

- The implementation period may take over 8 years.

- While other seawater desalination projects similar in size to the District's project, or larger (such as the Monterey Bay, or Dana Point facilities) have put significant time, effort, and expense into permitting and initial studies for a desalination project, neither projects have received all their permits and they are still in the pilot testing and feasibility study phases.

- Little is known about the hydrogeologic characteristics of the areas proposed for subsurface intakes and discharges. Therefore, it is unknown whether these structures will be feasible.

- Although the South SLO County desalination study participants have not begun implementation of a desalination project, there may be considerable pressure from regulatory agencies to form a regional partnership in lieu of developing two (2) desalination projects approximately 6-7 miles apart.

Boyle recommends proceeding with the following tasks, in order to begin implementation of a desalination project:

- Begin initial funding analysis of this project, in order to assess developer impact fees, water rates, and financial responsibility of project partners (other Nipomo Mesa water purveyors);

- Conduct an initial meeting with the San Luis Obispo County planning department, and other resource agency representatives, in order to begin identifying permitting issues and processes;

- Contact PG&E and discuss availability of power at the potential treatment plant sites, in order to identify the schedule and cost to upgrade electrical service to these locations (if required);

- Meet with the South SLO County desalination study partners to discuss potential for working together; and

- Begin searching for appropriate grant funding sources.

Section 12 References

Boyle Engineering, Engineering Feasibility Study, Dana Point Ocean Desalination Project, March 2007, prepared for Municipal Water District of Orange County.

California Department of Water Resources, Southern District, "Water Resources of the Arroyo Grande – Nipomo Mesa Area," 2002,

California Regional Water Quality Control Board Central Coast Region, Staff Report for Regular Meeting of April 19, 2002, Prepared March 20, 2002, Item: 11, Subject: Reissuance Of National Pollutant Discharge Elimination System Permit For Tosco Refining Company, Santa Maria Refinery, San Luis Obispo County--Order No. R3-2002-0010, NPDES No. CA0000051.

Condor Environmental, Alternative Access Study, Oceano Dunes State Vehicular Recreation Area, Prepared For California State Parks, Oceano Dunes District, November 15, 2006.

Monterey Bay National Marine Sanctuary, 2003, Draft Action Plan: Coastal Development: Desalination, revised: May 13, 2003

Appendices

Appendix A: Treatment Plant Site Options

Treatment Plant Site Options

As directed by the Board, Boyle evaluated three (3) potential sites for the proposed desalination facility. The following criteria were important in evaluating these sites:

1. Ability of the District to purchase the property;
2. Proximity to existing District service area;
3. Proximity to the proposed beach well/subsurface discharge sites;
4. Availability of power sufficient for a desalination facility;
5. Appropriate zoning for an industrial facility, and "buffer" from residential or commercial areas; and
6. Limited visual impact.

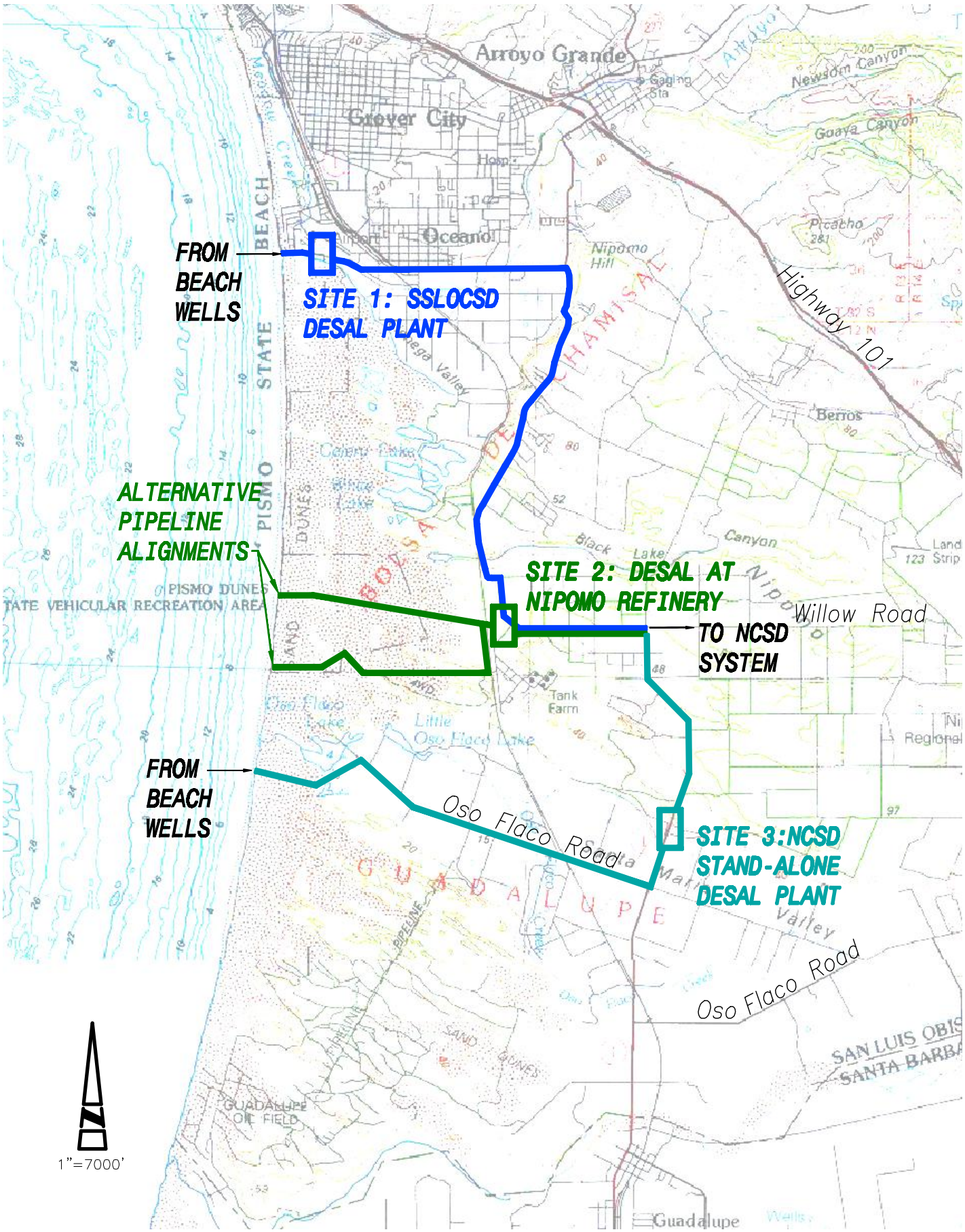
Boyle reviewed three (3) potential sites (see Figure A-1) with District staff. General opinions about these sites are summarized below:

Site 1 – South County SLO County Sanitation District Facility (Partnership with Arroyo Grande, Grover Beach, and Oceano CSD): Utilization of this site would require regional partnership and cooperation. At this time, the other agencies have not developed a formal Memorandum of Understanding or an agreement to begin implementing a desalination project, although they have received a Proposition 50 grant to perform a desalination feasibility study. The site is approximately seven (8) miles from the District service area, which is 5-6 miles farther than the other proposed sites. Because the site is located within the SSLOCSD Wastewater Treatment Facility's (WWTF) property, it would be in an appropriate area from the land planning perspective. In addition, the South SLO County agencies are planning to utilize the SSLOCSD WWTF's ocean outfall for brine discharge. If Nipomo joined this partnership, a different discharge strategy must be pursued because the other agencies had planned to utilize all the capacity in the outfall for their project (approximately 2300 AFY of production).

Boyle reviewed these issues with District Staff, and it was decided this site would be considered in the future but had some potential fatal flaws.

Site 2 – Adjacent to Nipomo Refinery: This site is not currently owned by the District, but the owners of the Refinery may consider selling, or leasing, it to the District. The site is approximately 1.5 miles from major transmission lines within the District's service area, which is preferable compared to Site A, but the distance to the ocean is approximately 3 miles. The Refinery is zoned as an industrial facility, so a desalination plant would be considered an appropriate land use for the adjacent property because visual impacts (and possibly noise) would not be significant concerns. In addition, the Refinery may be able to provide "waste heat" from their cooling operations in order to help reduce the District's power costs. The cost opinions developed in this TM were based on locating the plant at this location.

Site 3 – Undeveloped Parcel on Highway 1: This 35 acre parcel is not currently owned by the District, but the owners may consider selling it to the District. The site is approximately 2 miles from major transmission lines within the District's service area, which is preferable compared to Site A. However, the proposed intake and discharge lines would be approximately 5 miles long. The parcel is zoned for rural residential development, so a desalination plant could be considered an inappropriate land use for because visual impacts (and possibly noise) would be significant concerns. However, the western portion of the site is adjacent to Highway 1 and is immediately south of a wastewater treatment site. Therefore, industrial development of the western portion of the parcel may be possible.



DWG: W:\Nipomo CSD (19996)\19996.32 (Alternative Water Supply)\CAD\Exhibits\FIGURE 1-1 - Plant Siting and Pipeline Alignment Alternatives.dwg USER: rpiza
DATE: Sep 28, 2007 3:40pm XREFS: G-BDBx11h BEClogo North Arrow IMAGES: Google Earth 9-24-07.jpg New Picture (1).bmp

BOYLE ENGINEERING CORPORATION

NIPOMO COMMUNITY SERVICES DISTRICT

PLANT SITING AND PIPELINE ALIGNMENT ALTERNATIVES

BEC PROJECT NO. 19996.32

FIGURE A-1

Appendix B: Environmental and Permitting Constraints Analysis

Supplemental Water Alternatives, Environmental and Permitting Constraints Analysis, Prepared By Padre Associates, Inc. for Nipomo Community Services District, May 25, 2007.

NIPOMO COMMUNITY SERVICES DISTRICT

SUPPLEMENTAL WATER ALTERNATIVES ENVIRONMENTAL AND PERMITTING CONSTRAINTS ANALYSIS

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May 25, 2007

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1.0 INTRODUCTION

At the request of Boyle Engineering Corporation (Boyle), Padre Associates, Inc. (Padre) has prepared this environmental and permitting constraints analysis for supplemental water supply alternatives under consideration by the Nipomo Community Services District (NCSD). The following provides an overview of the primary environmental constraints and permitting issues associated with the six supplemental water supply alternatives under consideration by the NCSD.

1.1 SCOPE OF SERVICES

Padre's scope of services included the following tasks:

- Collection and analysis of existing environmental data for the water supply options;
- Preparation of a constraints analysis identifying potential environmental impacts associated with each of the water supply options;
- Identification of permitting requirements for each alternatives;
- Preparation of a permitting requirements matrix which presents a list of resource surveys and other pertinent environmental information that would be required by permitting and regulatory agencies.
- Preparation of this report presenting Padre's findings regarding the environmental and permitting constraints for the supplemental water alternatives under consideration.

This report is divided into five sections: Section 1 introduces the supplemental water supply alternatives. Section 2 provides a discussion of the federal, state, and local agencies that would be involved in permitting any of the alternatives and types of anticipated permits needed. Section 3 presents an overview of environmental resources that may be affected by the alternative projects and potential constraints to constructing the alternative projects. Section 4 provides a summary of salient points and Padre's recommendations. Section 5 presents the references cited in the report.

1.2 DESCRIPTION OF ALTERNATIVES

Presented below are descriptions of each of the water supply alternatives discussed in this report. Refer to Figure 1 for the relative locations of the proposed features of each alternative.

Alternative No. 1 (Sea Water/Cooling Water):

This alternative would include a water treatment facility located at either the ConocoPhillips (COP) Santa Maria Refinery using process cooling water as a water source, desalination of sea water at another location owned and operated by NCSD, or at the South San Luis Obispo County Sanitation District (SSLOCSD) Wastewater Treatment Facility located in Oceano.

Alternative No. 2 (Oso Flaco Lake Wells): This alternative would involve treating shallow groundwater or agricultural runoff at Oso Flaco Lake and delivering the treated water to the NCSD distribution system. This alternative may include extraction of either shallow ground

water, or surface runoff from agricultural lands into Oso Flaco Lake could be used as a water supply. The NCSD would build a new ocean outfall for the brine. In addition, enough water would be treated so that "cleaner" water would be released into the watershed to improve the health of the Oso Flaco wetlands.

Alternative No. 3 (Water Trading with CCWA Agencies): The State Water Project is a complex system of dams, reservoirs, power and pumping plants, canals, and aqueducts built to convey water from Lake Oroville to the Sacramento Delta, then on to Central and Southern California. The Coastal Branch of the State Water Project consists of (1) water conveyance facilities built by the California Department of Water Resources and (2) regional distribution and treatment facilities constructed by a cooperative group of local water agencies and cities operating as the Central Coast Water Authority (CCWA). Coastal Branch Phase II of the State Water Project was built between 1993 and 1997 to bring State water to San Luis Obispo and Santa Barbara Counties as per the Water Supply Contracts entered into by the State and both counties.

This alternative would consider acquiring unused capacity in the State Water Project (SWP) from one or more CCWA project participants, including acquiring exchange water from one or more CCWA project participants including Golden State Water Company. Water could be provided via a turnout along the State Water Pipeline within the NCSD boundary. This water would then either be delivered directly to the NCSD water system via pipeline from the Tefft Street turn-out, at a Bonita Well turnout, or indirectly via aquifer storage and recovery. As an option, NCSD could buy water directly from the CCWA or utilize aquifer storage and recovery for use of CCWA water for seasonal water needs.

Alternative No. 4 (Santa Maria Valley Groundwater): The City of Santa Maria may be willing to sell some of their entitlement to underflow water to NCSD. Facilities required to utilize this resource would include a wellfield, possibly treatment (based on regulatory review), pumping, storage, and a connection from the proposed wellfield to the District distribution system. It is assumed collector wells would be located along the Santa Maria River, near the end of Hutton Road or at the Bonita Well site.

Alternative No. 5 (Groundwater Recharge from Southland Wastewater Treatment Facility): This alternative would develop a groundwater recharge program within the Nipomo Mesa Management Area (NMMA) involving recharge of the groundwater basin with recycled water from Southland Wastewater Treatment Facility (WWTF). The NCSD owns and operates the Southland Wastewater Treatment Facility (WWTF), located just west of Highway 101 in the southern portion of Nipomo. It is anticipated recycled water could be pumped to the proposed recharge facilities during certain periods of the year. It is understood that the NCSD proposes to locate the proposed recharge facilities within the vicinity of the local groundwater pumping depression identified in previous studies of the Nipomo mesa groundwater basin. As an option under this alternative, NCSD could exchange water rights with Black Lake Golf Course, Black Lake development landscaping, and the Woodlands Golf Course and utilize treated wastewater for irrigation water at these areas.

The proposed groundwater recharge of recycled water within the study limits would not introduce a new supplemental water source from outside the NMMA, however, it would be

intended to provide a means to manage and help stabilize the groundwater basin within the subject area. As proposed, this alternative is intended to function as a groundwater management program and not a true supplemental water alternative.

Alternative No. 6 (Treated Water Exchange with Agricultural Water Users): The Southland WWTF provides secondary treatment for a mixture of domestic and industrial wastewater from part of the Nipomo community. This alternative would include a groundwater exchange program involving delivery of recycled water from Southland WWTF to potential agricultural users within the vicinity of the groundwater pumping depression previously identified in the Nipomo Mesa. As directed by NCSD staff, the boundary limits of this alternative include the depressed groundwater basin bounded by the Oceano and Santa Maria River Faults and within the NMMA.

The proposed groundwater exchange of recycled water for agricultural production will not introduce a new supplemental water source from outside the NMMA; however, it will be intended to provide a means to manage and redistribute the water balance within the subject area of the NMMA. As proposed, this scenario will provide for the transfer of a non-potable water source (reclaimed water from Southland WWTF) to potential agricultural users for either direct reuse in irrigation of crops or for percolation and subsequent recovery. In exchange, the groundwater previously pumped by the same agricultural users would either be: (1) directly pumped (at the subject wells) and transmitted for use by NCSD; or (2) indirectly extracted by NCSD at existing or new well locations.

2.0 PERMITTING REQUIREMENTS

This section lists and discusses the regulatory agencies that have jurisdiction and their permitting requirements within the area of the water supply alternatives under consideration. Proposed alternatives would require various federal, state, and local approvals, depending on the alternative. Refer to Table 1 for a general list of anticipated permitting agencies that would be involved with permitting one or more alternatives. Presented below is a description of each regulatory agency's anticipated role in review and permitting of the proposed alternatives.

2.1 FEDERAL AGENCIES

United States Army Corps of Engineers (USACE). The USACE would likely be the lead federal agency for the proposed project for placement of fill (including temporary trench spoils) within navigable waters of the U.S. under Section 404 of the Clean Water Act. The USACE also issues permits for construction of facilities within navigable waters in accordance with Section 10 of the Rivers and Harbors Act of 1899. During review of a permit application, the USACE will consult with the U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) to identify potential effects to federally-listed endangered and threatened species as required under Section 7 of the Endangered Species Act (ESA). A Biological Assessment would be required as part of this consultation to provide sufficient information for the USACE, USFWS, and NOAA Fisheries to fully determine the project's potential to affect federally-listed threatened or endangered species. A review of potential impacts to cultural or historical resources is coordinated through consultation with the State Historic Preservation Office.

A Jurisdictional Waters of the U.S. survey (wetlands delineation) may also be required to identify wetlands that may be impacted by the project. The USACE's jurisdiction under Section 404 of the Clean Water extends to the ordinary high water mark of a river or stream.

USACE permitting would likely affect Alternatives 1, 2, 3, and 4, wherever new construction of conveyance pipelines or other facilities would impact federal waters. Without more detailed engineering specifications, it is unclear to what extent federal waters may be affected. Depending on the alternative selected for implementation, the proposed project may potentially fall within one or more Nationwide Permits (NWP) developed by the USACE for major routine types of construction projects within federal waters.

National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries). NOAA Fisheries is responsible for the protection of marine fish and mammal species by administering the regulations listed in the ESA, Marine Mammal Protection Act, and the Magnuson-Stevens Fishery Management and Conservation Act. Based on the preliminary information available, NOAA Fisheries may not be involved for onshore portion of the alternatives unless the selected project would result in disturbance within the Santa Maria River or Nipomo Creek. The USACE would consult with NOAA Fisheries for potential impacts to marine fisheries and marine mammals for an ocean outfall pipeline proposed under alternative Nos. 1 or 2.

United States Fish and Wildlife Service (USFWS). The USFWS will be requested to review the project by the USACE with respect to potential impacts to federally-listed threatened

or endangered species. Such consultation will be initiated during the 404 or 10 permit process. Impact of critical habitat may also result in seasonal restrictions and recommendations for habitat restoration. Potential endangered species impacts under alternatives 1 through 4 may include potential takes of listed species known to occur in creeks and wetlands along pipeline routes. Under the Alternative 2 scenario, impacts to water quality or quantity within Oso Flaco Lake or creek could affect habitat. The USFWS would be a key stakeholder in mitigation of potential affects of water withdrawals from the Oso Flaco lake watershed. Additionally, impacts from desalination proposals would be required to avoid takes of habitat or individual Western snowy plover or least tern from proposed seawater intake structures or brine outfall lines.

2.2 STATE AGENCIES

Central Coast Regional Water Quality Control Board (RWQCB). The RWQCB's primary responsibility is to protect the quality of the surface and groundwater within the Central Coast region for beneficial uses. The duty is carried out by formulating and adopting water quality plans for specific ground or surface water bodies, by prescribing and enforcing requirements on domestic and industrial waste discharges, and by requiring cleanup of water contamination and pollution.

Pursuant to Section 401 of the Clean Water Act, the USACE permit under Section 404 is not active until the State of California first issues a water quality certification to ensure that a project will comply with state water quality standards. The authority to issue water quality certifications in the project area is vested with the RWQCB. All of the considered alternatives would involve construction activities which would expose greater than one acre of disturbed construction area to stormwater runoff, and would require enrolling for coverage under the General Construction Stormwater Permit issued by the State Water Resources Control Board and enforced by the RWQCB.

Alternative No. 1 (Seawater/Cooling Water) would likely include requirement of a National Pollutant Discharge Elimination System/Waste Discharge Requirements (NPDES/WDR) permit from the RWQCB for brine discharge to the ocean associated with any of the three scenarios. Also, Alternative No. 2 (Oso Flaco Agricultural Return Water) may also involve the discharge of treated brine to the ocean, requiring a NPDES/WDR permit from the RWQCB. Brine discharges would be required to meet state and federal water quality standards for ocean disposal in accordance with the California Ocean Plan. Impacts to marine organisms from brine discharge would also be considered a potential significant impact under the CEQA.

California Coastal Commission. The California Coastal Commission regulates development activities along California's coastline and within the designated coastal zone under the authority of the California Coastal Act. Within the Nipomo area, the coastal zone boundary extends inland from the coastline to Highway 1. Projects approved by the County within the coastal zone can be appealed to the Coastal Commission for independent review for consistency with the Coastal Act. Additionally, projects with construction activities seaward of mean high tide line or affecting coastal streams or environmental sensitive habitat areas (ESHAs) fall within the Coastal Commission's original jurisdiction and would require a Coastal

Development Permit issued by the Coastal Commission. Alternatives 1 and 2 would be located within the coastal zone and would be subject to Coastal Commission review and approval.

California State Lands Commission (CSLC). The CSLC manages the state's submerged tidelands along the California coast from the mean high tide line and seaward for three nautical miles. Construction of facilities within CSLC jurisdiction would require a state lands lease. Approval of the state lands lease is made by the commission, composed of the lieutenant governor, the state controller, and the state finance director. Alternatives 1 and 2 would include ocean outfall structures placed in CSLC jurisdiction and would require a state lands lease.

California Department of Fish and Game (CDFG). CDFG administers Section 1600 of the California Fish and Game Code. The regulation requires a Lake or Streambed Alteration Agreement (SAA) between CDFG and the applicant before the initiation of any construction project that will: 1) divert, obstruct, or change the natural flow or the bed, channel, or bank of any river, stream, or lake; 2) use materials from a streambed; or 3) result in the disposal or deposition of debris, waste, or other loose material where it can pass into any river, stream, or lake.

The CDFG also administers a number of laws and programs designed to protect fish and wildlife resources. Principle of these is the California Endangered Species Act of 1984 (CESA - Fish and Game Code Section 2050), which regulates the listing and take of state endangered (SE) and threatened species (ST). Under Section 2081 of CESA, CDFG may authorize the take of an Endangered and/or Threatened species, or candidate species through an Incidental Take Permit. However, plant or animal species that are "Fully Protected" under state law cannot be taken and no Incidental Take Permits may be issued. In the project area, the California least tern, the Southern sea otter, and the white-tailed kite are all fully-protected species.

Alternatives 1, 2, 3, and 4 would likely require SAA permits from the CDFG for pipeline creek crossings. The CDFG is a trustee agency under CEQA, and would likely provide comment on the CEQA document regarding potential project impacts to animal and plant species designated rare, threatened/endangered, or fully-protected status.

California Department of Health Services (DHS). DHS is responsible for overseeing the quality of water once it is in storage and distribution systems. DHS oversees the self-monitoring and reporting program implemented by all water purveyors, performs inspections, and assists with financing water system improvements for the purpose of providing safer and more reliable service. A Water Supply Permit Amendment would be required from DHS for any of the alternatives under consideration.

California Department of Transportation (Caltrans). Caltrans is responsible for managing California's highway and freeway systems and works collaboratively with local agencies to ensure proper management of local roadway systems. Caltrans reviews all requests from utility companies, developers, volunteers, nonprofit organizations, etc., desiring to conduct various activities within their right-of-way (ROW). Construction activity being proposed along a Caltrans ROW would require a Standard Encroachment Permit from Caltrans prior to project implementation. This could potentially occur with all alternatives except Alternatives 5 and 6.

2.3 LOCAL AGENCIES

County of San Luis Obispo. All of the alternatives would be within the jurisdiction of San Luis Obispo County land use regulations (SLO County). SLO County will require that a conditional (or minor) use permit, grading permit, and building permit be issued for the construction and operation of the project facilities (i.e. pipelines, wells, and storage) and will analyze the project to determine consistency with any applicable standards or policies. SLO County may impose specific requirements/conditions be incorporated into the permit governing the design or operation of the project and may not approve the permit unless it is found to be consistent with the County's General Plan and Land Use Ordinance. The County would be a permitting agency under CEQA and would rely on the NCSD's CEQA determination in issuance of permits. Encroachment along county roadways would require a standard encroachment permit issued by the County Public Works Department.

San Luis Obispo County Air Pollution Control District (APCD). The APCD would review proposed project for compliance with applicable Federal, State and local air quality control criteria. For any of the alternatives, NCSD likely would be required to submit a Construction Activity Management Plan to the APCD which will address construction-related dust control and equipment emissions. The CAMP will be required to address construction-related air impacts through various mitigation techniques. Detailed documentation of proposed project emissions (such as from organics removal during treatment) will be required to obtain Authority to Construct/Permit to Operate permits, if needed.

San Luis Obispo County Division of Environmental Health. The County Division of Environmental Health (SLODEH) is the local approval agency for issuance of water supply well permits or injection wells within a drinking water aquifer. Wellhead protection regulations require a minimum separation of water supply wells from wastewater disposal facilities. Under Title 22 regulations, the SLODEH may require any injected water to meet drinking water standards prior to injection.

2.4 CALIFORNIA ENVIRONMENTAL QUALITY ACT

The NCSD would act as the lead agency for compliance with the California Environmental Quality Act (CEQA) for implementation of any of the water supply alternatives under consideration. The NCSD would prepare an Initial Study/ Mitigated Negative Declaration (IS/MND) or Environmental Impact Report (EIR) for the selected project, depending on the level of impacts anticipated. During the CEQA process, NCSD would consult with other state and local agencies regarding concerns and suggested mitigation for environmental impacts. Environmental issues that arise during CEQA processes will be addressed through project design modifications or mitigation measures included in the CEQA document. Following completion of the CEQA process, the NCSD would submit permit applications to regulatory agencies as appropriate and negotiate permit conditions as needed.

Table 1. Permit Requirements Summary

Agency	Permit/Approval	Regulated Activity	Authority
Federal Agencies			
U.S. Army Corps of Engineers (USACE)	Section 404 permit Section 10 permit	Discharge of dredged or fill material into water of the U.S. during construction. Jurisdictional water include territorial seas, tidelands, rivers, streams, and wetlands	Section 404 Clean Water Act (33 USC 1344). Rivers and Harbors Act
U.S. Fish and Wildlife Service (USFWS)	Endangered Species Act, Section 7 consultation	Impacts to federally-listed species and species proposed for listing.	16 USCA 1513 50 CFR Section 17
NOAA Fisheries	ESA, Section 7 consultation	Impacts to federally-listed species and species proposed for listing.	16 USCA 1513 50 CFR Section 17
State of California Agencies			
Regional Water Quality Control Board	Section 401 Water Quality Certification SWPPP Permit NPDES/WDRs	Discharges that may affect surface and ground water quality.	Clean Water Act Porter-Cologne State Water Quality Act (1969)
California Coastal Commission	Appeal Jurisdiction within Coastal Zone	Projects within Coastal Zone approved by County can be appealed to Coastal Commission for review and approval.	California Coastal Act
California Department of Fish and Game (CDFG)	1602 Permit Section 2081 Management Agreement	Crossing of streams and rivers that will result in disturbance to the streambed. Potential adverse effects to State-listed species	Sections 1601-1607 of California Fish and Game Code. Section 2081 of the Fish and Game Code
California State Lands Commission	State Lands Lease	Project activities offshore of mean high tide line.	California Public Resources Code, Division 6.
California Department of Health Services	Water Supply Permit Amendment	New water source	Ca Health and Safety Code, Div. 104, Part 12, Chapter 4 Article 7, Section 116525
California Department of Transportation	Standard Encroachment Permit	Construction activity within Caltrans right-of-way.	California Streets and Highway Code
Local Agencies			
County of San Luis Obispo Planning and Building Department	Development, Grading, Building Permit	Land use, grading, drainage, encroachment permit	San Luis Obispo County Code
San Luis Obispo APCD	Authority to Construct	Emissions associated with construction may require permits.	Clean Air Act
County of San Luis Obispo Division of Environmental Health	Well Construction Permit	Construction new water supply wells	California Water Code

3.0 ENVIRONMENTAL CONSTRAINTS

The following section describes the potential environmental constraints associated with the six water supply alternatives under consideration by the NCSD. Based on Padre's initial review of the project alternatives and review of permitting requirements, the probable issues that will need to be addressed during the permitting process for this project are biological resources including wetlands, cultural resources, geology and soils, and hydrology/ water quality. The following provides an overview of the environmental issue areas with emphasis on the sensitive biological resources that are expected to occur within the project area due to the presence of suitable habitat. The resources and required mitigation, if any, will be the focus of the respective regulatory agency review during the permit acquisition phase of the project.

3.1 BIOLOGICAL RESOURCES

Padre conducted a desk-top review to determine potential biological resource constraints within the vicinity of the identified water supply alternative location. This review included a query of the California Natural Diversity Database (CNDDB [CNDDB, 2006]) for the purposes of identifying documented occurrences of special-status plant and animal species within the vicinity of the alternative projects. Figures 2 through 5 illustrate the known occurrences of special-status species in relationship to the water supply alternatives under consideration. The figures illustrate a representative sample or ranges for known species occurrences.

3.1.1 Federally-Listed Animal Species

California red-legged frog (*Rana aurora draytonii*). The California red-legged frog (CRLF) is a federally-listed threatened species and a California species of special concern. The CRLF occurs in different habitats depending on their life stage and season. CRLF breed from November through March. All stages are most likely to be encountered in and around breeding sites, which include marshes, springs, permanent and semi-permanent natural ponds, ponded and backwater portions of streams, as well as artificial impoundments such as stock ponds, irrigation ponds, and siltation ponds. This species prefers dense emergent and bank vegetation including willow (*Salix* sp.), cattail (*Typha* sp.), and bulrush (*Scirpus* sp.). The absence of these plant species within the site does not exclude the possibility that the site provides CRLF habitat, but the presence of one or all of these plants is an important indicator that the site may provide foraging or breeding habitat (USFWS, 2005).

CRLF is a concern for alternatives 1, 2, and 4 due to the known presence or suitable habitat in creeks and wetlands within the project Nipomo area, especially around Oso Flaco Lake and Oso Flaco Creek. As such, formal Section 7 consultation pursuant to Section 404 of the Clean Water Act would be useful between the USACE and the USFWS to further assess potential CRLF impacts due to project implementation and the need for project-specific avoidance and minimization measures. This would include preparation of a Biological Opinion (BO) by the USFWS which will ultimately result in approval for authorized individuals to survey for and, as necessary, relocate CRLF from the project area during project implementation (i.e., "Take Statement").

Steelhead – Southern California ESU (*Oncorhynchus mykiss irideus*). Steelhead have been divided into 15 evolutionary significant units (ESU) based on similarity in life history, location, and genetic markers. The Southern California ESU was listed as federally endangered by the NOAA Fisheries in 1997. Southern California steelhead is also a California species of special concern. Steelhead are an anadromous form of rainbow trout that reproduce in freshwater, but spend much of their life cycle in the ocean, where increased prey density provides a greater growth rate and size. The Southern California ESU includes all naturally spawned populations of steelhead (and their progeny) in streams from the Santa Maria River (inclusive) to the southern extent of the species' range (U.S. – Mexico border). Historical information suggests that the Santa Maria River supported a steelhead run in the early 1900s. Currently, there is no evidence suggesting presence of this species in the Santa Maria River for several decades. However, it is assumed this species has the potential to occur within the Santa Maria River during periods of adequate flow (i.e., January through April).

Steelhead may not be a significant species of concern for the alternatives under consideration unless there would be an affect to the Santa Maria River. Existing fish migration barriers that exist at Nipomo Creek currently impede migration of steelhead upstream of the Hutton Road area. As part of the USACE permit process, Section 7 consultation per the ESA will be conducted with NOAA Fisheries to further assess potential steelhead impacts due to project implementation and the need for project-specific avoidance and minimization measures.

Western Snowy Plover (*Charadrius alexandrinus*) . The coastal population of nesting western snowy plover is federally-listed threatened species and a California species of special concern. The western snowy plover frequents sandy beaches and estuarine shores within the project site; requiring sandy, gravely or friable soil substrates for nesting. Western snowy plover breeding and nesting is currently being monitored by State Parks as part of their ongoing efforts to document snowy plover activity within the area. Plovers are known to occur in suitable habitat areas from Guadalupe Dunes to Pismo Beach. This species would be of concern for alternative Nos. 1 and 2 associated with any construction activities within Nipomo-Guadalupe dune complex.

California Least Tern (*Sterna antillarum brownii*). The California least tern is a migratory bird that is protected under both the provisions of the federal and California endangered species acts as endangered. Many areas of coastal habitat for the California Least Tern have been significantly modified by human activities, such as marinas and industrial development, and housing. Other threats to tern populations include increased predation (a result of anthropogenic factors and habitat modification), potential for washouts by significantly high tides, and recreation. Least tern spring migrants arrive and move through the area around the latter part of April. Egg-laying usually occurs at most of the sites by late May, with hatching chicks present in mid June. Least tern are known to occur in suitable habitat areas from Guadalupe Dunes to Pismo Beach.

3.1.2 Special-Status Plants

Gambel's water cress (*Rorippa gambellii*). Gambel's watercress is a federally and state-listed endangered species in the mustard family (Brassicaceae). Gambel's water cress occurs in freshwater or brackish marshes and swamps between 5 and 330 meters. This

species typically blooms from April to September. Gambel's water cress is known to occur in only four remaining locations in California.

La Graciosa thistle (*Cirsium loncholepis).* La Graciosa thistle is a federally endangered, state threatened species, and a CNPS List 1B species. This species is a perennial herb in the sunflower family (Asteraceae) that typically blooms May through August. La Graciosa thistle occurs in coastal dunes, brackish marshes, or riparian scrub often in association with lake edges, riverbanks, and other wetlands.

Nipomo Mesa lupine (*Lupinus nipomensis*). Nipomo Mesa lupine is an annual herb in the pea family (Fabaceae) that occurs in coastal dune habitat between 10 and 50 meters. This species typically blooms from December through May. Nipomo Mesa lupine is a federally endangered, state threatened species, and a CNPS List 1B species. This species is known from only one extended occurrence of five populations on Nipomo Mesa in San Luis Obispo County.

San Luis monardella (*Monardella frutescens*). San Luis monardella is a rhizomatous herb in the mint family (Lamiaceae). San Luis monardella is a CNPS List 1B species that is known to occur in San Luis Obispo and Santa Barbara Counties. This species inhabits coastal dunes and coastal scrub habitat associated with sandy soils between 10 and 200 meters. San Luis monardella generally blooms from May to September.

Blochman's leafy daisy (*Erigeron blochmaniae*). Blochman's leafy daisy is a rhizomatous herb in the sunflower family (Asteraceae) known to occur in San Luis Obispo and Santa Barbara Counties. Blochman's leafy daisy is a CNPS List 1B species. This species typically blooms from June through August and occurs in coastal dune and coastal scrub habitat between 3 and 45 meters.

Dune larkspur (*Delphinium parryi* ssp*. blochmaniae*). Dune larkspur is a CNPS List 1B species known to occur in San Luis Obispo, Santa Barbara, and Ventura Counties. This species is a perennial herb in the buttercup family (Ranunculaceae) that inhabits coastal dune and chaparral habitat between 0 to 200 meters. Dune larkspur generally blooms from April through May.

3.1.3 Other Potentially Occurring Special-Status Species

Although species described in this section are not indicated on the occurrences maps included (Figures 2 – 5), they have been included based on their occurrences within the Nipomo area.

Coast horned lizard (*Phrynosoma coronatum frontale*). The coast horned lizard is a federal species of concern and a California species of special concern that occurs in a variety of open habitats that provide sites for basking, sandy or sandy-loam substrates for night-time burial, and a suitable prey base (the species feeds almost exclusively on native ants). It was historically distributed throughout the Central and Coast Range of California, but now occurs at scattered, disjunct locations within this former range. The coast horned lizard produces clutches of 6 to 21 eggs from May to June and hatching typically occurs in August through September. A single coast horned lizard was observed within the non-native grassland/coastal sage scrub habitat area along the south side of the Santa Maria River in 2005 (Douglas Wood &

Associates, Inc., 2006). The coast horned lizard has the potential to occur throughout the Nipomo area. As such, mitigation to avoid and/or minimize impacts to coast horned lizard during project implementation would be determined during consultation with CDFG.

Southwestern pond turtle (*Clemmys marmorata pallida*). The southwestern pond turtle is a federal species of special concern and a California species of special concern. It is an aquatic turtle inhabiting streams, marshes, ponds, and irrigation ditches within woodland, grassland, and open forest communities. However, it requires upland sites for nesting and over-wintering. Stream habitat must contain large, deep pool areas (six feet) with moderate-to-good plant and debris cover, and rock and cobble substrates for escape retreats. Southwestern pond turtle was observed in Nipomo Creek during a reconnaissance-level survey conducted by Padre in July 2004. Therefore, it has been determined that this species has the potential to occur within Nipomo Creek area during implementation, including portions of the Santa Maria River. As such, mitigation to avoid and/or minimize impacts to southwestern pond turtle during project implementation would be determined during consultation with USFWS and CDFG.

Two-striped garter snake (*Thamnophis hammondi*). The two-striped garter snake is a California species of special concern which is highly aquatic and is typically found near permanent fresh water streams associated with willow habitat. This species occurs historically and currently throughout southern California streams, including the central coast. Small mammal burrows are used as over-wintering sites for the snake (Jennings, 1994). This species has the potential to occur within Nipomo Creek. Mitigation to avoid and/or minimize impacts to two-striped garter snake during project implementation would be determined during consultation with CDFG.

Blochman's ragwort *(Senecio blochmaniae).* Blochman's ragwort is a CNPS list 4 species. This species typically occurs in coastal dunes and coastal floodplains. Blochman's ragwort is a subshrub, perennial herb that blooms from May to October. A sparsely scattered population of this species (<50) was identified by Padre in 2004 within the northern sand banks of the Santa Maria River channel, directly adjacent to the existing concrete processing facility located directly west of Highway 101. Suitable habitat for this species exists along the Santa Maria River corridor. Measures to avoid and/or mitigate impacts to Blochman's ragwort would be determined during consultation with CDFG.

Nuttall's milk-vetch (*Astragalus nuttallii* var. *nuttallii*). Nuttall's milk vetch is a CNPS list 4 species, which was identified in the project area during the 2005 biological survey of the project area (Douglas Wood & Associates, Inc., 2006). Both locations were along the southern levee of the Santa Maria River within the disturbed grassland and coastal sage scrub habitat areas. Suitable habitat for this species exists along the Santa Maria River corridor. Measures to avoid and/or mitigate impacts to Nuttall's milk-vetch would be determined during consultation with CDFG.

Monarch Butterfly *(Danaus plexippus).* The Monarch butterfly does not have federal or state listing status, but is included as a sensitive species by the CNDDB and is a species of local concern in San Luis Obispo County. Winter roost sites extend from Northern Mendocino to Baja California, Mexico. The listing by CDFG is based on limited wintering roost sites within the Central California coast portion of the butterfly's West Coast wintering range. The Monarch butterfly can be found in a variety of habitats, especially those supporting milkweed plants

(Asclepias sp.), the primary food source of the caterpillars. These butterflies frequent grasslands, prairies, meadows, and wetlands, but avoid dense forests. In the winter, Monarchs cluster together in large numbers in eucalyptus, cypress, and Monterey pine trees, often on the edge of open areas. Measures to avoid and/or minimize impacts to Monarch butterflies and/or pre-activity surveys would be determined during the CEQA process and consultation with CDFG.

Raptor and Migratory Bird Species. Raptor and migratory bird species protected under the Migratory Bird Treaty Act (16 USC 703-712); CDFG Code Section 3503, and CDFG Code Section 3503.5 may nest within the area during project implementation. These include ground nesters (western meadowlark and lark sparrow), small tree/shrub nesters (bushtit, American robin, northern mockingbird, loggerhead shrike, house finch, and lesser goldfinch) and several raptors which require large trees, such as eucalyptus for nesting purposes (turkey vulture, red-tailed hawk, red-shouldered hawk, great-horned owl, barn owl, white-tailed kite and Cooper's hawk). Short-term impacts to these species may occur from vegetation clearing, debris removal, trenching and HDD operations, dust deposition and noise disturbance associated with the construction activities. Vegetation removal and subsequent grading activities may destroy nests, nestlings, or hatchlings of these protected bird species, and would be considered a significant impact. As such, measures, such as seasonal constraints and/or pre-activity nesting bird surveys to avoid and/or minimize impacts to raptors and migratory birds, would be determined during the CEQA process and consultation with CDFG.

3.2 WETLANDS/WATERS OF THE U.S.

The USACE is responsible for the issuance of permits for the placement of dredged or fill material into waters of the United States (waters) pursuant to Section 404 of the Clean Water Act (33 USC 1344). As defined by the USACE at 33 CFR 328.3(a)(3), waters are those that are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide; tributaries and impoundments to such waters; all interstate waters including interstate wetlands; and territorial seas. (Note: Based on the recent U.S. Supreme Court decision in *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers* [2001], and guidance from the U.S. Army Corps of Engineers and U.S. Environmental Protection Agency [2001], the Federal government no longer asserts jurisdiction over isolated waters and wetlands under Section 404 of the Clean Water Act based on the "migratory bird rule." Further guidance on the issue of isolated wetlands and waters is expected (U.S. Army Corps of Engineers, 2001).

Wetlands are a special category of waters, and are defined at 33 CFR 328.3(b) as: "...those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

In non-tidal waters, the lateral extent of USACE jurisdiction is determined by the ordinary high water mark (OHWM), which is defined as the: "…*line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial*

vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas." (33 CFR 328[e]).

In addition, a wetland definition has been adopted by the USFWS to include both vegetated and non-vegetated wetlands, recognizing that some types of wetlands may lack vegetation (e.g., mudflats, sandbar, rocky shores, and sand flats), but still provide functional habitat for fish and wildlife species (Cowardin, et al., 1979). These wetlands are defined as "…*lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification, wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year.*" Some of the USFWS-defined wetlands are not regulated by the Federal government.

The upper (landward) limit of USFWS-defined wetlands are the boundary between land with predominantly hydrophytic cover and land with predominantly mesophytic or xerophytic cover; the boundary between soil that is predominantly hydric and soil that is predominantly non-hydric; or in the case of wetlands without vegetation or soil, the boundary between land that is flooded or saturated at some time each year and land that is not (Cowardin et al., 1979). The lower limit in inland areas is established at a depth of 6.6 feet below the water surface; unless emergent plants, shrubs, or trees grow beyond this depth, at which the deepwater edge of such vegetation is the boundary (Cowardin et al., 1979).

Based on the definitions above, both waters of the U.S. and USACE-defined wetlands are present within the Santa Maria River floodplain, Nipomo Creek, and the Oso Flaco Lake and Oso Flaco Creek areas. Oso Flaco Lake occupies a surface area of 82 acres is classified by the USFWS as a palustrine emergent wetland. Additionally, several of the nearby drainages and associated storage ponds that act as tributaries to Nipomo Creek and the Santa Maria River, such as those occurring along the Nipomo Mesa have the potential to fall under the USACE jurisdiction. Wetlands and creeks impacted by pipeline installation activitieswould need to be restored or replaced. In the event a selected alternative would affect designated wetlands, an agency-approved Wetlands Mitigation and Monitoring Plan would need to be implemented as part of the project.

3.3 CULTURAL RESOURCES

Alternatives involving construction activities and placement of project-related infrastructure (i.e. pipelines, tanks, treatment plants) would require evaluation and analysis of the potential for effect on culturally-sensitive resources. Alternatives would require delineation of pipeline routes and placement of project facilities prior to implementing cultural records searches and/or surveys. The Dana Adobe, located on South Oakglen Avenue, is a designated California Historical Landmark. Sensitive cultural sites are known to exist near the Dana Adobe in eastern Nipomo.

3.4 GEOLOGY AND SOILS

The information discussed in this section was determined through a review of the San Luis Obispo County Safety Element (1998). Depending on jurisdiction, project alternatives would be reviewed for geologic (e.g. active faults, liquefaction) and other safety issues. Within the general project area (i.e. south-western San Luis Obispo County and the Santa Maria area), there is a potentially active fault (Santa Maria River Fault) and areas of moderate to high liquefaction, particularly in the coastal dune areas around Oso Flaco Lake. Areas located within 100-year flood plain zones include the Santa Maria River and the Oso Flaco Lake area. This area is also considered a "dam inundation zone". Additionally, areas east of the Guadalupe-Nipomo Dunes Complex (e.g. Conoco-Phillips Refinery, Nipomo) are subject to substantial wildland fire risk. Although no specific permits may be required in relation to these hazards, the projects will be reviewed for land-use policy consistency during the CEQA and County permitting process.

3.5 HYDROLOGY AND WATER QUALITY

Water Quality. It is Padre's understanding that Boyle will provide the NCSD with an assessment of water quality issues associated with the development of the water supply alternatives and provision of potable water in accordance with state and federal water quality standards within a separate document. The following discussion focuses on water quality and hydrologic impacts that may arise from the construction of each of the water supply alternatives. Water quality impacts would be connected to construction site erosion/spills/etc, frac-outs (as discussed), and discharges from each alternative. Hydrologic impacts would be due to extractions from certain sources and discharges to certain locations.

With increased development and storm water runoff, a wide variety of nutrients and constituents of concern have been introduced into state waters. Nutrient wastes in the form of sewage, agricultural fertilizers, and manure lead to reduced dissolved oxygen in surface waters and limit the capacity of water to support aquatic organisms. Constituents of concern, such as industrial wastes, insecticides, and herbicides, can poison wildlife and become concentrated in the food chain.

Oso Flaco Lake and Oso Flaco Creek has been identified by the RWQCB as an "impaired water body" under Section 303d of the Clean Water Act because of elevated levels of nitrates associated with irrigated agriculture within the watershed. Oso Flaco Creek is also listed as an impaired water body for elevated fecal coliform bacteria concentrations. Restoration of water quality at Oso Flaco Lake by the RWQCB has focused primarily on agricultural return water quality and quantity (RWQCB, 2006). Additionally, Nipomo Creek has been designated an "impaired water body" under Section 303d because of elevated fecal coliform bacteria concentrations.

HDD Drilling Techniques. Horizontal directional drilling (HDD) techniques involve the installation of pipelines without open-trenching. HDD installation methods are environmentally-preferable to open-trenching in most cases because it can be utilized to avoid impacts to sensitive resources such as creeks and wetlands. "Frac-outs", or the loss of drilling fluids to the surrounding environment, are a risk in utilizing HDD drilling techniques. The potential for "frac outs" should be minimized by incorporating engineering and geologic information and

developing a drilling and drilling fluid monitoring program that is appropriate for the existing subsurface geological conditions. The HDD drilling plans should specify drilling parameters such as drilling equipment capacity, directional bore depths, entry, and exit angles. Drilling fluid properties including fluid weight, viscosity, water loss, and gel strength should be designed and monitored by a qualified engineer. Only bentonite-based drilling mud is allowed for use within state waters in California. Compounds that may be toxic to fish are prohibited from use as additives to drilling mud mixtures.

4.0 SUMMARY AND RECOMMENDATIONS

The following section provides a summary of the permitting issues and requirements for the water supply alternatives under consideration by the NCSD. A summary of the permitting requirements is presented in Table 2, followed by general recommendations on a permitting strategy.

4.1 SUMMARY OF ENVIRONMENTAL/PERMITTING ISSUES BY ALTERNATIVE

The following provides an overview of the expected agency jurisdictional issues and associated permits that may be required for the various water supply alternatives:

Alternative No. 1 (Seawater/Cooling Water): Although specific locations are not identified under this alternative, proposals for desalination facilities along California's coast have raised unique issues that would need to be addressed through project design and agency negotiations. The California Coastal Commission has raised concerns about brine disposal impacts to marine resources. Open seawater intakes structures have been effectively prohibited by the Coastal Commission due to entrainment and take of marine organisms. One method of mitigating concerns associated with desal intake system construction within the beach areas would be to utilize existing intake structures or outfall pipelines. As a result of concerns about open ocean intake pipelines, most desalination facilities currently under consideration along the Central and South Coasts of California include beach water intake systems that utilize wells or intake galleries that would draw brackish water from permeable zones within the coastline and beach areas.

The design of a beach well intake system can result in a separate set of environmental impacts. The Nipomo-Guadalupe Dune complex is a unique and sensitive area that has been heavily protected by land acquisition, land use planning, and regulatory activities. Numerous threatened or endangered species, such as the Western snowy plover and the California least tern, are present within the dune complex and along the beach areas of the Nipomo-Guadalupe dunes.

The area around the Conoco-Phillips refinery is known to contain special-status plant species (e.g. Nipomo Mesa Lupine, La Graciosa Thistle, Dune Larkspur), as well as sensitive habitat (Central Coast Dune Scrub).

Selection of one of the seawater or cooling water alternatives will require review and approval of a Coastal Development Permit by the County of San Luis Obispo which would be appealable to the Coastal Commission. The State Lands Commission would require a state lands lease for placement of an ocean outfall line in state waters. The ocean outfall line would also require a Section 404/10 permit from USACE for construction in navigable waters. Pipeline

facilities associated with any of the options would likely require permits from the USACE, RWQCB, and CDFG for pipeline creek crossings. A Caltrans encroachment permit would be required for pipeline crossings at Highway One. A RWQCB NPDES/WDR permit would be required for the disposal of brine into the Pacific Ocean or other form of injection or disposal options that may affect surface or ground water quality.

Alternative No. 2 (Oso Flaco Lake Watershed): This alternative would involve treating shallow groundwater or agricultural runoff within the Oso Flaco Lake watershed and delivering the treated water to the NCSD distribution system. This alternative may include returning a portion of the treated flow to the watershed for environmental uses.

The Oso Flaco Creek Watershed covers approximately 10,370 acres. The western terminus for the watershed is Oso Flaco Lake, owned by California State Parks. Oso Flaco Creek flows out of the lake and meanders ¼-mile to the Pacific Ocean through active sand dunes. Oso Flaco Lake is the largest of four small freshwater lakes located in the Guadalupe Nipomo Dunes Complex. The freshwater lake occupies a surface area of 82 acres and is classified by the U.S. Fish and Wildlife Service as palustrine emergent wetlands, a valuable habitat for wildlife, and subsequently a resource for many recreational and educational activities.

Oso Flaco Lake and Little Oso Flaco Lake are usually at maximum pool due to the steady flow of agricultural runoff. It has been estimated that 6,371 acres in the watershed are irrigated, primarily with pumped groundwater, and that 17,564 acre-feet per year (AFY) of water are applied, resulting in 968 AFY of agricultural runoff. Efforts are currently underway to improve irrigation efficiency to both reduce the quantity of water applied and the volume of agricultural runoff. It has been estimated that if 100% of the irrigated area were to adopt sprinkler/drip systems, the annual runoff volume would decrease to 440 AFY (CRCD, 2004).

The critical environmental issue associated with this alternative is ensuring that significant negative impacts would not occur to Oso Flaco Lake, Little Oso Flaco Lake or associated creeks. Impacts would be considered significant if less environmental flows to the creeks and lakes would result in reduced habitat for endangered species. The County of San Luis Obispo has designated Oso Flaco Lake as a Sensitive Resource Area in its South County Coastal Area Plan (1988). Activities within Sensitive Resource Areas are required to undergo extra scrutiny to ensure that damage to the resource will not result from proposed projects. Hydrologic modeling of the watershed would be required to show that water levels within the lakes would not be significantly affected through water withdrawal upstream. A project that improves water quality in Oso Flaco Lake could be leveraged as a desirable outcome for stakeholders in the area, including State Parks, RWQCB, USFWS, CDFG, the Dunes Center, and agricultural water users.

This alternative project would require review and approval of Coastal Development Permits by the County of San Luis Obispo and the Coastal Commission for the outfall line extending into the ocean. The State Lands Commission would require a state lands lease for placement of an ocean outfall line. The ocean outfall line would also require a Section 404/10 permit from USACE for construction in navigable waters. Pipeline facilities associated with any of the options would likely require permits from the USACE, RWQCB, and CDFG for pipeline creek crossings. A Caltrans encroachment permit would be required for pipeline crossings at Highway One. A RWQCB NPDES/WDR permit would be required for the disposal of brine into

the Pacific Ocean or other form of injection or disposal options that may affect surface or ground water quality.

Formal Section 7 consultation would be required with the USFWS due to the presence of CRLF within the Oso Flaco Creek area. NOAA Fisheries would be consulted by the USACE for potential impacts associated with an ocean outfall to marine fisheries and marine mammals. The level of disturbance during construction of pipelines to environmentally sensitive areas could be minimized through the use of HDD construction techniques.

Alternative No. 3 (Water Trading with CCWA Agencies): This alternative would consider acquisition of unused capacity in the State Water Pipeline (SWP) from one or more CCWA project participants, including acquiring exchange water from one or more CCWA project participants. Water could be provided via a turnout along the State Water Pipeline within the NCSD boundary. This water would then either be delivered directly to the NCSD water system, or indirectly via aquifer storage and recovery.

As new construction activities would be minimal with this alternative, agency jurisdictional issues would be less than other alternatives. The use of a CCWA interconnection at the Tefft Street site may require a pipeline crossing at Nipomo Creek. If it can be determined that creek and wetland crossings can be avoided, USACE, RWQCB, and CDFG permits would not be required. Furthermore, impacts to special-status wildlife and plants could be minimized if construction is limited to disturbed and developed areas. NOAA Fisheries most likely will not be a key permitting agency under this alternative provided that surface water flows within the Santa Maria River are not affected. Existing fish passage barriers in Nipomo Creek have almost eliminated the likelihood of steelhead in Nipomo Creek. A Caltrans encroachment permit would be required for a pipeline crossing at Highway 101, if required.

Recent litigation regarding the State Water Project's Harvey O. Banks intake facility have included the judge's threat to require the California Department of Water Resources (DWR) to stop pumping water from the delta. The main issue centers around fish takes that are have not been permitted by the USFWS and NOAA Fisheries under the Endangered Species Act. It is Padre's understanding that CDFG and DWR are in negotiations with NOAA Fisheries and the USFWS which may result in an agreement being enacted to allow continued water withdrawals from the delta area with allowed incidental take of fish species.

Alternative No. 4 (Santa Maria Groundwater): This alternative would include the development of wells at either the Hutton Road area or at the Bonita well site to extract groundwater, which then would be conveyed to NCSD through a pipeline. Selection of one of the seawater or cooling water alternatives will require review and approval of a discretionary development permit by the County of San Luis Obispo. Pipeline facilities associated with any of the options would likely require permits from the USACE, RWQCB, and CDFG for any pipeline creek crossings. A Caltrans encroachment permit would be required for pipeline crossings at Highway 101, if crossed. NOAA Fisheries most likely will not be a key permitting agency under this alternative provided that surface water flows within the Santa Maria River are not affected. Existing fish passage barriers in Nipomo Creek have almost eliminated the likelihood of steelhead in Nipomo Creek.

Alternative No. 5 (Groundwater Recharge from Wastewater Treatment Facility): This alternative would include the construction groundwater recharge facilities within a specified area where groundwater depressions are known. This alternative would require a discretionary permit from the County of San Luis Obispo for the construction of water transmission and disposal facilities. It is anticipated that pipeline alignments associated with this alternative could be designed to avoid wetlands and sensitive habitat areas through environmental planning and site design. It is also anticipated that wetland and creek pipeline crossings would not be required for this alternative. A WDR permit modification from the RWQCB would be required for the disposal of treated wastewater at the proposed recharge facilities. No Caltrans encroachment permit would be required if conveyance facilities did not cross Highways 1 or 101.

Alternative No. 6 (Treated Water Exchange with Agricultural Water users). This alternative would include an exchange of treated wastewater for agricultural water within a specified area where groundwater depressions are known. This alternative would require a discretionary development permit from the County of San Luis Obispo for the construction of water transmission and storage facilities. It is anticipated that pipeline alignments associated with this alternative could be designed to avoid wetlands and sensitive habitat areas through environmental planning and site design. It is also anticipated that wetland and creek pipeline crossings would not be required for this alternative. A WDR permit modification from the RWQCB would be required for the beneficial re-use of treated wastewater at the proposed agricultural lands. No Caltrans encroachment permit would be required if conveyance facilities did not cross Highways 1 or 101.

4.2 GENERAL RECOMMENDATIONS

Biological Resources. The preliminary review of the project alternatives identified potential constraints related to habitat for protected species within the Oso Flaco Lake, Nipomo-Guadalupe Dunes and other wetland/creek areas in the project area. The following are recommendations to minimize impacts to biological resources:

- Complete required CRLF protocol-level surveys during the CRLF breeding season (January 1 through June 30) to identify all known populations of CRLF within the limits of the project boundary and nearby areas. This would be accomplished once project alternative details and engineering specifications can clearly define areas of potential impact. As an example, potential impacts to the CRLF and associated habitat areas can be avoided and/or minimized through additional pipeline-route deviations and/or adjustments.
- Where necessary, the use of HDD construction methods across creeks and streams would minimize impacts to wetland/ jurisdictional waters and special-status species with the potential to occur in the area.
- Rare plant species (e.g. Nipomo Mesa Lupine, La Graciosa Thistle, Dune Larkspur) are located within the vicinity of Oso Flaco Lake and the Conoco-Phillips Refinery. Coastal Dune Scrub, considered a sensitive habitat, is common in this area. Botanical surveys may be needed to determine the likelihood of impacts within any final selected pipeline alignments, or other treatment plant facilities. Impacts to rare

plants may be avoided through route-deviations or other strategic placement as feasible, and/or through seed collection and restoration, as necessary.

Wetlands/Waters of the U.S. A high-level preliminary review of the project alternatives and site survey(s) conducted to date identified potential constraints related to regulated waters of the U.S. and wetlands. Following are recommendations to minimize impacts to wetlands and Waters of the U.S.:

- Where necessary, the use of HDD construction methods across creeks and streams would minimize impacts to wetland/ jurisdictional waters and special-status species with the potential to occur in the area.
- Whenever possible, limit construction activities to within previously disturbed or developed areas to avoid impacting sensitive habitat areas. A wetland delineation may be required to determine the likelihood of impacts to identified wetlands within final selected pipeline alignments and other impacted areas.
- "Frac-outs", or the loss of drilling fluids to the surrounding environment, and potential release of drilling mud into sensitive aquatic areas, are considered serious offenses by regulatory agencies. The potential for "frac-outs" should be minimized by incorporation of engineering and geologic information and development of a drilling and drilling fluid monitoring program that considers the existing geological conditions.
- Creek crossings and/or HDD operations may be limited by CDFG, RWQCB, and NOAA Fisheries to April 15 through October 15 to avoid impacts to water quality and associated sensitive species.

Cultural Resources. Alternatives involving construction activities and placement of project-related infrastructure (i.e. pipelines, tanks, treatment plants) would require evaluation and analysis of the potential for effect on culturally-sensitive resources. Alternatives would require delineation of pipeline routes and placement of project facilities prior to implementing cultural records searches and visual survey.

Table 2. Matrix of Required Permits by Alternative

Alternatives/Options	USACE – 404/10 Permit	USFWS – Section 7	NOAA Fisheries – Section 7	California Coastal Commission Appeal Jurisdiction	California State Lands Commission	CDFG- SAA	Regional Water Quality Control Board (RWQCB) – 401 Cert.	RWQCB – NPDES/WDR	RWQCB - SWPPP	DHS –Water Supply Permit	Caltrans – Encroachment Permit	County of San Luis Obispo Permits	SLO APCD – Authority to Construct	SLO Environmental Health	Relative Difficulty for Permitting (Low to High)	Biological-related mitigation Required (H=High, L=Low)	Permitting Time Requirement
Alternative 1 – Seawater/Cooling Water Treatment	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	H	H	24-36 mos.
Alternative 2 – Oso Flaco Agricultural Water	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	H	H	24-36 MOS.
Alternative 3 – Water trading with CCWA agencies	☒	☒	☒	☐	☐	☒	☒	☐	☒	☒	☒	☒	☐	☐	L	L	12-18 MOS.
Alternative 4 – Santa Maria Groundwater	☒	☒	☒	☐	☐	☒	☒	☐	☒	☒	☐	☒	☐	☒	L	L	12-24 MOS.
Alternative 5 – Groundwater Recharge with Treated Water from Southland WWTF	☐	☐	☐	☐	☐	☐	☐	☒	☒	☒	☐	☒	☐	☒	L	L	12 MOS.
Alternative 6 – Agricultural Water Exchange	☐	☐	☐	☐	☐	☐	☐	☒	☒	☒	☐	☒	☐	☐	L	L	12 MOS.

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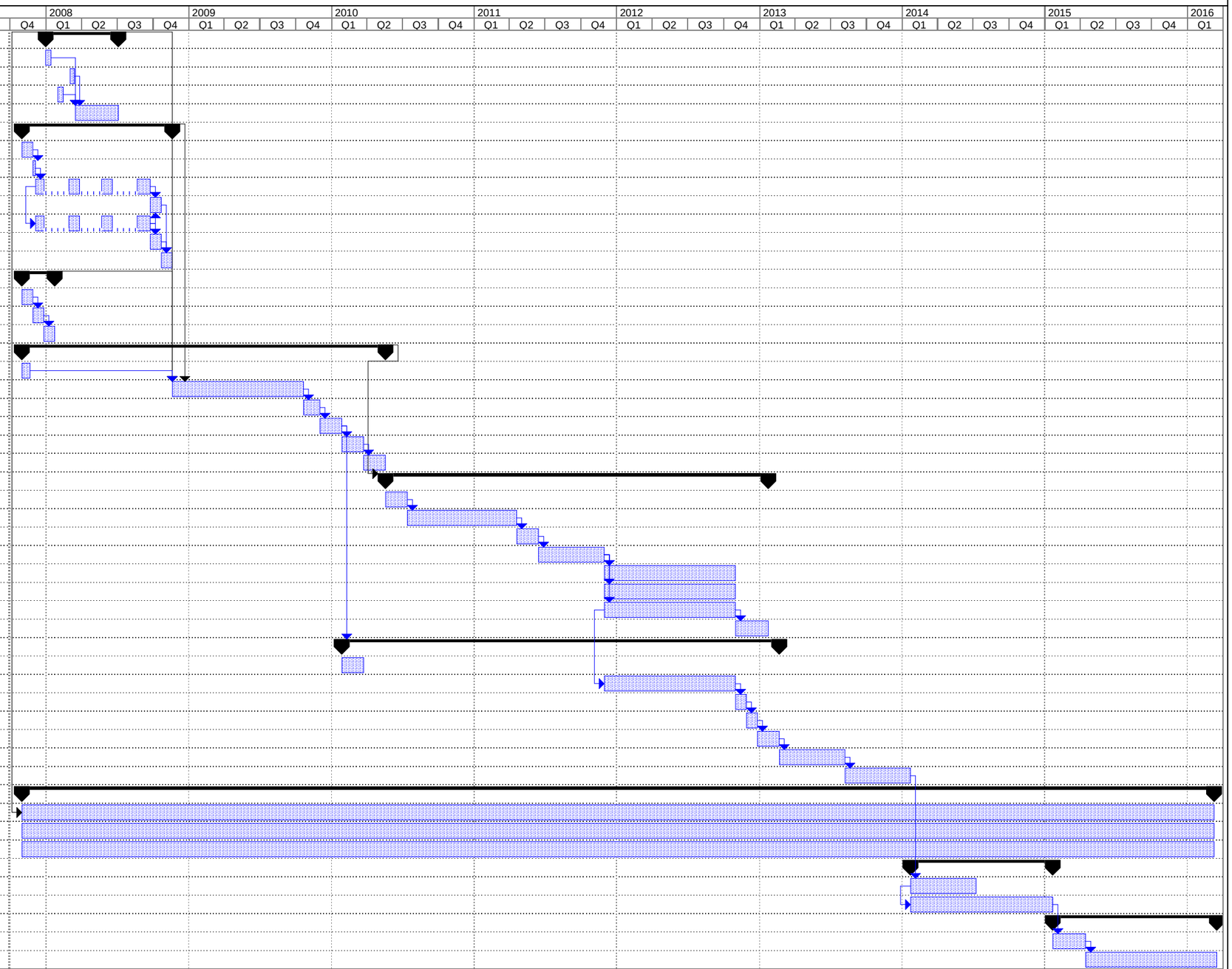
Appendix C: Projected Project Schedule Detail

NCSD Desalination Option - Conceptual Schedule

ID	Task Name	Duration
1	**Terrestrial and Freshwater Impact Studies**	**26.8 wks**
2	**CRLF Survey**	**2 wks**
3	**Botanical Survey**	**2 wks**
4	**Wetland Delineation**	**2 wks**
5	**Report**	**4 mons**
6	**Phase 1 Marine Impact Studies**	**55 wks**
7	**Map bathymetry and habitat types**	**1 mon**
8	**Select reference site**	**1 wk**
9	**Monitor currents, temperature, salinity**	**4 mons**
10	**Quantify "background" conditions**	**1 mon**
11	**Determine species present**	**4 mons**
12	**Estimate Impacts**	**1 mon**
13	**Report**	**1 mon**
14	**Cultural Resource Study**	**12 wks**
15	**Record search and lit. review**	**1 mon**
16	**Field survey**	**1 mon**
17	**Report**	**1 mon**
18	**Phase 1 Hydrogeologic Field Study**	**133 wks**
19	**Estimate number of holes**	**3 wks**
20	**Obtain permits etc**	**48 wks**
21	**Drill and log holes**	**6 wks**
22	**Estimate hydraulic parameters**	**2 mons**
23	**Assess suitability and select intake system**	**2 mons**
24	**Report**	**2 mons**
25	**Test-Scale Feasibility Study**	**140 wks**
26	**Prelim design**	**2 mons**
27	**Obtain permits for Feasibility Study**	**10 mons**
28	**Final design**	**2 mons**
29	**Install test intake structure and pilot plant**	**6 mons**
30	**Operate the intake structure**	**12 mons**
31	**Operate the pilot plant**	**12 mons**
32	**Operate the outfall structure**	**12 mons**
33	**Report**	**3 mons**
34	**Phase 2 Hydrogeologic Field Study**	**160 wks**
35	**Develop hydrogeologic model**	**8 wks**
36	**Obtain field observations**	**48 wks**
37	**Calibrate hydrogeologic model**	**4 wks**
38	**Estimate impacts of full-scale facility**	**1 mon**
39	**Report**	**2 mons**
40	**Preliminary Engineering**	**6 mons**
41	**CEQA/NEPA**	**6 mons**
42	**Public Outreach**	**436 wks**
43	**Continuing public outreach**	**109 mons**
44	**Outreach campaigns**	**109 mons**
45	**Web site maintenance**	**109 mons**
46	**Design and Permitting**	**52 wks**
47	**Design**	**24 wks**
48	**Permitting**	**52 wks**
49	**Bidding and Construction**	**60 wks**
50	**Bidding**	**12 wks**
51	**Construction**	**12 mons**



Project: NCSD Desalination Option
Date: Fri 9/28/07

Task | Split | Progress | Milestone | Summary | Project Summary | External Tasks | External Milestone | Deadline

Appendix D: Opinion of Probable Cost

Opinion of Probable Cost - Construction

Design and Construction Budget
Seawater Desalination Facility
Annual Production = 6300 AFY

Description	Quantity	Units	Unit Cost	Subtotal
Professional Services (Design/Construction Management)				
Design Phase				
Plans, Specifications, and Estimates (5% of Subtotal)	1	LS	$3,090,000	$3,090,000
Permit Applications and Coordination	1	LS	$780,000	$780,000
Subtotal				**$3,870,000**
Construction				
Construction Phase Professional Engineering Services				
Construction Management (5% of Subtotal)	1	LS	$3,090,000	$3,090,000
Geotechnical Engineering/Materials Testing (3% of Subtotal)	1	LS	$1,850,000	$1,850,000
Environmental Mitigation and Monitoring (2% of Subtotal)	1	LS	$1,240,000	$1,240,000
Subtotal				**$6,180,000**
Intake/Discharge/Product				
Mobilization (5% of subtotal)	1	LS	$208,500	$210,000
0.9 MGD Intake Wells	20	EA	$175,000	$3,500,000
36" Raw Water Pipeline	3	MI	$1,200,000	$3,600,000
24" Discharge Pipeline	3	MI	$1,000,000	$3,000,000
24" Product Pipeline	1.5	MI	$1,000,000	$1,500,000
0.9 MGD Subsurface Discharge Wells	10	EA	$100,000	$1,000,000
Electrical (10% of subtotal)	1	LS	$347,500	$350,000
Controls and Instrumentation (10% of subtotal)	1	LS	$347,500	$350,000
PG&E Service and Fees	1	LS	$50,000	$50,000
Subtotal				**$13,560,000**
Treatment Plant				
Membrane filtration plant construction cost @ $1.50/gpd	13	MGD	$1,500,000	$19,500,000
SWRO plant construction cost @ $5/gpd	5.6	MGD	$5,000,000	$28,000,000
Convert District Wells to Chloramination	1	LS	$700,000	$700,000
Subtotal				**$48,200,000**
Construction Subtotal (Rounded to nearest $100,000)				**$68,000,000**
TOTAL Design and Construction (Rounded to nearest $100,000)				**$71,900,000**

Design and Construction Budget
Seawater Desalination Facility
Annual Production = 6300 AFY

Description	Quantity	Units	Unit Cost	Subtotal	Phase 1	Phase 2
Professional Services (Design/Construction Management)						
Design Phase						
Plans, Specifications, and Estimates (5% of Subtotal)	1	LS	$3,087,675	$3,087,675	$3,088,000	$0
Permit Applications and Coordination	1	LS	$780,800	$780,800	$781,000	$0
Subtotal				**$3,868,475**	**$3,869,000**	**$0**
Construction						
Construction Phase Professional Engineering Services						
Construction Management (5% of Subtotal)	1	LS	$3,087,675	$3,087,675	$2,779,000	$309,000
Geotechnical Engineering/Materials Testing (3% of Subtotal)	1	LS	$1,852,605	$1,852,605	$1,853,000	$0
Environmental Mitigation and Monitoring (2% of Subtotal)	1	LS	$1,235,070	$1,235,070	$1,235,000	$0
Subtotal				**$6,175,350**	**$5,867,000**	**$309,000**
Intake/Discharge/Product						
Mobilization (5% of subtotal)	1	LS	$208,500	$208,500	$209,000	$0
0.9 MGD Intake Wells	20	EA	$175,000	$3,500,000	$3,500,000	$0
36" Raw Water Pipeline	3	MI	$1,200,000	$3,600,000	$3,600,000	$0
24" Discharge Pipeline	3	MI	$1,000,000	$3,000,000	$3,000,000	$0
24" Product Pipeline	1.5	MI	$1,000,000	$1,500,000	$1,500,000	$0
0.9 MGD Subsurface Discharge Wells	10	EA	$100,000	$1,000,000	$1,000,000	$0
Electrical (10% of subtotal)	1	LS	$347,500	$347,500	$348,000	$0
Controls and Instrumentation (10% of subtotal)	1	LS	$347,500	$347,500	$348,000	$0
PG&E Service and Fees	1	LS	$50,000	$50,000	$50,000	$0
Subtotal				**$13,553,500**	**$13,555,000**	**$0**
Treatment Plant						
Membrane filtration plant construction cost @ $1.50/gpd	13	MGD	$1,500,000	$19,500,000	$15,600,000	$3,900,000
SWRO plant construction cost @ $5/gpd	5.6	MGD	$5,000,000	$28,000,000	$22,400,000	$5,600,000
Convert District Wells to Chloramination	1	LS	$700,000	$700,000	$700,000	$0
Subtotal				**$48,200,000**	**$38,700,000**	**$9,500,000**
Construction Subtotal (Rounded to nearest $100,000)				**$68,000,000**	**$58,200,000**	**$9,900,000**
TOTAL Design and Construction (Rounded to nearest $100,000)				**$71,900,000**	**$62,100,000**	**$9,900,000**